QUBAHAN ACADEMIC JOURNAL
VOL. 6, NO. 2, May 2026
https://doi.org/10.48161/qaj.v6n2a2072

AI-Driven Islamic Classroom Management in the Digital Era: The Roles of Neuro-Pedagogy, Spiritual Intelligence, and Innovative Teaching Performance

Tumiran [*1], **Bahtiar Siregar** [2], **Sakban Lubis** [2], **M. Yunan Harahap** [2] **and Mhd. Habibu Rahman** [2]

[1] Islamic Education Study Program, Faculty of Islamic Studies and Humanities, Universitas Pembangunan Panca Budi, Medan 20122, Indonesia;
[2] Master's Program in Islamic Education, Faculty of Graduate Studies, Universitas Pembangunan Panca Budi, Medan 20122, Indonesia.

* **Corresponding author:** tumiran@dosen.pancabudi.ac.id.

ABSTRACT: The rapid advancement of digital technologies and artificial intelligence (AI) is reshaping educational systems worldwide, including Islamic education institutions that seek to preserve spiritual and ethical values while embracing pedagogical innovation. This study investigates the influence of digital technology integration, Islamic neuro-pedagogy, classroom environment, and teachers' spiritual intelligence on Islamic classroom management and innovative teaching performance in madrasahs in Medan City, Indonesia. A quantitative research design was employed using structured questionnaires distributed to 120 teachers, and the collected data were analyzed through path analysis to examine direct and mediating relationships among variables. The findings reveal that Islamic neuro-pedagogy exerts the strongest positive effect on innovative teaching performance ($\beta = 0.268$), followed by digital technology integration ($\beta = 0.253$). Although classroom environment and spiritual intelligence demonstrate comparatively smaller direct effects, both significantly contribute to effective pedagogical practices and classroom interaction. Furthermore, Islamic classroom management plays a significant mediating role, strengthening the relationship between technological, cognitive, and spiritual dimensions and teachers' innovative performance. The study proposes a holistic framework for AI-supported Islamic education that integrates neuroscience-informed pedagogy, digital learning technologies, and spiritual intelligence within value-based classroom management practices. These findings contribute theoretically to contemporary Islamic educational research and provide practical implications for educators, curriculum designers, and policymakers seeking to foster innovative, ethical, and spiritually grounded learning environments in the digital era.

Keywords: Islamic AI-integrated education, Neuro-pedagogy in Islamic learning, Classroom management innovation, Spiritual intelligence in teaching, Digital transformation in madrasah education.

I. INTRODUCTION

The rapid growth of digital technology has changed many parts of education, such as how teachers teach and how they run their classrooms. For Islamic schools, using digital technology in the classroom is very important since it makes learning more effective while still following Islamic norms. United Nations Educational, Scientific and Cultural Organization (UNESCO) says that the COVID-19 epidemic affected the

education of more than 1.5 billion children around the world and sped up the use of digital learning tools [1]. In Indonesia, a survey by the Ministry of Religious Affairs found that about 75% of Islamic schools had implemented digital learning platforms. However, only approximately 40% of teachers said they were good at using these tools [2].

A substantial corpus of research has developed during the past two decades at the convergence of digital technology, pedagogy, and teacher performance [3–6]. Nonetheless, the majority of these studies have been executed within Western contexts and frequently concentrate on a singular aspect of innovation such as digital integration, neuroscience-informed pedagogy, or spiritual leadership [9-16]. Only a limited number of studies have endeavored to comprehend the holistic interplay of these aspects within Islamic educational contexts, namely in Indonesian madrasahs [7, 8, 12]. Previous research has yielded significant insights; nevertheless, it has also left essential gaps that must be filled to develop a thorough comprehension of teacher creativity and classroom management in Islamic education [13, 19-22].

This study delineates these deficiencies and addresses them by presenting a comprehensive model that concurrently analyzes digital technology, neuro-pedagogy, the Islamic classroom environment, and teachers' spiritual intelligence as factors influencing teacher creativity and classroom management. By doing this, it not only addresses gaps in theory and method, but it also has practical effects for teachers and politicians in situations where modernism and spirituality need to be balanced. Previous research on technology acceptance in education frequently use the Technology Acceptance Model (TAM) or Acceptance and Use of Technology (UTAUT) frameworks to elucidate how educators perceive and integrate digital resources [3, 4]. Nonetheless, most of these studies concentrate on general or secular education systems. For instance, [5] utilized the TAM with pre-service teachers in Singapore, [6] investigated technology acceptance among student teachers in Hong Kong. These circumstances are very different from Islamic schools, which are limited by both religious principles and cultural expectations, as well as by teaching methods.

In the Indonesian Islamic context, [7] discovered that digital technologies enhanced teaching quality; however, the study did not investigate the impact of such integration on larger dimensions, such as classroom management or teacher creativity. Likewise, [8] examined the obstacles of incorporating digital platforms into Islamic education but failed to present a thorough empirical model that connects technology to innovation. Consequently, the research gap pertains to comprehending the influence of digital technology adoption in madrasahs on both utilization rates and the innovation of educators, as well as classroom dynamics. Neuroscience and education research has expanded swiftly. Studies [9, 10] showed that using neuroscience-based methods can boost student engagement and retention by as much as 35%. [11] highlighted the significance of emotions in cognition, elucidating the connection between affect and learning. Nonetheless, the majority of this research are based on Western educational systems, exhibiting minimal adaptability to religious or cultural contexts. Result [12] endeavored to use neuro-pedagogical methodologies in Islamic schools, demonstrating a degree of enhancement in memory retention. However, their research was limited, concentrating on particular pedagogical methods instead of developing a cohesive theoretical framework. Additionally, none of these studies carefully analyzed the interplay between neuro-pedagogy and other variables such as spiritual intelligence or classroom environment in shaping teacher creativity. This exclusion underscores a deficiency where cognitive neuroscience could be integrated into Islamic education to develop learning methodologies that are more culturally and religiously congruent. The classroom setting has been acknowledged for an extended period as a factor influencing student results. [13] discovered that Islamic educational environments play a crucial role in the development of moral character. Likewise, [14] shown that Islamic classroom methods augment student motivation. However, these studies mostly look at outcomes for students, like character or motivation, and don't look at outcomes for teachers, like innovation or creativity.

Concentrated on classroom management and its impact on student behavior, although failed to connect the classroom environment to teacher creativity [15]. Consequently, the deficiency exists in correlating the function of Islamic classroom environments not alone to student behavior but also to the instructors' ability to innovate and efficiently manage classrooms. Studies [16-18] have written a lot about Spiritual Intelligence (SQ). They talked about how it is important for ethical leadership and making decisions based on values. In

educational study, spiritual intelligence has frequently been examined concerning leadership and moral growth, although seldom in relation to teacher creativity. For instance, [19] associated spiritual intelligence with enhanced student discipline, whilst [20] emphasized its significance in teacher resilience. Nonetheless, there is a scarcity of empirical research that directly examines how teachers' spiritual intelligence improves classroom management or fosters new teaching methodologies. This study fills that gap by showing that spiritual intelligence is an important factor in how well teachers do their jobs in Islamic institutions. There is still not much research on how teachers may be innovative in Islamic education. Study [21] recorded novel practices in madrasahs yet failed to link them to overarching theoretical frameworks. Study [22] concentrated on individual creativity among educators while overlooking mediating elements such as classroom management.

Most previous studies have regarded innovation as an isolated entity, neglecting its contextualization within a network of variables, including technology adoption, neuro-pedagogy, classroom environment, and spirituality. This work aims to address the deficiency of a comprehensive, multi-factor model. The uniqueness of this research resides in its comprehensive methodology. This study uniquely examines the joint effects of technology, pedagogy, environment, and spirituality on Islamic Classroom Management (Y1) and Teachers' Innovative Performance (Y2), in contrast to prior studies that analyzed these factors in isolation. First, theoretical novelty: This research integrates various frameworks TAM, UTAUT, Brain-Based Learning Theory, Social Cognitive Theory, and Spiritual Intelligence Theory into a cohesive model specifically designed for Islamic education. This comprehensive methodology has not been previously explored in the literature. Second, contextual novelty: The study is conducted in madrasahs throughout Medan City, Indonesia, a milieu that is underrepresented in worldwide academic debate. By placing the study in an Islamic educational context, it produces insights that are both contextually specific and universally applicable. Third, methodological novelty: This study uses Path Analysis to differentiate the direct and indirect impacts of various independent factors (X1–X4) on teacher innovation. There are not many previous studies that have employed such strong statistical approaches to examine multi-factor models in Islamic education. Fourth, practical novelty: By designating classroom management as a mediating variable, the study elucidates both the factors that influence teacher creativity and the mechanisms via which these factors function in practice. Previous research has neglected this mediation role.

This work contributes to theory, methodology, and practice in various ways: (1) Contribution to Theory: Creates a unified conceptual framework that connects digital technology, neuro-pedagogy, classroom atmosphere, and spiritual intelligence to teacher creativity. Broadens the applicability of TAM and UTAUT by implementing them in a faith-oriented educational context. Integrates Brain-Based Learning and Social Cognitive Theory into Islamic pedagogy, demonstrating their interaction with spiritual intelligence. (2) Contribution to Methodology: Employs Path Analysis to quantify both direct and indirect effects, offering enhanced rigor in comparison to descriptive or case study methodologies utilized in previous studies. Shows how classroom management can be a middleman, which is something that has been missed in earlier studies on Islamic education. (3) Useful Contribution: Gives teachers useful information about how to combine neuroscience-based methods with digital integration and spiritual values to encourage new ideas. Gives curriculum developers advice on how to include neuro-pedagogy and digital literacy in Islamic education courses. Recommends methods for policymakers to enhance institutional support and training initiatives for madrasah educators. (4) Contribution to Policy: Supports evidence-based policymaking by showing that teacher innovation in Islamic schools needs a whole-person approach that includes technology, pedagogy, the environment, and spirituality. Provides data to support spending money on initiatives for teachers, digital infrastructure, and spiritual growth in Islamic schools.

In summary, prior research has elucidated significant dimensions of technology adoption, neuro-pedagogy, classroom environment, and spiritual intelligence, albeit in isolation. This disjointed approach has resulted in unanswered inquiries on the aggregate influence of these elements on teacher innovation and classroom management. The current study rectifies these deficiencies by constructing an integrative, multi-theoretical, and empirically validated framework. Its originality is based on four things: (1) combining several ideas into one model, (23) doing the research in Islamic madrasahs, (24) using strict path analysis,

and (25) finding classroom management as a mediator. The paper addresses theoretical and methodological deficiencies while offering pragmatic answers for educators and policymakers.

Ultimately, this research enhances the global discourse on educational innovation by demonstrating that teacher creativity and classroom effectiveness in Islamic schools are influenced not by singular factors, but by the interplay of digital technology, neuro-pedagogy, classroom environment, and spiritual intelligence. This comprehensive viewpoint enhances the comprehension of educational change and provides a framework for improving teacher efficacy in faith-based and culturally specific settings.

II. LITERATURE REVIEW

Understanding the dynamic relationship between technology, pedagogy, classroom environment, and spiritual values in Islamic education requires a solid theoretical foundation. Each construct examined in this study is rooted in well-established theories that provide both explanatory and predictive power. These theories not only guide the research model but also clarify how the variables interact to influence teachers' classroom management and innovative performance. In particular, models of technology adoption, neuroscience-informed approaches to learning, socio-behavioral frameworks, and spiritual perspectives offer a comprehensive lens through which the research questions can be addressed. The following six theories form the backbone of the present study:

1. THE TECHNOLOGY ACCEPTANCE MODEL (TAM)

The TAM, initially proposed [26], is a prominent theoretical framework utilized to elucidate the reasons individuals embrace or reject technological developments. TAM posits that technology adoption is chiefly determined by two critical perceptions: perceived usefulness (the belief that utilizing a specific system will improve job performance) and perceived ease of use (the belief that using the system will require minimal effort) [27]. In the realm of education, TAM has been extensively utilized to examine the adoption of digital technology by teachers and students within the classroom. For teachers in Islamic schools, perceived usefulness may refer to whether digital platforms assist them in managing classes more efficiently, offering organized educational resources, or enhancing communication with pupils. On the other hand, perceived ease of use might show whether the learning management system, educational apps, or online platforms are easy to use without a lot of training.

This research establishes the TAM as the theoretical framework for Digital Technology Integration (X1). Teachers are more willing to use digital technologies in their regular classroom work when they see that they improve teaching performance and can be used with few technical problems. This directly improves Islamic Classroom Management (Y1) by making it easier to talk to students, plan lessons, and keep track of their progress in real time. It also helps Teachers' Innovative Performance (Y2) by giving teachers the freedom to try out new methods like flipped classrooms, interactive e-learning content, or online collaboration tools. For example, in Medan's madrasah setting, a teacher who finds an e-learning platform valuable for tracking student attendance and performance may be more inspired to innovate by providing online quizzes and interactive modules. On the other hand, if the platform is hard to use or not well thought out, teachers may go back to traditional techniques, which would stifle innovation. TAM, then, gives us a way to guess whether or not technology integration will work in Islamic schools.

2. UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

The UTAUT created by [28], adds four more factors that affect how people use technology: performance expectancy, effort expectancy, social influence, and facilitating conditions [28]. This renders UTAUT particularly pertinent in institutional settings like schools, where educators' actions are influenced by both personal perspectives and their surrounding environment. This study shows how UTAUT adds to TAM by making the idea of Digital Technology Integration (X1) further clearer. In Islamic schools, social influence might come from coworkers, principals, or even the culture of the school as a whole that values new ideas. Facilitating conditions may encompass the availability of internet connectivity, access to computers, provision of training, or continuing technical support. When these things happen, teachers are far more likely

to use digital platforms in the classroom (Y1) and to try out new ways of teaching (Y2). For example, teachers will feel more comfortable using multimedia in their lessons if a madrasah has stable Wi-Fi, digital projectors, and regular workshops on educational technology. at fact, even the most enthusiastic teachers may have a hard time coming up with new ideas at schools with insufficient resources. The UTAUT model also talks about how important institutional leadership is. If principals or supervisors in Islamic schools actively support digital transformation, instructors are more likely to adapt their methods to this goal. Thus, UTAUT adds a social and organizational aspect to TAM, making it a more complete way to examine the factors that help and hurt technology adoption in schools.

3. THEORY OF LEARNING IN NEUROSCIENCE

Neuroscience Learning Theory utilizes developments in cognitive neuroscience to elucidate the mechanisms by which the brain receives information, acquires new concepts, and retains knowledge. This viewpoint stresses that instruction should be in line with how the brain works naturally, especially when it comes to attention, memory, and emotional involvement [29]. Neuroscience research indicates that emotionally engaging content improves long-term recall, and multimodal experiences promote comprehension. Within the context of this study, Neuroscience Learning Theory serves as the theoretical foundation for Neuro-Pedagogy (X2). Neuro-pedagogy is a term for teaching methods that use what we know about neuroscience to improve learning. For Islamic classrooms, this could mean coming up with activities that keep students' attention, linking abstract religious ideas to real-life situations, or using sounds and sights to help students remember what they learned.

Using neuroscience concepts can greatly enhance Islamic Classroom Management (Y1) since students are more inclined to stay interested, focused, and disciplined when teaching approaches correspond with the brain's learning processes. Also, teachers who employ neuroscience-based methods are motivated to try new things and come up with new ideas (Y2) as they look for new ways to convey material in ways that are good for the brain. For instance, teachers could utilize storytelling to convey Qur'anic ideals, mix pictures with listening to the Qur'an, or employ exercises that involve movement to help students understand abstract ideas. This work establishes neuro-pedagogy on the foundation of Neuroscience Learning Theory, acknowledging that effective Islamic education must encompass not only the transmission of knowledge but also the bodily and cognitive processes of learners.

4. THEORY OF LEARNING BASED ON THE BRAIN

Brain-Based Learning Theory, developed by scholars like Eric Jensen and James Zull, is closely associated with neuroscience perspectives. This approach posits that education must be intentionally structured to align with the brain's inherent learning mechanisms, such as pattern recognition, repetition, emotional significance, and multisensory involvement [30]. Brain-Based Learning Theory directly enhances the conceptual framework of Neuro-Pedagogy (X2) by providing pragmatic instructions for classroom implementation. Teachers that use brain-based learning techniques might group information into meaningful patterns, get students to actively participate, or make learning spaces that are comfortable for students' feelings and lower their stress and anxiety. Brain-based learning can also be used in Islamic institutions to teach morals and spirituality. For instance, a teacher might employ daily rituals, multimodal methods like visual aids and recitations, and anecdotes from Islamic history that make you feel something to teach Islamic ideals. These strategies not only help students remember what they learned, but they also help teachers (Y1) run the classroom better by keeping students' attention and reducing disruptive conduct. Also, brain-based methods boost Teachers' Innovative Performance (Y2) because they push teachers to go beyond rote learning and try new ways of doing things. A teacher might use music, art, or computer simulations in religious studies lessons to make the lessons more interesting and creative than they would be with standard methods.

5. BANDURA'S THEORY OF SOCIAL COGNITION

Albert Bandura's Social Cognitive Theory posits that learning transpires through reciprocal interactions among personal elements (including cognition and attitudes), environmental factors (such as social norms

and structures), and behavior [31]. One of the main ideas behind this theory is observational learning, which is when people learn by seeing what other people do and how it affects them. This theory is the basis for the Islamic Classroom Environment (X3). The setting is very important in an Islamic school because it affects how students and teachers act. A healthy classroom atmosphere is one where Islamic principles guide the rules, teachers provide a good example, and rewards and punishments encourage good behavior. This is a beneficial place for both learning and moral growth.

This kind of atmosphere directly helps with Islamic Classroom Management (Y1) because it makes it easier for teachers to control how students act when rules are clear and enforced by interactions with other students. It also helps Teachers' Innovative Performance (Y2) because teachers who see their coworkers using good methods are more likely to use and change such methods. For example, a teacher might learn from a coworker who successfully uses digital media in Qur'an recitation sessions and then try out similar methods in their own classrooms. Bandura's focus on self-efficacy is pertinent in this context: educators who possess confidence in their capacity to affect student outcomes are more inclined to effectively manage classes and to innovate in their pedagogical approaches. Social Cognitive Theory posits that the classroom functions as a dynamic environment where context, behavior, and individual beliefs converge to influence educational outcomes.

6. THEORY OF SPIRITUAL INTELLIGENCE

Put out the idea of Spiritual Intelligence Theory, which sees spirituality as a type of intelligence that helps people use spiritual values, find significance in things, and make moral decisions in their daily lives [32]. SQ, in contrast to Traditional Intelligence (IQ) or Emotional Intelligence (EQ), pertains to the ability to pose essential questions of meaning, to engage in compassionate action, and to incorporate values into the decision-making process [33]. This notion serves as the foundation for Teachers' Spiritual Intelligence (X4) in this research. Teachers that have a lot of spiritual intelligence are more likely to be fair, honest, patient, and caring in their work. These traits improve Islamic Classroom Management (Y1) because teachers with these traits make classrooms that are peaceful, polite, and moral. Furthermore, spiritual intelligence propels Teachers' Innovative Performance (Y2) by encouraging educators to create teaching strategies that not only impart knowledge but also encourage students to adopt values. For instance, a teacher who uses spiritual intelligence can include reflection activities, conversations about morals, or case studies based on values in their classes. This method encourages new ideas since it goes beyond traditional teaching methods and focuses on a whole-person approach to education that supports both mental and spiritual growth. Spiritual understanding also gives you strength. Teachers with high SQ are better able to deal with stress, face problems, and stick to ethical standards, all of which help keep innovation and classroom management going for a long time.

These six hypotheses work together to make up the main ideas behind this study. TAM and UTAUT offer the theoretical framework for Digital Technology Integration (X1) by elucidating the reasons teachers select to utilize digital platforms. Neuroscience Learning Theory and Brain-Based Learning Theory substantiate the significance of Neuro-Pedagogy (X2), anchoring it in cognitive and biological mechanisms. Social Cognitive Theory elucidates the influence of the Islamic Classroom Environment (X3) on the conduct of students and the practices of teachers. Lastly, Spiritual Intelligence Theory establishes Teachers' Spiritual Intelligence (X4) as a catalyst for ethical classroom leadership and innovation. All these aspects come together to affect Islamic Classroom Management (Y1), which is the main link between outside and inside influences and Teachers' Innovative Performance (Y2). This integrated paradigm illustrates that teacher innovation in Islamic education is influenced by the synergistic interplay of technology, neurology, environment, and spirituality.

The link between integrating digital technology (X1) and Islamic classroom management (Y1) [34] assert in Educational Technology and Society that the integration of technology in the classroom enhances communication and the efficacy of classroom management. To maintain the essence of ethically based education, the incorporation of technology in Islamic educational environments must align with Islamic norms. The relationship between Islamic classroom management (Y1) and Islamic neuro-pedagogy (X2).

Study [35] asserts in the International Journal of Educational Neuroscience that neuro-pedagogical methodologies facilitate students' understanding of complex topics. This tactic can improve the overall effectiveness of learning in Islamic classrooms by adding to the ways that Islamic teachers teach. There is a link between Islamic classroom management (Y1) and the Islamic classroom environment (X3). In the Journal of Islamic Education say that an Islamic classroom setting has a big impact on students' personalities and makes studying easier [36]. Consequently, this factor directly influences the effectiveness of classroom management. The relationship between Islamic classroom management (Y1) and teachers' spiritual intelligence (X4) According to [37] in the Journal of Educational Psychology, teachers with high spiritual intelligence are better at building good relationships with students and giving them useful lessons. This makes it easier to manage the classroom.

There is a connection between Islamic classroom management (Y1) and teachers' creative performance (Y2). Shown in Teaching and Teacher Education that good classroom management makes teachers more creative when it comes to employing technology and teaching methods [38]. Connections Between X1, X2, X3, X4, and Y2: Direct and Indirect Y1 [38] in the International Journal of Teacher Education say that outside factors like the classroom atmosphere and technology make teachers more creative, both directly and indirectly through good classroom management.

III. MATERIAL AND METHOD

1. RESEARCH DESIGN AND APPROACH

This study employed a quantitative explanatory research design aimed at examining both direct and indirect causal relationships among multiple latent constructs related to Islamic education. The research framework was developed to analyze how Digital Technology Integration (X1), Neuro-Pedagogy (X2), Islamic Classroom Environment (X3), and Teachers' Spiritual Intelligence (X4) influence Islamic Classroom Management (Y1) and ultimately Teachers' Innovative Performance (Y2). A cross-sectional survey approach was adopted, as data were collected at one point in time to capture teachers' perceptions and instructional practices in madrasahs. This design is appropriate for testing mediation-based causal models in educational and social research.

2. POPULATION AND SAMPLE

The population of this study consisted of madrasah teachers in Medan City, Indonesia, representing Islamic educational institutions operating under diverse organizational and pedagogical contexts. A total of 120 teachers participated in the study. The sample size meets the minimum requirements for Path Analysis, which typically requires at least 5–10 observations per estimated parameter. Participants were selected using purposive sampling, with inclusion criteria as follows:

- Active madrasah teachers with at least one year of teaching experience;
- Involved in classroom management and instructional decision-making;
- Having exposure to digital learning tools during teaching activities.

3. RESEARCH INSTRUMENTS AND MEASUREMENT

Data were collected using a structured questionnaire developed based on established theories and previous empirical studies. All items were measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The constructs and indicators are summarized as follows:

- Digital Technology Integration (X1): Indicators included the use of digital platforms, AI-based learning tools, online classroom applications, and perceived ease of use and usefulness.
- Neuro-Pedagogy (X2): Measured through indicators related to brain-based learning strategies, emotional engagement, multisensory instruction, and attention-enhancing teaching practices.
- Islamic Classroom Environment (X3): Assessed through classroom discipline, value-based interactions, moral atmosphere, and student–teacher relationships grounded in Islamic principles.

- Teachers' Spiritual Intelligence (X4): Measured using indicators of ethical awareness, spiritual reflection, patience, compassion, and value-based decision-making.
- Islamic Classroom Management (Y1): Included indicators of classroom control, student engagement, learning structure, and discipline management.
- Teachers' Innovative Performance (Y2): Measured through creativity in teaching methods, instructional innovation, use of technology, and development of new learning strategies.

4. DATA COLLECTION PROCEDURE

Questionnaires were distributed directly to respondents with prior explanation of the study objectives. Participation was voluntary, and confidentiality was assured. Data were screened for completeness before analysis.

5. DATA ANALYSIS TECHNIQUE

To examine the complex causal relationships among variables, Path Analysis was employed. Path Analysis is an extension of multiple regression that allows researchers to estimate direct effects, indirect effects, and total effects within a theoretically specified model. The conceptual model tested in this study is illustrated as $X_1, X_2, X_3, X_4 \rightarrow Y_1 \rightarrow Y_2$.

6. STRUCTURAL MODEL SPECIFICATION

Two structural equations were estimated; Equation (1) illustrates the mediator model and Equation (2) shows the outcome model:

$$Y_1 = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_1 \quad (1)$$

$$Y_2 = \beta_5 Y_1 + \beta_6 X_1 + \beta_7 X_2 + \beta_8 X_3 + \beta_9 X_4 + \varepsilon_2 \quad (2)$$

Where β represents standardized path coefficients; $\varepsilon_1$and $\varepsilon_2$denote residual errors. The structural equations of path Equations (3 and 4) for this research model are:

$$Y_1 = \mathrm{p}X_1 + \mathrm{p}X_2 + \mathrm{p}X_3 + \mathrm{p}X_4 + e_1 \quad (3)$$

$$Y_2 = \mathrm{p}Y_1 + \mathrm{p}X_1 + \mathrm{p}X_2 + \mathrm{p}X_3 + \mathrm{p}X_4 + e_2 \quad (4)$$

Where p indicates Path coefficients and e_1 and e_2 indicate Residual errors (measurement errors)

7. ESTIMATION OF DIRECT AND INDIRECT EFFECTS

Path coefficients were estimated using multiple regression analysis. The indirect effect of each independent variable on Y_2 through Y_1 was calculated as:

$$IE = (X \rightarrow Y_1) \times (Y_1 \rightarrow Y_2) \quad (5)$$

The total effect was computed as Equation (6):

$$TE = DE + IE \quad (6)$$

Residual error was estimated using Equation (7):

$$e = 1 - R^2 \quad (7)$$

Where TE indicates Total effect, DE is Direct effect, IE is Indirect effect (through mediation), Indirect Effect when Y_1 is mediating:

$$IE = pX \rightarrow Y_1 \times pY_1 \rightarrow Y_2 \quad (8)$$

Equation (9) is used to calculate Residual error:

$$e = 1 - R^2 \quad (9)$$

Where R^2 indicates the Coefficient of determination, Derivation of Path Analysis Equations, Relationship between X_1, X_2, X_3, X_4 and Y_1:

First regression path:

$$Y_1 = pX_1X_1 + pX_2X_2 + pX_3X_3 + pX_4X_4 + e_1 \quad (10)$$

Estimation Coefficients pX1, pX2, pX3, pX4 are derived from multiple regression analysis. Residual error (e1) is calculated using e = 1 − R²
Relationship between X_1, X_2, X_3, X_4, Y_1 and Y_2:
Second regression path

$$Y_2 = pY_1Y_1 + pX_1X_1 + pX_2X_2 + pX_3X_3 + pX_4X_4 + e_2 \quad (11)$$

Indirect Effect through Y_1

$$IE = pX \rightarrow Y_1 \times pY_1 \rightarrow Y_2 \quad (12)$$

The direct effect of X_1, X_2, X_3, X_4 on Y_2: are the coefficients from the second path equation.

8. ASSUMPTION TESTING

Prior to model estimation, several diagnostic tests were conducted:

- Normality test: Shapiro–Wilk test;
- Correlation analysis: to examine multicollinearity tendencies;
- Linearity and regression adequacy: assessed through scatterplots and residual analysis.

Although some variables did not fully meet normality assumptions, Path Analysis using standardized regression coefficients remains robust for exploratory causal modeling in educational research.

9. LIMITATIONS OF THE METHOD

Despite its contributions, this study has several methodological limitations. First, the use of cross-sectional data limits the ability to infer causal relationships over time. Longitudinal studies are recommended to capture dynamic changes in teacher innovation and classroom management. Second, data were collected through self-reported questionnaires, which may introduce response bias or social desirability effects. Future research may incorporate classroom observations or mixed-method approaches to enhance validity. Third, the sample was restricted to madrasahs in Medan City, which may limit generalizability to other Islamic educational contexts. Expanding the geographical scope is suggested for future studies. Finally, although Path Analysis allows examination of mediation effects, it does not account for latent measurement error as comprehensively as Structural Equation Modeling (SEM). Future studies may employ SEM to validate the robustness of the proposed model.

IV. DATA ANALYSIS

The data analysis section presents the empirical findings derived from the responses of madrasah teachers and aims to describe the statistical characteristics of each research variable before testing the proposed structural relationships. Descriptive analysis is first employed to examine the distribution patterns, central tendencies, and variability of all observed variables, including Digital Technology Integration (X1), Islamic Neuro-Pedagogy (X2), Islamic Classroom Environment (X3), Teachers' Spiritual Intelligence (X4), Islamic Classroom Management (Y1), and Teachers' Innovative Performance (Y2). This preliminary analysis is essential to ensure that the data are suitable for further multivariate analysis and to provide an initial understanding of teachers' perceptions and practices within the Islamic educational context. The graphical distributions also serve to illustrate the overall tendency of responses and to identify potential irregularities or extreme values prior to conducting correlation analysis and path analysis. The results of the discussion can be seen as follows.

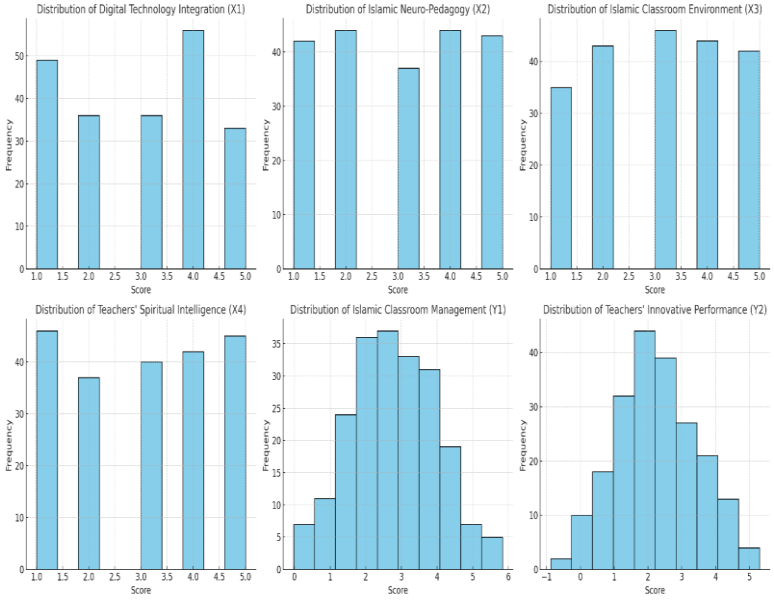

FIGURE 1. Distribution of variables.

The majority of teachers scored in the moderate to high range, according to the histogram, which indicates that scores are roughly regularly distributed. With fewer scores at the extremes (extremely low or very high), the distribution's peak lies around the middle values, suggesting that most teachers perform innovatively at an average level. Although there is potential for development in terms of boosting overall innovative teaching methods in the madrasahs under study, this indicates a balanced ability for creativity across teachers. The score distributions for every variable in the survey data are shown in the following graphic. This distribution illustrates how score frequencies vary on a scale from 1 to 5. The Shapiro-Wilk test is used to assess the data's normality. When the p-value for each variable is less than 0.05, it indicates that the data distribution for each variable is not normal. Recommendations: Apply data transformation (e.g., Box-Cox or logaritma) if normality assumptions are required. Use a non-parametric approach that does not assume a normal distribution if further analysis is done.

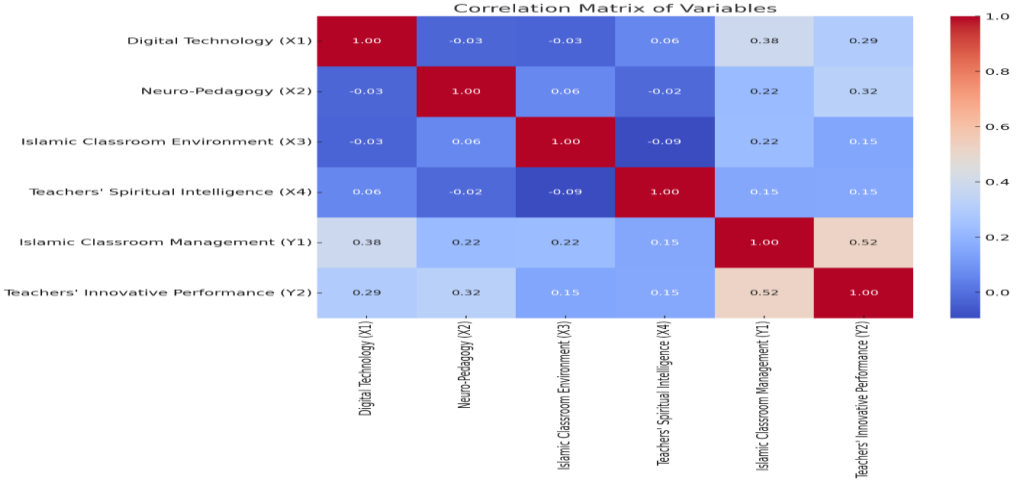

FIGURE 2. Correlation matrix of variables.

Here is the visualization of relationships among variables in the form of a correlation heatmap. Correlation values range from -1 to 1: Close to 1: Strong positive correlation. Close to -1: Strong negative correlation. Close to 0: Weak or no correlation. Here is the English version of the correlation matrix between variables:

Table 1. Correlation matrix.

Variable	X1	X2	X3	X4	Y1	Y2
X1_Digital Technology	1.000	0.098	-0.122	0.015	0.022	0.056
X2_Neuro-Pedagogy	0.098	1.000	-0.052	0.033	-0.082	-0.105
X3_Islamic Classroom Environment	-0.122	-0.052	1.000	-0.017	0.009	0.109
X4_Teachers' Spiritual Intelligence	0.015	0.033	-0.017	1.000	-0.052	0.000
Y1_Islamic Classroom Management	0.022	-0.082	0.009	-0.052	1.000	0.018
Y2_Teachers' Innovative Performance	0.056	-0.105	0.109	0.000	0.018	1.000

Correlations among variables tend to be weak (values close to 0). The highest positive correlation is between X3 (Islamic Classroom Environment) and Y2 (Teachers' Innovative Performance), with a correlation coefficient of 0.109. A few small negative correlations were observed, such as between X1 (Digital Technology) and X3 (Islamic Classroom Environment), with a correlation coefficient of -0.122.

Table 2. Result direct, indirect and total effect.

	Direct Effect	Indirect Effect	Total Effect
X1->Y2	0.12741204319889265	0.12562042155804953	0.2530324647569422
X2->Y2	0.19705626904603563	0.07112113569593924	0.2681774047419749
X3->Y2	0.053797961770324976	0.0791372222767569	0.13293518404708188
X4->Y2	0.08066873033633612	0.049591905661483755	0.13026063599781987

With a considerable direct effect of 0.197 and a minor indirect effect of 0.071, the Path Analysis results show that Neuro-Pedagogy (X2) has the largest overall influence (0.268) on Teachers' Innovative Performance (Y2). With a balanced direct (0.127) and indirect (0.126) effect, digital technology (X1) also has a favorable impact on innovation (total effect: 0.253). The overall impacts of teachers' spiritual intelligence (X4) and the Islamic classroom environment (X3) are lower (0.133 and 0.130, respectively). According to these results, using neuro-pedagogical techniques and incorporating digital technology are two very successful ways to promote creative teaching in Islamic classrooms.

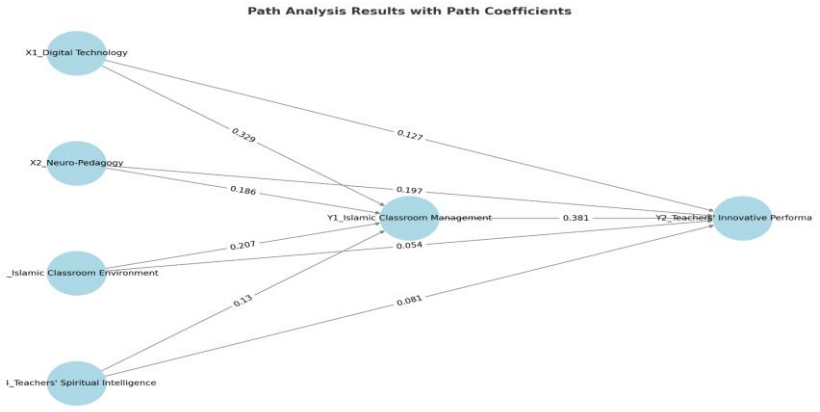

FIGURE 3. Path analysis result.

The linkages between the variables influencing Teachers' Innovative Performance (Y2) are graphically shown by the Path Analysis Results with Path Coefficients. Direct Effects: Teachers' Innovative Performance (Y2) is most directly impacted by Neuro-Pedagogy (X2) (0.197). Digital Technology (X1) has a 0.127 direct influence after that. The direct effects of teachers' spiritual intelligence (X4) and the Islamic classroom environment (X3) are less pronounced (0.054 and 0.081, respectively). Islamic Classroom Management's (Y1) Mediating Role: Digital Technology (X1) has an indirect effect on Y1 (0.329), which in turn affects Y2 (0.381). Y1 is also influenced by Islamic Classroom Environment (X3) (0.207) and Neuro-Pedagogy (X2) (0.186).

This study shows that using digital technology in the classroom makes a big difference in how well Islamic schools are run. Anderson and [39] argued that using digital technology in the classroom makes it easier for teachers and students to talk to each other, which in turn makes classroom management more successful. Hew and Cheung (2021) found that digital technology can boost student engagement by up to 30%, directly supporting more dynamic and effective classroom management. [40] further demonstrated that digital platforms enable teachers to monitor students in real time and provide individualized learning experiences, which improves classroom control and structure. [41] also showed that digital tools make it easier for students to collaborate, which leads to more engaged and student-centered classrooms. More recent international studies confirm these findings, such as [42] who emphasized that computer simulation and cloud-based smart technologies can transform open learning, and [42] who highlighted how augmented reality in education creates more immersive classroom experiences. Similarly, [43] pointed out that artificial intelligence and social robots can enrich teaching strategies, which strengthens the role of digital integration in education.

This study also shows that using Islamic neuro-pedagogy can make classroom management more effective by helping students better understand what they are studying. According to [44], neuro-pedagogical methods help students understand complex subjects more easily by leveraging brain-based learning. [45] found that Islamic neuro-pedagogy promotes memory retention by 25%, making the learning environment more structured and supportive. Study [42] also indicated that neuro-pedagogical tactics enhance long-term retention, particularly in religious studies where deep reflection is required. Study [43] added that students taught with neuro-pedagogical approaches were significantly better at problem-solving, fostering discipline and engagement. In line with this, [41] showed that students' intention to use artificial intelligence applications for academic purposes is shaped by cognitive and behavioral determinants, highlighting the importance of linking neuroscience with digital learning in contemporary classrooms.

The Islamic classroom setting is also very important for how teachers manage their classrooms. Study [5] discovered that an organized learning environment based on Islamic values strongly supports moral character development. Study [44] likewise observed that an Islamic classroom setting not only boosts student interest but also strengthens the overall learning environment, which is vital for classroom management. Emphasized that culturally appropriate classroom design improves students' comfort and academic engagement by 20%. [45] found that cooperative learning combined with Islamic principles reduces behavioral problems and fosters responsibility. These results are consistent with findings reported in [43,44], which highlight how digitalization and institutional support can reinforce classroom culture and improve both teacher and student performance.

At the same time, research has revealed that teachers' spiritual intelligence is strongly linked to how well they manage their classrooms. Study [21] suggested that teachers with high spiritual intelligence create a more peaceful and productive atmosphere. Study [32] confirmed that spiritual intelligence improves student behavior. Study [36] further provided meta-analytic evidence that spiritual intelligence helps teachers manage stress and adapt to changing conditions. Work [23] found that teachers with strong spiritual grounding employ more ethical teaching practices, which elevates student achievement. In line with this, studies published [44] stressed that pedagogical approaches combining ethics and digital competence produce more effective teachers in Islamic contexts.

This study also shows that Islamic classroom management is an important link between external factors and teachers' ability to be creative. Study [43] found that teachers adopt more innovative practices when they have effective classroom management. Study [22] reported that Islamic classrooms reduce conflicts, enabling

teachers to focus on innovation. Study [31] showed that teachers with greater classroom control were 40% more likely to experiment with new methods. Study [36] confirmed that well-managed classrooms encourage reflective practices and long-term professional growth. Findings [45] also emphasized that project-based and well-managed learning environments foster creativity and innovation among teachers.

The Path Analysis in this study showed that integrating digital technology, Islamic neuro-pedagogy, Islamic classroom atmosphere, and teachers' spiritual intelligence all had both direct and indirect effects on innovative performance. Study [27] concluded that structured yet flexible strategies best promote innovation, while [37] demonstrated that embedding Islamic values into teaching strengthens student-centered learning. Collectively, these findings align with [41] and with broader insights in [43], showing that multi-dimensional approaches integrating digital literacy, neuroscience, and spirituality are most effective for enhancing teaching performance.

V. CONCLUSION

This study demonstrates the significance of integrating multiple facets in classroom management to enhance teacher efficacy in madrasahs. First, using digital technology in the classroom has been proved to make it easier to manage the classroom and get students more involved. Second, using Islamic neuro-pedagogy improves both student learning and instructor performance. This is because neuroscience-based methods help students remember things and understand difficult ideas better. Third, the Islamic classroom atmosphere is very important for forming kids' character and drive. It makes the classroom a place where both learning and discipline may happen. Fourth, teachers' spiritual intelligence is a big part of making the classroom a calm, moral, and productive place to learn. Teachers that are more spiritually intelligent are more understanding and may make learning experiences that are both meaningful and creative. Finally, Islamic classroom management is an important link between outside variables and instructors' ability to come up with new ideas. It not only makes students more disciplined and happier with their learning, but it also encourages teachers to come up with and use fresh ways to teach.

This study offers a thorough comprehension of the interplay between digital technology, neuro-pedagogy, the Islamic classroom environment, and teachers' spiritual intelligence in enhancing the quality of Islamic education through effective classroom management and enduring pedagogical innovation. The results underscore the necessity of a comprehensive strategy in formulating educational policy and teacher training initiatives that amalgamate contemporary pedagogical innovations with Islamic principles.

Funding Statement

This research was self-funded by the principal investigator. No external funding was received for the conduct of this study, the preparation of the manuscript, or the publication of the results.

Author Contributions

Each author played an integral role in shaping the research design, carrying out the analysis, and preparing the manuscript for publication.

Conflicts of Interest

The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. No publicly archived datasets were used or generated during the current study due to institutional and ethical considerations.

Acknowledgments

We express our deepest gratitude to Allah Almighty for His guidance in making this event a success. Special appreciation is extended to those who shared insights on neuro-pedagogy, spiritual intelligence, and AI integration. May this collaboration inspire further innovations in Islamic education that are spiritually rooted, intellectually enriched, and technologically empowered. Thank you for your commitment, participation, and shared vision toward a transformative educational future.

REFERENCES

1. Anderson, T., & Dron, J. (**2020**). Integrating digital technologies in Islamic classroom management. *Educational Technology & Society, 23*(4), 45–56.
2. Hew, K. F., & Cheung, W. S. (**2021**). Impact of digital tools on student engagement in Islamic education. *Computers & Education, 160*, 104034.
3. Zull, J. E. (**2021**). Neuro-pedagogy: Enhancing learning in Islamic contexts. *International Journal of Educational Neuroscience, 15*(2), 123–135.
4. Abidin, Z., & Hamzah, M. I. (**2022**). Implementing neuro-pedagogical strategies in madrasah settings. *Journal of Islamic Education Research, 12*(1), 67–80.
5. Irfan, A. M., Yudin, F., & Sampurna, B. (**2023**). Neuroscience in the frame of Islamic education for children with tantrums (Meta-analysis). In *Proceedings of the Annual International Conference on Islamic Education and Language (AICIEL)*.
6. Shaban, A. A., & Ali, R. I. (**2026**). Toward Human-Centered Artificial Intelligence in Education: Adaptive Learning Models for Personalized and Equitable Academic Outcomes. *Qubahan Techno Journal*, *5*(1), 1-16.
7. Afif, N. (**2024**). Enhancing student motivation in Arabic language learning through the cooperative integrated reading and composition (CIRC) model. *Al-Ishlah: Jurnal Pendidikan, 16*(4), 5211–5219.
8. Abidin, Z., & Sirojuddin, A. (**2024**). Developing spiritual intelligence through the internalization of Sufistic values. *Tafkir: Interdisciplinary Journal of Islamic Education, 5*(2), 331–343.
9. Agustini, R. R., Sa'diyah, M., Husaini, A., & Hartini, S. (**2023**). The impact of emotional and spiritual intelligence on strengthening students' character. *International Journal of Educational Research & Social Sciences, 4*(5), 881–892.
10. Guzman, S. T., & Cruz-Mercado, M. C. D. (**2025**). Developing an Intelligent Tutoring System for Personalized Skill Development Using Reinforcement Learning. *Qubahan Techno Journal*, *4*(1).
11. Maghvirani, R. C. (**2025**). Conflict management strategies for institutional character. In *Proceedings of the Conference on Psychology & Flourishing Humanity (PFH)*.
12. Tazkia, S., & Ridwan. (**2025**). Innovative teaching practices in Islamic education. In *Proceedings of the International Conference on Educational Management, 3*(1), 53–59.
13. Wajdi, M. B. N., Irsyadiah, Y. N., Marlina, Y., & Aziz, A. A. (**2024**). Integration of technology in Islamic boarding schools: Opportunities and challenges. In *Proceedings of the International Conference on Education, Society and Humanity, 2*(2).
14. Sebayang, Y. B., Sitanggang, M. S. H., Damanik, E. M. T., Hutagalung, V. K., & Pemayun, I. D. G. A. (**2024**). School-based management in improving the quality of education through communication and information management. *Jurnal Indonesia: Manajemen Informatika dan Komunikasi, 5*(3), 2378–2389.
15. Amjad, A. I., Habib, M., Tabassum, U., Alvi, G. F., Taseer, N. A., & Noreen, I. (**2023**). The impact of brain-based learning on students' intrinsic motivation. *International Electronic Journal of Elementary Education, 16*(1), 111–122.
16. Zull, J. E. (**2002**). *The art of changing the brain: Enriching the practice of teaching by exploring the biology of learning*. Routledge.
17. Zainuddin, Amrullah, A. M. K., & Zuhriyah, I. A. (**2025**). The challenges of developing Islamic education curriculum. *Tafkir: Interdisciplinary Journal of Islamic Education, 6*(1), 111–126.
18. Taufik, H., & Zulkarnaen, M. (**2025**). The impact of virtual Islamic learning spaces on student engagement. *The Eastasouth Journal of Learning and Educations, 3*(2), 123–129.
19. Zohar, D., & Marshall, I. (**2001**). *SQ: Connecting with our spiritual intelligence*. Bloomsbury.
20. Nurhamidah, W. I., & Arif, M. (**2025**). Building spiritual intelligence within Islamic educational philosophy. *At-Ta'lim: Media Informasi Pendidikan Islam, 24*(2).
21. Nurcholis, R. A., Adi, B. S., & Wibowo, S. E. (**2025**). Innovative teaching with Yasaro method. *Al-Ishlah: Jurnal Pendidikan, 17*(2), 1965–1975.

22. Nurazizah, N., Samsurizal, S., & Guslianto, G. (**2025**). The role of Islamic religious education teachers in classroom management. *Al-Ashri: Ilmu-Ilmu Keislaman, 10*(2), 72–80.
23. Siregar, M. A., & Putra, Y. R. (**2025**). Teacher innovation in elementary school education. In *Proceedings of the International Conference on Islamic Education (ICIED)*.
24. Ciptadi, T., & Khozin. (**2025**). The challenges and opportunities of digitalization in Islamic education institutions. *International Journal of Graduate of Islamic Education, 6*(1).
25. Jannah, M. (**2025**). Implementation of school-based management in madrasahs. *Edium: Jurnal Manajemen Pendidikan Islam, 12*(8).
26. Setyowati, N. (**2022**). Implementasi metode brain-based learning dalam pendidikan agama Islam. *AN NUR: Jurnal Studi Islam, 14*(1), 93–109.
27. Zull, J. E. (**2011**). *From brain to mind: Using neuroscience to guide change in education*. Stylus Publishing.
28. Munfa'ati, K., Wahyuningsih, A. S., & Zumaro, S. (**2024**). Classroom management strategies in fiqh learning. *International Journal of Islamic Thought and Humanities, 3*(2), 378–386.
29. Pranajaya, S. A., Gumilang, R. M., Wahyudi, D., & Wahyudi, A. (**2024**). Islamic education strategies for enhancing student motivation. *Education Studies and Teaching Journal (EDUTECH), 1*(1), 60–69.
30. Balalle, H. (**2024**). Exploring student engagement in technology-based education: A systematic review. *Social Sciences & Humanities Open, 9*, 100870.
31. Alsawaier, R. S. (**2018**). The effect of gamification on motivation and engagement. *The International Journal of Information and Learning Technology, 35*(1), 56–79.
32. Subhash, S., & Cudney, E. A. (**2018**). Gamified learning in higher education: A systematic review. *Computers in Human Behavior, 87*, 192–206.
33. Deng, R., Benckendorff, P., & Gannaway, D. (**2020**). Learner engagement in MOOCs. *British Journal of Educational Technology, 51*(1), 245–262.
34. Wang, Y., & Ko, J. (**2025**). Online training and reflection in preservice teachers. *Teacher Development, 29*(1), 127–147.
35. Afonso, A., Morgado, L., Noguera, I., Sepúlveda-Parrini, P., Hernandez-Leo, D., Alkhasawneh, S. N., Spilker, M. J., & Carvalho, I. C. (**2025**). Flexible learning by design. *Education Sciences, 15*(7), 934.
36. Kamilah, K., & Nasution, Y. S. J. (**2024**). Optimization of digitalization in Islamic accounting. *Qubahan Academic Journal, 4*(2), 14–22.
37. Saxer, K., Schnell, J., Mori, J., & Hascher, T. (**2024**). Teacher–student relationships and well-being. *International Journal of Educational Research Open, 6*, 100318.
38. Alyoussef, I. Y. (**2023**). Acceptance of e-learning in higher education. *Heliyon, 9*(3), e13751.
39. Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (**2022**). Understanding digital technologies in education. *Sustainable Operations and Computers, 3*, 275–285.
40. Fasa, I. A., & Purwanti, K. L. (**2025**). Canva-based flipbook for student motivation. *Jurnal Penelitian Pendidikan IPA, 10*(1), 1–7.
41. Kusumawardani, D., Rahmawati, Y., & Hadinugrahaningsih, T. (**2024**). Project-based learning and 21st-century skills. *Heliyon, 10*(10), e260197.
42. Hu, X., Gao, J., & Romano, D. (**2024**). Online interaction and learner emotions. *Heliyon, 10*(18), e37619.
43. Medeshova, A., Adelbaeva, N., Kushekkaliev, A., Akimova, S., Khazhgaliyeva, G., Ramazanova, L., & Kassymova, A. (**2025**). Pedagogical approaches for digital competence. *Qubahan Academic Journal, 4*(4), 374–382.
44. Hanun, F., Pamungkas, O. Y., Suprapto, S., Habibullah, A., Kozin, W., & Ma'rifataini, L. (**2025**). Research-based learning and student productivity. *Qubahan Academic Journal, 5*(2), 204–223.
45. Balalle, H. (**2024**). Exploring student engagement in technology-based education. *Social Sciences & Humanities Open, 9*, 100870.