

SMART CLASSROOM DESIGN FOR INCLUSIVE MADRASAH: TRANSFORMING CURRICULUM AND DIGITAL LEARNING ENVIRONMENTS FOR STUDENTS WITH SPECIAL NEEDS

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Abstract : This study aims to analyze smart classroom design in supporting curriculum transformation and the creation of a digital learning environment in inclusive Islamic schools. This study uses a qualitative approach with a case study design to gain an in-depth understanding of the implementation of technology-based learning that is responsive to the diversity of student characteristics. Data were collected through observation, in-depth interviews, and documentation. The results of the study show two main findings. First, the formation of an adaptive digital curriculum characterized by material differentiation, method flexibility, and a variety of technology-based assessments. Second, the development of an inclusive digital learning ecosystem built through equal access, multimodal support, technology integration, student empowerment, active collaboration, and more meaningful learning experiences. These findings confirm that educational transformation depends not only on the availability of digital devices, but also on integrated and systemic pedagogical design. This study contributes by offering a conceptual model of an inclusive smart classroom that can serve as a reference for educational institutions in developing technology-based learning in a fair, adaptive, and sustainable manner.

Keywords : Inclusive Madrasah; Curriculum; Digital Learning.

Abstrak : Penelitian ini bertujuan untuk menganalisis desain smart classroom dalam mendukung transformasi kurikulum dan pembentukan lingkungan belajar digital di madrasah inklusi. Studi ini menggunakan pendekatan kualitatif dengan desain studi kasus untuk memperoleh pemahaman mendalam mengenai implementasi pembelajaran berbasis teknologi yang responsif terhadap keberagaman karakteristik peserta didik. Data dikumpulkan melalui observasi, wawancara mendalam, dan dokumentasi. Hasil penelitian menunjukkan dua temuan utama. Pertama, terbentuknya kurikulum digital adaptif yang ditandai dengan diferensiasi materi, fleksibilitas metode, serta variasi asesmen berbasis teknologi. Kedua, berkembangnya ekosistem pembelajaran inklusif digital yang dibangun melalui akses setara, dukungan multimodal, integrasi teknologi, pemberdayaan peserta didik, kolaborasi aktif, serta pengalaman belajar yang lebih bermakna. Temuan ini menegaskan bahwa transformasi pendidikan tidak hanya bergantung pada ketersediaan perangkat digital, tetapi pada desain pedagogis yang terintegrasi dan sistemik. Penelitian ini berkontribusi dalam menawarkan model konseptual smart classroom inklusif yang dapat menjadi rujukan bagi lembaga pendidikan dalam mengembangkan pembelajaran berbasis teknologi secara adil, adaptif, dan berkelanjutan.

Kata Kunci : Madrasah Inklusif; Kurikulum; Pembelajaran Digital.

INTRODUCTION

Educational transformation in the digital era demands fundamental changes in learning design, particularly in the context of inclusive madrasas that cater to the diverse characteristics of students (Dias et al., 2024; Useche et al., 2022). The presence of students with special needs in madrasas demands a pedagogical approach that is more adaptive, flexible, and responsive to variations in learning abilities (Kajiwara & Kawabata, 2024; Zhang & Lian, 2024). In this context, a smart classroom is not simply defined as a technology-equipped classroom, but as a digital learning ecosystem designed to accommodate diverse learning needs (Vecchiarini & Somià, 2023). Curriculum transformation is crucial because it determines the direction, strategy, and evaluation of learning. Without adaptive curriculum reconstruction, the use of technology has the potential to become merely a symbol of modernization without a substantive impact on equitable access to learning (Mahsusi et al., 2024). Therefore, smart classroom design in inclusive madrasas must be understood as a systemic effort to provide equitable, participatory, and needs-oriented learning for students with special needs.

Advances in educational technology have opened up significant opportunities for creating more personalized and multimodal learning. Various digital platforms allow for the presentation of materials in text, audio, visual, and interactive formats that can be tailored to students' learning profiles (Chuaphun & Samanchuen, 2024). For students with special needs, this flexibility is crucial, as they often require different approaches to understanding information (Carrasco et al., 2023). However, many technology implementations in educational institutions still focus on administrative efficiency or enhancing the institution's image, rather than on profound pedagogical transformation (Maimunah et al., 2025). In inclusive madrasas, these challenges are further complicated because, in addition to considering technological aspects, learning design must also align with Islamic values and principles of social justice (Zenaida et al., 2023). Therefore, smart classroom integration needs to be directed at creating a digital learning environment that truly supports students' individual needs.

Conceptually, a smart classroom in an inclusive context requires the application of differentiated learning and the principles of Universal Design for Learning (UDL). Curriculum transformation involves not only media changes but also adjustments to learning objectives, teaching strategies, and assessment systems for greater flexibility (Chinchay et al., 2024; Starks & Reich, 2023). Students with special needs require learning spaces that allow for repetition of material, paced learning, and additional visual or audio support. This design encourages a paradigm shift from uniform learning to student-centered learning (Moya & Camacho, 2024). In inclusive madrasas, this approach is relevant

because diversity of abilities is not seen as an obstacle, but rather as a reality that must be pedagogically facilitated. Therefore, smart classroom design must be able to integrate technology with an adaptive curriculum that supports accessibility and learning equity.

Several previous studies have shown that technology can increase motivation and learning engagement. However, most studies still focus on the context of regular schools without specifically examining its impact on students with special needs in inclusive madrasas. Furthermore, existing research tends to position technology as a separate variable from the curriculum structure (Fedele et al., 2024; Wijaya et al., 2024). However, the success of a smart classroom is largely determined by the synchronization between curriculum design, teacher competency, and infrastructure readiness (Geletu & Mihiretie, 2023). This gap highlights the need for research that positions smart classroom design as an integral part of inclusive curriculum transformation. With this approach, analysis examines not only the effectiveness of technology but also how it transforms pedagogical practices to support students' specific learning needs (Sari, 2025).

Inclusive madrasas have unique characteristics because they combine general education and religious education in a single, integrated system. Values such as *rahmatan lil 'alamin* (*blessing for the universe*), justice, and respect for differences serve as the normative foundations for education delivery (Safuan et al., 2024). However, these values need to be concretely translated into the design of digital learning environments. For students with special needs, a welcoming learning environment is not only about acceptance, but also about accessibility of materials, flexibility of methods, and adequate technological support. Curriculum transformation through smart classrooms must ensure that every student has an equal opportunity to develop according to their potential (Bhutoria, 2022). Thus, technology serves as a bridge to strengthen the implementation of inclusive values in daily learning practices.

Based on this description, this study aims to analyze smart classroom design as a strategy for curriculum transformation and strengthening the digital learning environment for students with special needs in inclusive madrasas. The research focuses not only on the technical aspects of using digital devices, but also on changing the learning paradigm to be more adaptive and personalized. This study also seeks to identify how the design affects student accessibility, participation, and engagement in the learning process. With a comprehensive approach, this research is expected to provide theoretical contributions to the study of inclusive education transformation as well as practical contributions to the development of learning policies and innovations in madrasas. Ultimately, smart classroom design is positioned as a strategic strategy for realizing inclusive, quality, and equitable education in the digital era.

METHOD

This research uses a qualitative research design with a case study approach to in-depth examine smart classroom design as a strategy for curriculum transformation and strengthening the digital learning environment for students with special needs in an inclusive madrasah. The case study approach was chosen because it allows for comprehensive exploration of the phenomenon in a real and bounded system context, namely an inclusive madrasah that has implemented digital technology-based learning. The research focuses on how the design is designed, implemented, and interpreted by educational actors to support the learning needs of students with special needs. With this approach, the research not only describes the use of technology but also analyzes the pedagogical and curricular changes that occur in daily learning practices.

The research location was one of the inclusive madrasahs in Indonesia that actively integrates technology into the learning process. The research subjects included the madrasah principal, the deputy head of curriculum, subject teachers, special assistant teachers, information technology personnel, and students with special needs involved in the implementation of smart classrooms. Informants were selected using a purposive sampling technique based on their strategic role and direct involvement in the planning and implementation of digital learning. To enrich the data, a snowball technique was used to reach additional informants relevant to the research focus. The participant selection criteria considered experience in curriculum adaptation, the use of learning technology, and direct interaction with students with special needs.

Data collection was conducted through participant observation, in-depth interviews, and documentation studies. Observations focused on learning practices in digital classrooms, the use of learning devices and applications, forms of instructional differentiation, and interaction patterns between teachers and students with special needs. In-depth interviews were conducted semi-structured to explore teachers' experiences, perceptions, and strategies in adapting the curriculum and technology-based learning methods. Documentation included analysis of curriculum tools, lesson plans (RPP), individual learning programs (PPI), madrasah policies, and archives of digital platform use. All data was documented in the form of transcripts, field notes, and digital archives to build an integrated data corpus.

Data analysis was conducted using an interactive analysis model that includes data reduction, data presentation, and conclusion drawing. In the initial stage, the researcher repeatedly read all data to gain a comprehensive understanding of the case context. Next, a manual coding process was conducted to identify meaningful units relevant to the research focus, such as adaptive curriculum design, learning differentiation strategies, digital accessibility, and the involvement of students with special needs. Codes with meaningful connections were then grouped into categories and developed into main themes. This process was carried out reflectively and iteratively to ensure consistency of interpretation

and alignment between the empirical data and the conceptual framework of inclusive education transformation. To ensure data validity, this study employed source and technique triangulation by comparing the results of observations, interviews, and documentation. Furthermore, member checking was conducted by requesting confirmation from several informants regarding the summary of interview results and the researcher's initial interpretations. Peer discussions were also conducted to test the analytical rigor and minimize subjective bias. The entire research process was documented through an audit trail to ensure transparency and traceability of the research stages.

Ethically, this research upholds the principles of informed consent, confidentiality, and protection of participant identity. All informants were provided with an explanation of the research's purpose, procedures, and benefits prior to data collection. Individual and institutional identities were disguised using codes or pseudonyms to maintain privacy and integrity. The data obtained were used solely for academic purposes and the development of learning models. With this methodological approach, the research is expected to yield a deeper understanding of smart classroom design as a strategy for curriculum transformation and strengthening digital learning environments that support the needs of students with special needs in inclusive madrasahs.

RESULT AND DISCUSSION

This study explores in-depth how smart classroom design in an inclusive madrasah contributes to curriculum transformation and the creation of a responsive digital learning environment for students with special needs. The results show that technology integration not only modernizes classrooms but also enables the implementation of more structured, differentiated learning. Digital features such as multimodal materials, flexible learning pace, and technology-based assessments have been shown to help students with diverse learning needs access materials more independently and according to their abilities. The curriculum transformation that occurs is not only in the delivery format, but also in a paradigm shift from uniform learning to adaptive and personalized learning. These findings confirm that inclusive smart classroom design can strengthen the principle of educational equity by providing equal participation space. The following section presents key findings related to adaptive curriculum changes and strengthening the digital learning environment to support students' specific needs.

1. Adaptive Curriculum Transformation Based on Smart Classroom

The transformation of the adaptive curriculum based on smart classrooms combines digital technology integration, learning differentiation, and the reconstruction of pedagogical strategies to create a learning system that is responsive to the needs of students with special needs. This design not only changes the media for delivering material but also restructures learning objectives, instructional methods, and assessment

systems to be more flexible and personalized. The previously uniform curriculum has shifted to an approach that allows for variations in learning pace, multimodal presentation of materials, and adjustment of achievement targets based on individual abilities. This transformation demonstrates that smart classrooms function as pedagogical instruments that support the concrete implementation of inclusivity principles in learning practices. The following research data shows that the form of the adaptive curriculum transformation based on smart classrooms in inclusive madrasas consists of several main aspects, as summarized in the following table.

Table 1: Adaptive Curriculum Transformation Based on Smart Classroom

Interview Data / Observation	Description	Code
Madrasah Teacher: <i>"Since using smart classrooms, I no longer provide just one type of material. I prepare videos, audio explanations, and visual modules so students can choose the learning method that's easiest for them to understand."</i>	Multimodal presentation of materials to accommodate the variety of learning styles and needs of students with special needs	Multimodal Learning
Special Assistant Teacher: <i>"We're now adjusting our lesson plans. The targets aren't always the same, depending on each student's abilities. The important thing is that they develop according to their potential."</i>	Differentiation of learning objectives and indicators in the curriculum	Curriculum Differentiation
Classroom observations show that students can repeat material through learning recordings and access digital modules independently.	Flexibility of learning pace that supports individual needs	Tempo Flexibility
Subject Teacher: <i>"Assessment isn't just about written exams. There are digital projects and portfolios so students can demonstrate their abilities in different ways."</i>	Transformation of the assessment system towards more personal and contextual evaluation	Adaptive Assessment
Deputy Head of Curriculum: <i>"Smart classrooms have made us revise the curriculum to be more open and less rigid than before."</i>	Curriculum reconstruction in response to inclusive technology integration	Curriculum Reconstruction

Table 1 shows that the changes are not limited to the use of digital devices, but to the overall structure and practices of learning. This data points to several fundamental changes in curriculum practices at inclusive madrasas.

First, multimodal learning. Data shows that material is no longer presented in one dominant format, but rather through a combination of visual, audio, and interactive media. This variation allows learners with different learning needs to access information through channels that best suit their characteristics. These findings confirm a shift from

a one-way approach to one that is more flexible and responsive to diversity. Multimodal learning is becoming an increasingly relevant approach to supporting the diversity of student learning styles. Data shows that material is no longer presented in a single, dominant format, but rather through a combination of complementary visual, audio, and interactive media. This variety allows students with different learning needs to access information through channels that best suit their characteristics. For example, visually inclined students may find it easier to understand through images or videos, while auditory learners benefit from audio-based explanations. Furthermore, interactive media also encourages active student engagement in the learning process. These findings underscore a shift from a one-way approach to a more flexible, responsive approach that better accommodates diversity, thereby improving the effectiveness and quality of students' overall understanding.

Second, adjustments to learning outcomes. Learning planning demonstrates the modification of indicators and targets to suit individual abilities. This practice reflects a paradigm shift from uniform standards to recognition of each student's personal development. The curriculum is no longer understood as a rigid document, but as a dynamic framework that can be contextualized.

Third, the flexibility of the learning process. Observation data shows that students can re-access materials and independently adjust their learning pace. This creates a safer and less stressful learning environment, especially for those who need additional time to understand the material. Flexibility in the learning process is a crucial aspect supporting student success. Based on observational data, students can reaccess learning materials at any time and adjust their learning pace to suit their individual needs. Furthermore, the freedom to control their own learning pace helps reduce the stress and anxiety that often arise in conventional learning. This safer, more comfortable learning environment is highly beneficial, especially for students who need additional time to understand the material fully. Thus, learning flexibility not only enhances comprehension but also supports students' overall emotional well-being.

Fourth, changes to the evaluation system. Assessment no longer relies solely on written tests, but rather through project-based assignments and digital portfolios. This approach provides a more equitable opportunity for students to demonstrate competence through various forms of ability expression. Changes to the evaluation system are a crucial step in improving the quality of learning. Assessments no longer rely solely on written tests; instead, they are developed through project-based assignments and digital portfolios. This approach allows students to demonstrate their understanding and skills more comprehensively, beyond simply problem-solving skills. Through projects, students can apply knowledge in real-world situations, while digital portfolios document ongoing learning progress. Furthermore, this variety of assessment formats

also provides a more equitable opportunity for students with different learning styles. Thus, this more flexible and diverse evaluation system is expected to reflect students' competencies better.

Thus, these findings indicate that technology integration has driven the reconstruction of learning practices toward a more adaptive, personalized, and inclusive system. This transformation demonstrates that digital-based classroom design acts as a catalyst in delivering a curriculum that is more aligned with the real needs of students.
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2. Strengthening Accessibility and Participation of Students with Special Needs

Strengthening accessibility in digital learning reflects a commitment to the principles of inclusivity and educational equity. Adaptive, flexible, and individual-responsive learning designs have been shown to open up broader participation opportunities for students with special needs. Support for multimodal features, a choice of assignment formats, and structured online interaction spaces not only facilitate understanding but also build self-confidence and social engagement. Field data shows that equal access leads to increased engagement, independence, and more meaningful academic interactions.

Table 2: Strengthening Accessibility and Participation of Students with Special Needs

Interview Data / Observation	Description	Conceptual Code
Students can enlarge text, use audio, and repeat the material independently.	System features allow for customization to individual learning needs.	Adaptive Accessibility
Students are more active in asking questions via digital forums compared to face-to-face classes.	Digital media provides a safe space to participate	Safe Participation Space
The teacher provides alternative forms of assignments (videos, visual presentations, sound recordings)	Task differentiation accommodates variations in learning styles.	Instructional Flexibility
Interaction between students increases through structured online discussions.	Digital platforms encourage inclusive social engagement	Inclusive Engagement

Table 2 shows four interrelated forms of strengthening access and engagement. Thus, the data explains the following findings as below;

First. Customizing visuals, audio, and the speed of material presentation allows each individual to learn at their own pace. Material can be re-accessed, enlarged, slowed down, or presented in a different format, minimizing barriers to understanding. This helps students who need additional support stay on track without feeling left behind.

This flexibility also encourages independence, as they can personalize their learning strategies. This makes the learning process more responsive to differences in abilities and learning characteristics.

Second. The digital-based classroom environment creates a safer and less stressful atmosphere for interaction. Students demonstrate greater confidence in asking questions, answering questions, and expressing opinions through available interactive media. This situation reduces anxiety and concerns about social judgment. Increased participation results in stronger emotional and academic engagement. This transformation demonstrates the power of technological support to build self-confidence and expand the space for learning expression.

Third. A variety of assignment methods and formats allows competency achievement to be expressed through various means, including visuals, audio, and collaborative projects. Teachers are no longer limited to a single evaluation model, but rather adapt strategies to the needs of the class. This approach makes the learning process more dynamic and responsive to diversity. The impact is seen in the improved quality of work results and the consistency of assignment completion.

Fourth. Collective engagement is further strengthened through collaborative activities facilitated by digital platforms. Interactions between students become more open and mutually supportive. They learn not only individually but also build cooperation and empathy within groups. This demonstrates that the transformation of digital learning environments contributes to the creation of more inclusive and sustainable learning experiences.

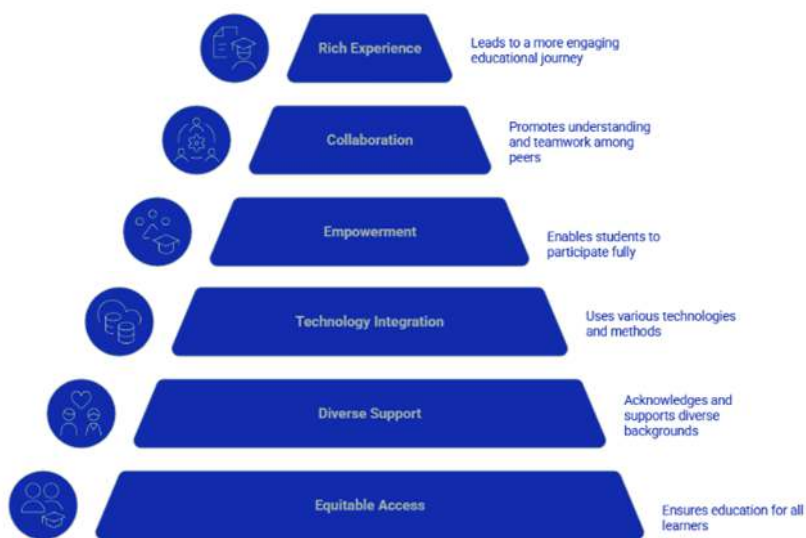


Figure 1: Structure of the Digital Inclusive Learning Ecosystem

Based on the data and visualizations as figure 1, research findings indicate that the formation of an inclusive digital learning ecosystem in a smart classroom is built through six main layers: equal access, diverse support, technology integration, empowerment, collaboration, and rich learning experiences. The primary foundation lies in equal access, which ensures all students can utilize digital facilities without structural or technical barriers. Furthermore, diverse support demonstrates the differentiation of learning strategies according to individual needs, making the learning process more adaptive. Technology integration strengthens the system through the structured use of digital devices and platforms within the curriculum.

In the next stage, empowerment reflects increased self-confidence and independence in learning, while collaboration demonstrates the growth of more positive social interactions in the classroom. Ultimately, a rich learning experience indicates that the curriculum and learning environment have been comprehensively transformed. The combination of all these elements forms an inclusive, participatory, and sustainable digital learning system in inclusive madrasahs.

The findings of this study confirm that the implementation of smart classrooms in inclusive madrasahs has resulted in two fundamental changes: the formation of an adaptive digital curriculum and the development of a technology-based inclusive learning ecosystem. The first change is evident in the design of flexible materials, adjustments to delivery strategies, and variations in evaluation that enable differentiation of learning abilities. The second change is seen in the formation of a systemically structured learning environment through the provision of equitable access, multimodal support, strengthening social interactions, and more meaningful learning experiences. This transformation demonstrates that innovation does not stop at the use of digital devices, but rather touches the pedagogical, structural, and cultural dimensions within educational institutions (Zakiyah, 2025). Thus, the design of smart classrooms serves as a catalyst for a paradigm shift from a uniform approach to a learning system that is responsive to the diverse characteristics of students in inclusive madrasahs.

Interpretatively, the adaptive digital curriculum reflects a shift in learning orientation from a static model to a dynamic and contextual one. Adapting content through interactive media, visual and audio-based modules, and flexible assessments demonstrates that the learning process is designed to accommodate varying cognitive styles and individual needs (Ezzaim et al., 2024). This flexibility allows learners to access materials through pathways that align with their individual potentials and challenges. These changes also demonstrate that technology is not positioned as an additional element, but rather as a primary driver in restructuring learning practices (Magaji & Ade-Ojo, 2023; Malik et al., 2024). In this context, consciously planned design is a determining factor in successful

implementation, as inclusivity does not emerge automatically but is built through pedagogical strategies integrated with adaptive digital systems.

From a theoretical perspective, the results of this study align with the principles of Universal Design for Learning, which emphasize diverse presentation methods, forms of participation, and variations in the expression of learning outcomes. This concept underscores the importance of designing learning from the outset to ensure it is accessible to a wide range of learner characteristics without requiring additional modifications later (Gaulke et al., 2024; Pellikka et al., 2024). Furthermore, the social constructivist approach explains that meaningful learning experiences are formed through active interactions between individuals and their environments (Madkour & Alaskar, 2024). The integration of technology in smart classrooms enhances the process of knowledge construction through interactive and collaborative digital media. Thus, adaptive curriculum design is not merely a technical innovation, but a concrete representation of contemporary learning theory in the practice of inclusive education.

The novelty of this research lies in combining curriculum transformation and digital learning environment reconstruction within a single, cohesive conceptual framework. While many previous studies have addressed the digitalization of learning or inclusive education separately, this study demonstrates the interconnectedness of the two as an integrated system. This integration results in a model that focuses not only on the provision of facilities but also on changes in pedagogical structures and learning culture. By presenting a design based on the needs of diverse learners in a madrasah environment, this research enriches the literature on technology-based educational transformation in the context of Islamic educational institutions (Khamaj & Ali, 2024). This conceptual contribution opens up new dialogue on how digital innovation can align with institutional values and local characteristics.

The practical implications of the first finding suggest that educational institutions need to design digital transformation policies that focus on learning design, not just infrastructure procurement. Teachers need to improve their competency in designing flexible materials, effectively utilizing digital platforms, and conducting differentiation-based assessments. Furthermore, madrasah management needs to ensure policy support that enables the sustainable development of a technology-based curriculum. This transformation also requires a shift in mindset, emphasizing that diversity is not a barrier but rather a foundation for designing learning strategies. With this approach, implementing smart classrooms can result in systematic and sustainable changes in inclusive education practices.

From a global perspective, the findings of this study are relevant to the international agenda regarding equitable access and quality of education in the digital era. The developed inclusive smart classroom model demonstrates that technology integration can be

instrumental in narrowing the learning gap when designed adaptively(Ho et al., 2024). The context of inclusive madrasahs provides an example of how even religiously based institutions can adopt digital innovations without losing their identity(Rachmawati et al., 2022). Thus, this study contributes to the global discourse on educational transformation in developing countries, particularly in integrating technology and principles of social justice. The resulting model has the potential to be replicated with contextual adjustments in various education systems internationally.

However, this study's limitations lie in its implementation, which was limited to a single inclusive madrasah context. Variations in institutional characteristics, human resource readiness, and facility availability may influence the outcomes of implementing a similar model elsewhere. Furthermore, the relatively short observation period does not fully reflect the long-term impact on students' academic achievement and social development. Therefore, further research using a longitudinal approach and a broader range of locations is needed to test the consistency and sustainability of this inclusive smart classroom model.

The second finding indicates that the formation of an inclusive digital learning ecosystem occurs through a layered structure that includes providing equitable access, multimodal support, systematic use of devices, strengthening independence, active collaboration, and richer learning experiences. This structure demonstrates that inclusivity is the result of the integration of various interacting components(Chinchay et al., 2024; Tafazoli, 2024). Each layer plays a strategic role in building an environment that enables the full participation of all learners(Thomas & Sebastian, 2023). With a structured system, the learning process no longer relies solely on individual interventions but rather on the design of a comprehensive, supportive environment(Ma et al., 2021). This confirms that the success of digital transformation is largely determined by the synergy between technological and social aspects within an integrated framework.

Interpretation of these findings suggests that a balance between technological support and social interaction is key to successful smart classroom implementation. An environment that provides various forms of learning support encourages increased self-confidence and active engagement in classroom activities. More intensive interaction between students strengthens the social dimension of learning and reduces the potential for exclusion. Thus, inclusivity is not simply defined as access to devices, but also as a participatory experience that builds positive relationships within the learning community. These changes demonstrate that digital environment design can create a more open and supportive atmosphere for diverse student characteristics.

Theoretically, these findings relate to the ecological theory of education, which positions individuals as part of a broader system, encompassing the physical, social, and cultural environments(Koutsouveli & Geraki, 2022). The interaction between these factors shapes the overall learning experience(Masykuroh et al., 2024). Furthermore, self-determination theory explains that supporting the needs for autonomy, competence, and

social connectedness contributes to increased intrinsic motivation (Addas et al., 2024). In the context of a smart classroom, providing access, diverse support, and active collaboration serve as means of fulfilling these needs. The integration of these theories strengthens the understanding that technology-based inclusive learning is not merely a technical innovation but also a psychosocial process that influences the holistic development of learners.

The novelty of the second finding lies in the visualization of the digital inclusive ecosystem pyramid model, which systematically depicts the stages of developing a learning environment. This model not only explains the components involved but also demonstrates the hierarchical relationships between the mutually supportive elements. This approach provides a conceptual contribution to formulating a more structured implementation framework. By presenting a clear visual model, this research makes it easier for other educational institutions to understand the necessary transformation stages. This innovation enriches the literature on designing inclusive digital learning environments, particularly in the context of religious-based educational institutions.

The practical implications of the second finding emphasize the importance of a holistic approach to smart classroom development. Madrasah administrators need to ensure that the provision of digital facilities is accompanied by pedagogical support strategies and the strengthening of a collaborative culture (Adeleke Adeoye et al., 2025). Teachers act as facilitators, managing social interactions while effectively utilizing technology (Aamir et al., 2024; Arzo & Hong, 2024). Furthermore, institutional policies need to integrate accessibility principles into all learning plans. This comprehensive approach enables the creation of an environment that is not only technologically modern but also equitable and supportive for all students.

Globally, the digital inclusive learning ecosystem model contributes to strengthening the educational paradigm that positions technology as a means of empowerment, not merely a symbol of modernization. This study illustrates how digital transformation can align with principles of social justice and institutional values. This contribution is relevant in the international context that is promoting technology-based inclusive education in various countries. However, this study still has limitations in quantitatively measuring the long-term impact on academic performance and social development. Therefore, further studies are needed to expand empirical validation and assess the model's sustainability over a longer period.

CONCLUSION

This research shows that smart classroom design in inclusive madrasahs results in an integrated transformation between an adaptive digital curriculum and a technology-based inclusive learning ecosystem. This transformation not only touches on the use of devices but

also reconstructs the learning structure through material differentiation, assessment flexibility, equal access, multimodal support, and strengthening social collaboration. The synthesis of findings indicates that the successful implementation of smart classrooms depends on the integration of curriculum design and learning environment engineering that is responsive to the diversity of student characteristics. Thus, inclusivity is realized as a result of systemic planning, not simply normative policy.

The primary contribution of this research lies in the development of a conceptual model that integrates curriculum transformation and the formation of an inclusive digital ecosystem in the madrasah context. This study enriches the literature on technology-based inclusive education by presenting a systematic and applicable framework for the learning ecosystem pyramid. This model provides a theoretical and practical foundation for educational institutions seeking to develop smart learning spaces without neglecting the principles of equity and diversity.

Further research is recommended to test the effectiveness of this model in diverse educational contexts, both geographically and culturally, and to examine its long-term impact on academic achievement, social development, and learning independence. Quantitative or mixed methods approaches could also be used to strengthen the empirical validity of the findings.

The key message from this research is that digital transformation in education must be oriented toward humanity. Technology will only be meaningful if it is designed to expand access, strengthen participation, and value diversity. Smart classrooms are not simply symbols of modernization, but rather pedagogical strategies for realizing equitable, adaptive, and sustainable education.

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