



# Transforming Islamic religious education within pesantren: A conceptual framework for integrating deep learning and 21st-century skills

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**Abstract:** Amid the rapid transformation of modern education, a critical tension has emerged between the pursuit of educational innovation and the preservation of Islamic education's foundational identity, values, and epistemological framework in responding to contemporary challenges. This study aims to analyze the integration of deep learning as a pedagogical approach in IRE (Islamic Religious Education) in the context of pesantren and examine its contribution to strengthening 21st-century skills while maintaining Islamic values. This study employs a Systematic Literature Review of 18 selected studies from 300 articles (2016–2026), analyzed through thematic analysis and VOSviewer to identify trends in deep learning, 21st-century skills, and Islamic education in pesantren contexts. The results of the study indicate three main themes, namely: (1) deep learning and active pedagogy, (2) 21st-century skills and digital literacy, and (3) Islamic education in the context of pesantren. These findings indicate that deep learning can be integrated into values-based learning in pesantren, particularly in support of the development of students' critical thinking, creativity, communication, and collaboration skills. However, the implementation of this approach still faces several challenges, such as limited infrastructure, teacher readiness, and resistance to pedagogical change. This study is limited by its reliance on secondary literature from 2016–2026; therefore, future empirical research is needed to validate the application of deep learning in pesantren contexts. This study contributes conceptually by synthesizing the interplay between deep learning, Islamic values, and 21st-century skills, providing a foundation for developing contextual, reflective, and adaptive pesantren learning models aligned with 21st-century educational demands.

## INTRODUCTION

Essentially, IRE in Indonesia, particularly within pesantren, plays a strategic role in developing students' character, morals, and spirituality. As Islamic educational institutions with strong traditional roots, pesantren serve not only as centres for the transmission of religious knowledge but also as spaces for the formation of values, religious culture, and students' socio-religious identity. The values-based nature of pesantren education makes them crucial institutions in maintaining the continuity of Islamic tradition while simultaneously shaping a generation



capable of responding to social change (Dhofier, 1982; Steenbrink, 1974; Van Bruinessen, 1995). However, the development of digital technology and the transformation of global education present new challenges for pesantren: adapting learning without losing their Islamic identity.

The advancement of the digital era has brought significant changes in the world of education, encouraging a shift in learning paradigms and a more adaptive use of technology. These changes are not only related to the use of digital media, but also include innovations in learning methods, changes in interaction patterns between educators and students, and the development of more flexible learning strategies according to the needs of the times (Barbour et al., 2020; González-pérez & Ramírez-montoya, 2022a; van Laar et al., 2020). In the IRE context, several studies also emphasise the importance of innovative strategies in terms of (1) education management, (2) updating the learning system, (3) learning assessment achievements, and collaboration between parents and stakeholders (Panadero, 2017; Saifani, 2024; Smith & Storrs, 2023; van Laar et al., 2020).

Long before the 21st century, the development of Islamic education had, from the beginning, a responsibility to maintain the continuity of teachings and to deeply instil Islamic values in students. However, the dynamics of education today unfold in an environment shaped by the development of artificial intelligence, the rapidly accelerating flow of information, and changing student competency needs. These conditions require Islamic educational institutions, including Islamic pesantren, to adapt conceptually to remain relevant to current developments without losing their Islamic character. Therefore, strengthening 21st-century skills such as critical thinking, creativity, communication, collaboration, and deep learning skills is a crucial aspect in the development of pesantren (Panadero, 2017; van Laar et al., 2020).

Despite the increasing demands for 21st-century competency development, learning practices in pesantren still face various challenges in pedagogical adaptation. Several studies indicate that the learning process still relies heavily on conventional methods, such as lectures and an emphasis on memorization (Mu'alimin et al., 2026; Nuha et al., 2024). In these circumstances, students tend to act as recipients of information. At the same time, space for critical discussion, reflection, and the connection of Islamic values to real-life contexts has not yet been fully developed. This situation has the potential to lead to a textual and less in-depth understanding of religion, thus not optimally supporting students' critical, reflective, and contextual thinking skills (Alotaibi, 2025; Falaqi et al., 2025). In fact, Islamic education in the contemporary era not only emphasises a normative understanding of religious teachings but also requires students to integrate Islamic values with the various challenges of modern life (González-pérez & Ramírez-montoya, 2022b; Thorndahl & Stentoft, 2020).

This situation demonstrates the need for a learning approach that focuses not only on delivering material but also on building deeper understanding and developing students' 21st-century skills. One relevant approach to address this need is deep learning, a pedagogical approach that emphasises meaningful learning processes, active student engagement, reflective skills, and the application of knowledge in various real-life contexts (Ergas & Hadar, 2023; Fullan, 2020; Fullan et al., 2017). In this study, deep learning does not refer to artificial intelligence technology, but rather to the concept of in-depth learning that positions students as active subjects in constructing understanding and meaning in learning. These characteristics align with the principles of Islamic education in pesantren, which emphasise value formation, reflection, and character development. Furthermore, several studies in the context of Islamic education have shown that the implementation of innovative learning approaches and the strengthening of 21st-century skills can be carried out in harmony with Islamic values as the primary foundation of education (Fahrudin & Malik, 2025; Hajar, 2024; Rosin et al., 2025).

Studies on deep learning and 21st-century skills have flourished in various educational contexts. However, most of this research still focuses on formal educational settings such as elementary schools, secondary schools, and universities. Meanwhile, discussions on the application of deep learning approaches in the context of pesantren are still relatively limited (Kocak et al., 2021; Shahab & Barak, 2025; Tian et al., 2023). Furthermore, research specifically examining the relationship among deep learning, the strengthening of 21st-century skills, and the characteristics of Islamic education in pesantren remains scarce. To date, few studies have developed a conceptual synthesis based on a systematic literature review of the relationship between these three aspects. Therefore, this study was conducted to address this gap in the literature and provide a more comprehensive understanding of the opportunities to integrate deep learning into the development of pesantren learning to meet the demands of 21st-century education.

Based on this framework, this study aims to identify obstacles to integrating deep learning in pesantren, including technical obstacles related to learning support systems and non-technical obstacles such as human factors, mindsets, and learning culture. Furthermore, this study aims to develop a conceptual understanding of strategies to strengthen the integration of deep learning in order to support the development of 21st-century competencies in pesantren. Studies on the integration of deep learning, 21st-century skills, and IRE in the context of pesantren still require further development; therefore, this study was conducted to provide a synthesis based on the results of a literature search using academic databases (Barbour et al., 2020; Smith & Storrs, 2023). This study is also expected to contribute to stakeholders in Islamic education in pesantren,

including institutional leaders, educators, and policymakers, in encouraging the development of more active, reflective, and adaptive learning to the changes of the digital era (Ergas & Hadar, 2023; Fullan, 2020; Panadero, 2017; Theobald et al., 2020). Thus, this study is expected to enrich the literature on integrating in-depth learning and 21st-century skills in the context of Islamic education in pesantren.

## **METHOD**

This study follows a systematic literature review approach with four systematic stages (Xiao & Watson, 2019). These include search strategies, the determination of inclusion and exclusion criteria, the study selection process, and data analysis to describe the development of the literature related to Deep Learning in IRE.

### **Literature Search Strategy**

The literature search was conducted using several online sources, with Google Scholar as the primary platform for searching scientific articles. To assist with data collection and filtering, the Publish or Perish application, version 8.19.5300, was used to extract articles based on a predetermined publication year range. Reference management was performed using Mendeley Desktop version 1.19.8 to facilitate source organisation and bibliography compilation. Furthermore, topic and keyword correlation analysis was conducted using VOSviewer version 1.6.20 to support theme identification. Keywords included Deep Learning in Education, 21st-Century Skills, Islamic Education, Pesantren Education, and Digital Literacy in Religious Education. These keywords were combined to broaden and narrow search results relevant to the study's focus, referring to the guidelines outlined by (Xiao & Watson, 2019).

### **Inclusion and Exclusion Criteria**

The inclusion criteria used in this study include, 1) articles published between 2016 and 2026 to ensure the relevance and timeliness of the data, considering that systematic reviews of the literature emphasise the importance of using recent literature to identify research trends (Xiao & Watson, 2019), 2) articles discuss topics related to Deep Learning, active learning, 21st-century skills, digital literacy, or Islamic education, 3) articles are available in full text, 4) the articles analysed come from scientific journals and conference proceedings that are relevant to the field of education, especially Islamic education. Meanwhile, articles that are general opinion in nature are not available in full text, and articles that do not have a direct connection to the focus of the study are excluded from the analysis process.

To provide a systematic overview of the characteristics of the analysed studies, a summary of the articles is presented in a table that includes information on the author, year of publication, research context, type of research, and study focus. This tabular presentation aims to facilitate the

identification of patterns, comparisons, and trends in research themes relevant to the study topic. From the entire selection process, 18 articles that met the inclusion criteria were analysed in depth and presented in a table as the main research object. Meanwhile, several other references were used as theoretical and methodological foundations, but were not included in the table because they were not included in the analysis object. Thus, the table plays an important role as a basis for the thematic analysis process and in identifying the relationship between in-depth learning, 21st-century skills, and the context of Islamic education in pesantren.

The initial literature search yielded approximately 300 articles obtained from various relevant academic databases. Next, a screening process was conducted using titles and abstracts to identify articles relevant to the research focus. At this stage, 25 articles were deemed relevant and met the initial research criteria.

The next step was a full-text review based on predetermined inclusion and exclusion criteria. The selection results showed that 18 articles met the criteria and were subsequently analysed in depth through thematic synthesis. This number indicates that research specifically addressing the integration of deep learning, 21st-century skills, and Islamic education in pesantren is still relatively limited and in the early stages of academic development.

In addition to the articles analysed thematically, several additional references were used as methodological and theoretical foundations, particularly in explaining the Systematic Literature Review approach. However, these references were not included in the study's primary analysis.

The data analysis in this study employed a thematic synthesis approach to identify recurring patterns, emerging themes, and conceptual relationships across the findings reported in the selected studies. This approach was adopted because it enables the systematic integration and interpretation of evidence derived from both conceptual and empirical research, thereby generating a comprehensive understanding of the integration of deep learning approaches in IRE within Islamic pesantren contexts. The analytical process was conducted through several sequential stages. The first stage involved a thorough and critical examination of all selected articles to gain an in-depth understanding of their research contexts, objectives, methodological approaches, and principal findings. At this stage, each article was mapped based on the year of publication, research context, focus of study, research approach, and key findings relevant to the research theme (Braun & Clarke, 2006, 2014; Byrne, 2022).

The second stage involved open coding of the key findings from each article. These codes were then grouped into categories with similar meaning and substance. In the third stage, these

categories were synthesised into several main themes that represent research trends in deep learning, 21st-century skills, and learning in the context of Islamic education in pesantren.

In addition to identifying key themes, the analysis examined the distribution of publication years to track the development of research trends over time. Through this process, this research not only describes the results of previous studies but also attempts to construct a conceptual interpretation of the relevance of the deep learning approach in strengthening 21st-century skills in IRE within pesantren. To enhance the validity of the interpretation, the analysis was conducted systematically through the stages of theme identification, category grouping, and conceptual interpretation, based on interrelationships among studies. Thus, the resulting synthesis is expected to provide a more in-depth, critical, and contextual picture of the development of deep learning studies in education pesantren.

## RESULTS AND DISCUSSION

Based on the selection process described in the methods section, 25 articles were obtained during the initial identification stage. After a screening process based on inclusion and exclusion criteria, 18 articles were deemed relevant and were analysed in depth. These articles were published between 2016 and 2026, with a trend of increasing publications after 2020. This increase was particularly evident in studies discussing 21st-century skills, technology-based educational transformation, and more reflective, collaborative, and participatory learning approaches.

The analysis shows that most research focuses on general and higher education contexts, while studies specifically addressing the integration of deep learning into IRE in pesantren remain relatively limited. This finding indicates that research on deep learning in the context of IRE is still in its early stages and has not been comprehensively explored. Based on the research characteristics, the reviewed articles included conceptual studies, systematic reviews, longitudinal studies, and experimental studies. This diversity of research characteristics indicates that the study of deep learning and 21st-century skills is developing multidimensionally, from both theoretical and implementation aspects. Furthermore, the dominance of conceptual and qualitative studies suggests that research on deep learning remains largely focused on developing paradigms, learning models, and pedagogical approaches rather than on quantitatively measuring the effectiveness of its implementation.

To analyse findings across studies, this research employed a thematic synthesis approach. This approach was chosen because it allows researchers to identify patterns, relationships, differences, and trends across studies in greater depth. Unlike meta-analysis, which focuses on quantitative data synthesis, thematic synthesis was deemed more appropriate because the majority of the articles reviewed were conceptual and qualitative in nature. Through this approach, research

results are not only presented descriptively but also critically interpreted to develop a conceptual understanding of the integration of deep learning in education pesantren. To support the analysis, relationships among keywords were also visualised in VOSviewer to strengthen the identification of key themes, conceptual linkages, and research development trends within the analysed literature.

The thematic synthesis results revealed three main interrelated themes: the transformation of pedagogy toward deep learning, the strengthening of 21st-century skills and digital literacy, and the integration of Islamic educational values within the context of pesantren. These three themes demonstrate that the discussion of deep learning is not only concerned with changes in learning methods but also with a broader transformation of educational paradigms.

### 1. Pedagogical Transformation towards Deep Learning

Most studies indicate a paradigm shift in learning from a teacher-centred model to a more participatory and reflective student-centred model. In various studies, deep learning is understood as an approach that emphasises students' cognitive and affective engagement through reflection, meaning construction, problem-solving, and the ability to connect knowledge to real-life contexts. However, the synthesis of research findings reveals differences in orientation across studies. Studies in the general education context tend to emphasise pedagogical innovation and the integration of digital technology. In contrast, research in the Islamic education context focuses more on character formation and value internalisation. These differences indicate that the cultural characteristics and orientation of educational institutions strongly influence the implementation of deep learning.

In the context of pesantren, traditional learning approaches such as lectures, memorisation, *talaqqi* (recitation), and *sorogan* (recitation of the Koran) continue to play a crucial role in the transmission of religious knowledge. However, several studies have shown that the dominance of teacher-centred learning can limit students' development of critical thinking, reflection, and active participation. On the other hand, international research shows that active learning approaches are more effective in fostering in-depth understanding and higher-order thinking skills than passive learning (Theobald et al., 2020; Thorndahl & Stentoft, 2020). These findings suggest that the primary challenge in education pesantren lies not in the conflict between traditional values and modern learning, but rather in how to implement contextual pedagogical transformation without losing the Islamic identity of the pesantren.

### 2. Strengthening 21st-Century Skills and Digital Literacy

The second theme demonstrates that 21st-century skills are a primary focus in contemporary educational development. The reviewed literature consistently identifies critical

thinking, creativity, communication, collaboration, and digital literacy as essential competencies to be developed in the learning process. However, the synthesis results show that their implementation varies across approaches. Some studies view digital technology as a learning support tool, while others emphasise that digital transformation also requires a shift in pedagogical paradigms toward more interactive, collaborative, and contextual learning. Thus, technology integration cannot be understood solely as the use of digital media, but also as part of a transformation in students' learning styles.

In the context of pesantren, strengthening 21st-century skills faces unique challenges due to the hierarchical learning structure and limited integration of technology into the learning process. However, several studies have shown that the collective culture within pesantren has significant potential to foster collaboration, communication, and community-based learning skills. Therefore, the integration of deep learning in pesantren needs to be directed toward developing more dialogical, reflective, and problem-solving-based learning without eliminating religious values as the primary foundation of education.

### 3. Integration of Deep Learning in Islamic Education

The synthesis of these findings demonstrates that Islamic education and the development of 21st-century skills are not mutually exclusive. Various studies demonstrate that Islamic values such as reflection, the search for meaning, deliberation, and character building are linked to the principles of deep learning, which emphasise meaningful learning and active student involvement. However, research specifically addressing the integration of deep learning models in education pesantren remains very limited. Most research remains conceptual in nature and fails to provide a detailed explanation of operational implementation strategies. This situation indicates a significant research gap that warrants attention in future studies.

Based on the results of the thematic synthesis, this research offers a conceptual framework for integrating deep learning in education pesantren, comprising three main dimensions: pedagogical, value, and digital transformation. The pedagogical dimension includes active, reflective, collaborative, and problem-solving-based learning. The value dimension emphasises the internalisation of Islamic values and the formation in character throughout the learning process. Meanwhile, the digital transformation dimension concerns the use of technology to support contextual learning and strengthen students' digital literacy. This conceptual framework shows that integrating deep learning in pesantren need not eliminate classical learning traditions but can be reconstructed to be more dialogical, contextual, and participatory. In this way, pesantren have the opportunity to develop learning models that maintain their Islamic identity while being responsive to the demands of 21st-century education.



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## A Conceptual Framework for Transforming IRE in Pesantren

The thematic synthesis results indicate that deep learning has significant potential for integration into IRE in pesantren. The main principles of deep learning, such as critical reflection, meaning construction, active student involvement, and the application of knowledge in real-life contexts, align closely with the orientation of education pesantren, which emphasises character formation, internalisation of values, and spiritual development. Thus, deep learning is not only pedagogically relevant but also philosophically aligned with the goals of Islamic education, which prioritise meaningful learning.

These findings demonstrate a consistent pattern across international studies: active and reflective learning approaches are more effective in fostering deep understanding than passive, teacher-centred learning models (Ergas & Hadar, 2023; Thorndahl & Stentoft, 2020). From a theoretical perspective, deep learning views the learning process not simply as a transfer of information, but as a process of knowledge construction involving reflection, critical analysis, and problem-solving. Therefore, the integration of deep learning in education pesantren has theoretical relevance in supporting the development of 21st-century skills, such as critical thinking, creativity, communication, and collaboration.

Nevertheless, the synthesis results indicate that implementing deep learning in pesantren presents more complex challenges than in general education. Learning traditions that are still oriented towards teacher authority, the dominance of lecture methods, and mechanical memorisation patterns influence students' active engagement in the learning process. These conditions indicate that the main challenge in implementing deep learning lies not in the concept's inconsistency with in pesantren values, but rather in the pedagogical and operational aspects of its application.

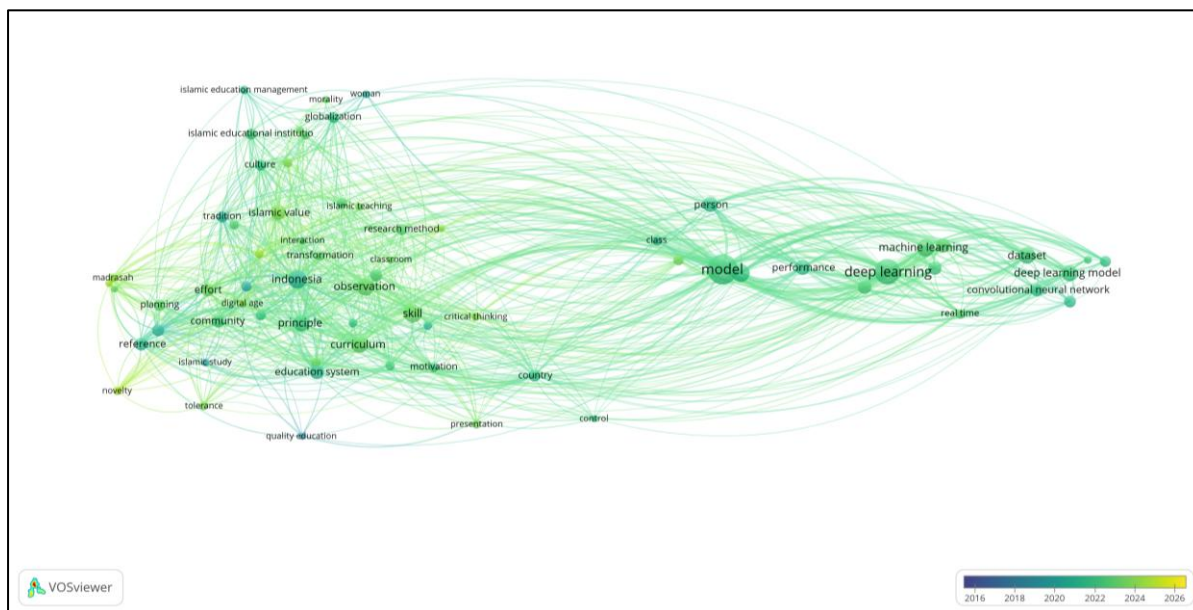
In this context, the study argues that the transformation of learning in pesantren should be guided by a pedagogical reconstruction process that maintains the pesantren's scientific identity while remaining more adaptive to modern learning needs. Learning traditions such as *talaqqi*, *sorogan*, and *musyawarah* (religious deliberation) remain relevant in Islamic education, but need to be developed through a more dialogical, participatory, reflective, and problem-solving approach. This approach enables students not only to understand religious material textually but also to connect it to social realities and global challenges contextually.

The results of this study also indicate that integrating deep learning in education pesantren requires innovative strategies that bridge the traditions of pesantren learning and the demands of 21st-century skills. Based on the results of the thematic synthesis, this study offers three main

strategies for integrating deep learning in IRE within pesantren. First, pedagogical transformation through the implementation of active learning based on discussion, reflection, collaborative learning, and problem-solving to increase students' cognitive engagement. Second, strengthening value-based learning through the integration of Islamic values in the process of developing critical thinking, creativity, communication, and collaboration skills, third, adapting digital technology to support contextual learning and strengthen students' digital literacy.

Conceptually, these three strategies demonstrate that developing 21st-century skills in pesantren can be achieved without diminishing the identity and characteristics of Islamic education. Critical thinking skills can be developed through reflection on religious and social issues, and creativity can be fostered through project-based learning and the exploration of contextual ideas. At the same time, communication and collaboration can be strengthened through the traditions of deliberation and collective learning that have become part of the pesantren culture. Furthermore, the synthesis also shows that the success of learning transformation is strongly influenced by visionary and adaptive educational leadership. From the perspective of educational literature, leadership plays a strategic role as an agent of transformation, capable of directing change towards a more innovative and responsive learning system in response to current developments (Harris & Jones, 2018; Leithwood et al., 2020). In the context of pesantren, the roles of kiai, ustaz, and institutional administrators are not only related to administrative functions but also encompass cultural dimensions and religious legitimacy that influence the direction of educational change. Therefore, the process of pedagogical transformation in pesantren requires a contextual approach that is sensitive to the traditional values deeply rooted in the pesantren institutional culture.

Thus, this study not only describes the integration of deep learning in education pesantren but also makes a conceptual contribution in formulating a learning development strategy that bridges the traditions of Islamic education and the demands of 21st-century learning. The theoretical implications of this study indicate that deep learning can be a relevant pedagogical approach in supporting the transformation of education pesantren toward a more reflective, contextual, adaptive learning system, and oriented towards the holistic development of student competencies.



**Figure 1.** Visualisation of Research Keyword Network Using VOSviewer

Based on the visualisation results using VOSviewer for the period 2016-2026 in Figure 1, it can be seen that several keywords have strong relationships in the research network. The colours in the overlay visualisation indicate: blue indicates older research (around 2016-2018), green indicates intermediate research (2019-2022), and yellow indicates the most recent research (2023-2026).

Further analysis of sustainable educational transformation requires a balance between preserving traditional values and strengthening 21st-century competencies. Numerous studies have shown that the integration of the two is not contradictory, but rather complementary, strengthening the adaptability of Islamic education to global dynamics (Hajar, 2024; Nabila et al., 2024; Rosin et al., 2025). In this regard, deep learning can serve as a conceptual bridge between Islamic values and the need for modern skills such as critical thinking, collaboration, and digital literacy.

Learning traditions in pesantren, such as *talaqqi*, *sorogan*, and *musyawarah*, actually have the potential to be developed as forms of dialogic learning that align with the principles of deep learning. However, in practice, these methods are still often implemented conventionally and have not been fully utilised as spaces for critical reflection and exploration of meaning (Dhofier, 1982; Lukens-Bull, 2001; Suresman et al., 2025). Therefore, a reinterpretation of these practices is needed to support more participatory learning without losing the distinctive identity of pesantren.

Furthermore, technical barriers, such as limited digital infrastructure, and non-technical barriers, such as resistance to change, are important factors influencing the implementation of deep learning in pesantren. This demonstrates that educational transformation cannot be achieved

instantly but requires a gradual approach supported by increased teacher capacity and a shift in mindset toward educational innovation. Therefore, based on the analysis, the integration of deep learning into the pesantren curriculum is not radical but rather an adaptation that enables more contextual, reflective, and responsive learning to meet global needs without sacrificing Islamic values.

Based on these findings, this study not only identifies limitations in previous studies but also offers a conceptual framework that integrates deep learning with the strengthening of 21st-century skills in the context of education pesantren. Within this framework, deep learning plays a key role in encouraging a reflective and meaningful learning process, which in turn contributes to the development of critical thinking, creativity, communication, and collaboration skills. This integration is implemented in values-based learning in pesantren, resulting in a learning model that is more adaptive, contextual, and relevant to the demands of today's education. To identify patterns of interrelationships between topics in the study, a bibliometric analysis was conducted using VOSviewer and Publish or Perish. This analysis aims to map the relationships between keywords that appear in the selected articles, so that the main themes that develop in this study can be identified.

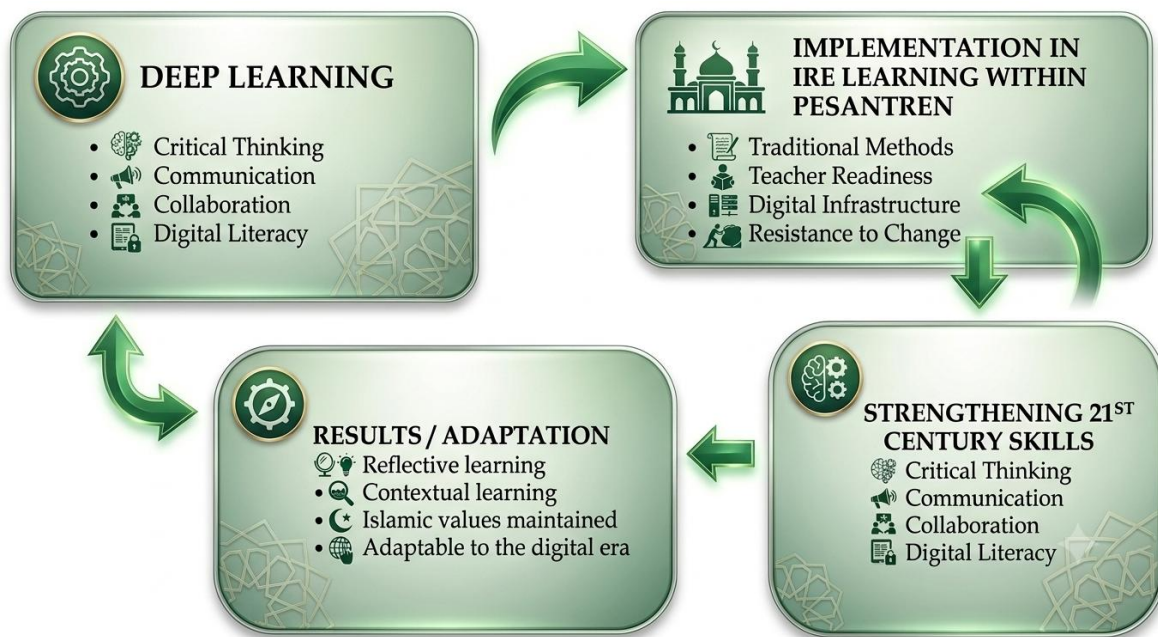
**Table 1.** Summary of Reviewed Studies

| No | Author                                  | Research Focus                                               | Main Findings                                                                                                                                                                    |
|----|-----------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Fullan et al. (2017)                    | Deep Learning and Educational Transformation                 | Deep Learning encourages meaningful learning through collaboration, student engagement, and reflective learning processes that support educational transformation                |
| 2  | Fullan (2020)                           | Deep Learning and Global Competencies                        | Deep Learning supports the development of global competencies, including critical thinking, creativity, communication, and collaboration in 21 <sup>st</sup> - century education |
| 3  | Ergas & Hadar (2023)                    | Reflective Learning and Deep Learning Pedagogy               | Reflective and dialogical learning Approaches contribute to deeper conceptual understanding and learner autonomy in educational settings                                         |
| 4  | Theobald et al. (2020)                  | Active Learning in Education                                 | Active learning strategies improve participation, higher-order thinking, and academic achievement compared to passive, teacher-centered learning models.                         |
| 5  | Thorndahl & Stentoft                    | Critical Thinking and Problem-Based                          | Problem-based reflective learning Approaches strengthen students' critical thinking and analytical skills in higher Education contexts                                           |
| 6  | González-Pérez & Ramírez-Montoya (2020) | 21 <sup>st</sup> -Century Skills and Digital Education       | Technology-supported learning environments contributed to the development of creativity, collaboration, communication, and critical thinking skills.                             |
| 7  | Van Laar et al. (2020)                  | Digital Literacy and 21 <sup>st</sup> - century competencies | Digital literacy is an essential competency that supports problem solving, information                                                                                           |

|    |                          |                                                |                                                                                                                                                             |
|----|--------------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                          |                                                | management, and collaborative learning in the digital era                                                                                                   |
| 8  | Barboue et al. (2020)    | Digital Transformation in Education            | Educational transformation requires not only technological integration but also pedagogical adaptation toward more interactive and student-centred learning |
| 9  | Panadero (2017)          | Self-Regulated Learning and Assessment         | Reflective assessment and self-regulated learning strengthen student autonomy and metacognitive awareness in learning processes                             |
| 10 | Harris & Jones (2018)    | Educational Leadership and School              | Visionary educational leadership plays an important role in encouraging institutional transformation and adaptive learning cultures                         |
| 11 | Leithwood et al. (2020)  | Leadership and Educational Change              | Effective leadership contributes significantly to innovation, organizational learning, and sustainable educational change.                                  |
| 12 | Al Ayyubi (2024)         | Leadership Transformation in Islamic Education | Leadership in Islamic educational institutions plays a strategic role in fostering adaptive, innovation-oriented learning systems.                          |
| 13 | Muntaha & Asyhari (2025) | Educational Leadership in pesantren            | The role of kiai and institutional leaders influences the success of educational transformation and curriculum development in pesantren                     |
| 14 | Rosinet al.(2025)        | Islamic Educational and Innovative Learning    | Islamic Education and integrate innovative pedagogical approaches while maintaining value-based educational principles.                                     |
| 15 | Hajar (2024)             | Technology Integration in Islamic Education    | The integration of technology in Islamic education supports contextual learning and improves students' digital literacy competencies                        |
| 16 | Fahrudin & Malik (2025)  | Deep Learning in Islamic education             | Deep learning approaches can strengthen reflective learning, contextual understanding, and character development in Islamic education                       |
| 17 | Smith & Storrs (2023)    | Digital Literacy and Educational Adaptation    | Educational institutions need adaptive strategies to improve digital literacy and respond to rapid technological changes.                                   |
| 18 | Braun et al. (2020)      | Reflective Pedagogy and Higher-Order Thinking. | Reflective and participatory pedagogical approaches support the development of higher-order thinking and meaningful learning experiences                    |

Based on Table 1 above, the analysed articles show variations in research contexts, approaches, and study foci. In general, most studies highlight the importance of deep learning and its relationship to the development of 21st-century skills (Celik et al., 2024; Kivunja, 2015). Although studies remain dominated by general and higher education contexts, those that specifically address Islamic education in pesantren are still relatively limited. This finding demonstrates a research trend toward integrating innovative learning and indicates opportunities for further research development in the context of pesantren.

Keywords such as education, student, Islamic education, and deep learning emerged as the most dominant nodes and were interconnected with other concepts, including teacher, skill, model, and digital technology. Furthermore, the interconnectedness among keywords indicates that integrating deep learning in the context of Islamic education focuses not only on conceptual aspects but also on skill development, teacher roles, and the use of technology in the learning process. This indicates that research on this topic is multidimensional and continues to evolve in line with the demands of 21st-century education. Throughout the research period, a conceptual model was identified, as shown in Figure 2 below.



**Figure 2.** Workflow of Implementing Deep Learning to Strengthen 21st-Century Skills in Pesantren

## CONCLUSION

A literature review indicates that integrating in-depth learning into IRE has significant potential to strengthen 21st-century skills in pesantren. The systematic literature review demonstrates that this approach is relevant for promoting more reflective, contextual, and character-oriented learning. However, its implementation still faces various challenges, both technical and cultural, such as limited infrastructure, the dominance of traditional learning methods, and resistance to change. Therefore, a learning strategy is needed that integrates Islamic values with 21st-century competencies in a balanced manner. The success of this implementation is greatly influenced by the readiness of human resources and the support of educational leadership in pesantren.

Conceptually, this study offers an integrative framework linking immersive learning to the strengthening of 21st-century skills in the context of education pesantren. However, this study has

limitations because it relies solely on secondary, literature-based data and has not directly tested the implementation of immersive learning in educational pesantren practices. Therefore, further research is recommended to empirically examine understudied factors, such as teachers' pedagogical readiness, educators' digital literacy, and students' active involvement in the immersive learning process. In addition, future research should expand the study context to include various types of pesantren with different characteristics and use more comprehensive methodological approaches, such as mixed methods, longitudinal studies, and action research, to test the effectiveness and sustainability of implementing immersive learning in strengthening 21st-century skills.

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