

Transformation of Pesantren-Based Madrasah Ibtidaiyah in the Era of Industrial Revolution 4.0: Case Study of Miftahul Ulum Kesamben Wetan

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Abstract: This research examines the transformation of pesantren-based Madrasah Ibtidaiyah in the era of the Industrial Revolution 4.0 with a case study on Miftahul Ulum Kesamben Wetan. The method used is qualitative with a library research/integrative review approach to analyze and synthesize relevant literature from national and international journals (2015-2024). The article selection process followed the PRISMA model and data analysis was conducted through thematic synthesis with a focus on institutional transformation, teacher professionalism development, technology integration, and character strengthening. The results showed that madrasah successfully integrated pesantren values with modern technology harmoniously through strengthening the vision and mission, adapting the curriculum, interactive learning methods, and digitizing administration. This transformation improves the quality of education without sacrificing the identity of pesantren, despite the challenges of infrastructure and human resource readiness. This study recommends developing a technology training model for pesantren teachers and studying the long-term impact of technology integration on students' religious character. These findings are important as a reference for the development of adaptive and sustainable Islamic education in the digital era.

Keywords: Madrasah Transformation, Pesantren, Industrial Revolution 4.0, Technology Integration, Islamic Education, Digitalization.

Article History:

Received: 30-04-2025

Online : 31-05-2025



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A. INTRODUCTION

The transformation of pesantren-based madrasah ibtidaiyah is a response to the dynamics of the Industrial Revolution 4.0 which is characterized by digitalization, automation, and global connectivity. In this context, pesantren-based madrasahs are faced with the challenge of maintaining traditional values while adopting modern technology. This transformation concept includes changes in education management, curriculum development, and improving teacher competencies to adapt to the demands of the digital era (Maisaroh, 2023). In addition, the integration of technology in learning is an important aspect in improving the quality of education in madrasah (Hanifah et al., 2024).

Research by Arif et al. (2020) shows that Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan has made various transformation efforts, such as increasing teacher professionalism through technology-based training, developing curriculum relevant to the digital era, and strengthening student character. These efforts reflect the madrasah's adaptation to the demands of the Industrial Revolution 4.0. Maisaroh (2023) also emphasized the importance of transforming education management in madrasahs to improve the efficiency and effectiveness

of the education system through digitalization. However, challenges such as limited infrastructure and educators' competence are still obstacles in this transformation process.

Teacher professionalism is key to the success of madrasah transformation. Rismawati et al. (2022) found that strategies to improve teacher professionalism at MI Miftahul Ulum Kesamben Wetan include IT-based training, educational seminars, and learning workshops in the digital era. In addition, Hanifah et al. (2024) highlighted the importance of teachers' pedagogical competence and digital literacy in facing the digital era. Yuningsih (2025) also emphasized that teachers' readiness to adopt digital technology is very important to improve the quality of learning in madrasah.

Strengthening student character is the main focus in madrasah education. Samadi et al. (2023) stated that the integration of character values into the curriculum and the development of extracurricular programs that support student character building are very important. Sholikin and Prasetyo (2023) also emphasized the implementation of the Pancasila Student Profile in strengthening the character of students in Madrasah Ibtidaiyah. In addition, Islamiati et al. (2024) showed that madrasahs have an important role in shaping students' character through teaching moral and ethical values.

The integration of technology in learning in madrasah is a crucial aspect in facing the digital era. Hanifah et al. (2024) found that teachers in Madrasah Ibtidaiyah have a basic understanding of technology, but still need further training to optimize digital learning media. Yuningsih (2025) also highlighted that most MI teachers face obstacles in adopting digital technology, such as lack of training and limited infrastructure. Maisaroh (2023) emphasized that digitalization can improve the efficiency and effectiveness of the madrasah education system, but it still faces various challenges.

From the results of the above research, it can be seen that the transformation of pesantren-based madrasah ibtidaiyah in the era of the Industrial Revolution 4.0 involves various aspects, including improving teacher professionalism, strengthening student character, and integrating technology in learning. However, there is still a gap in research related to the implementation of this transformation holistically in pesantren-based madrasah. The novelty of this research lies in the in-depth case study approach of MI Miftahul Ulum Kesamben Wetan, which integrates pesantren values with the demands of the digital era. The purpose of this study is to describe the transformation efforts made by MI Miftahul Ulum Kesamben Wetan in facing the challenges of the Industrial Revolution 4.0, as well as to identify effective strategies in improving the quality of education in pesantren-based madrasahs.

B. METHOD

This study uses a library research or integrative review approach, which is a systematic method for analyzing, synthesizing, and interpreting relevant literature related to the transformation of pesantren-based Madrasah Ibtidaiyah in facing the challenges of the Industrial Revolution 4.0. This approach allows researchers to build a deep conceptual understanding, identify patterns and trends, and formulate evidence-based recommendations from previous studies (Snyder, 2019). This approach was chosen because it is in accordance with the explorative and descriptive research objectives of the practice of educational transformation in Islamic boarding schools.

Data sources in this study were obtained from various reputable academic databases, namely Google Scholar, Scispace, Directory of Open Access Journals (DOAJ), and Scopus. The articles reviewed included relevant national and international journals with keywords: madrasa transformation, pesantren-based madrasa, Industrial Revolution 4.0, character education, teacher professionalism, and education digitalization. The inclusion criteria used were: (1) articles published in the 2015-2024 timeframe; (2) relevant to the research focus and variables; (3) available in full text; and (4) from peer-reviewed journals. The exclusion criteria included: (1) thematically irrelevant articles; (2) not research results (e.g. opinions or essays); and (3) duplicate articles from the same source.

The literature search process was conducted systematically through keyword matching in each database, followed by an initial assessment based on the title and abstract. Articles that met the inclusion criteria were then read thoroughly to ensure compatibility with the focus of the review. The literature selection procedure followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) model, which includes the stages of identification, screening, eligibility assessment, and synthesis. Each article was recorded in a literature review matrix that included key information such as author name, year of publication, objectives, methods and key findings.

Data analysis was conducted through thematic synthesis process, which categorized the findings based on the main themes: institutional transformation of madrasah, teacher professional development, technology integration, and character strengthening. This process aims to identify patterns, relationships between variables, and research gaps. To maintain the validity and reliability of the review results, source triangulation and cross-validation techniques were conducted between articles (Whittemore & Knafl, 2005). In addition, transparency in the selection process and literature documentation was maintained by systematically keeping a list of articles and selection criteria.

C. RESULTS AND DISCUSSION

1. Institutional Transformation Strategy: Integration of Pesantren Values and Modern Technology

Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan has carried out various strategies in order to transform in the era of the Industrial Revolution 4.0, while maintaining the pesantren identity that is strongly attached to the character of the institution. This transformation strategy is not only physical and technical, but also touches the philosophical aspects and basic values of Islamic education. One of the main strategies is to strengthen the institution's vision and mission to be in line with the times without leaving the roots of Islamic tradition. The vision of the madrasah was changed to be more futuristic, namely to become an Islamic basic education institution that excels in mastering science, technology and spirituality. This became the basis for developing strategic programs.

In addition, the institution applies an integrative approach, combining pesantren-based lessons (kitab kuning, tahfidz, adab islami) with digital literacy and technology. For example, the learning of the yellow Islamic classic book is still carried out, but supported by digital media such as interactive PDFs and applications that support understanding of nahwu-sharaf.

Another strategy is to increase the capacity of human resources. Madrasah teachers are encouraged to attend training in educational technology and digital classroom management. Some teachers have even developed simple app-based learning media, such as Canva, Google Classroom and Quizizz, to support online and hybrid learning.

On the institutional side, the madrasah formed a digitalization development team tasked with designing a roadmap for technological transformation, including the development of an internal internet network, a digital library, and a website-based madrasah information system. This transformation is carried out while maintaining the spirit of pesantren inherent in the daily life of students, such as the obligation to pray in congregation, habituation of morning and evening dhikr, and strengthening morals. This integration becomes the distinctive value of the transformation that is not merely imitating modern education, but adapting it selectively in accordance with pesantren values.

2. Curriculum Changes, Learning Methods, and Administration Digitalization

Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan has adjusted its curriculum to meet the challenges of the Industrial Revolution 4.0 era. The curriculum is not only based on the official curriculum of the Ministry of Religious Affairs and pesantren values, but also integrates 21st century competencies, such as digital literacy, creativity, and strengthening student character. The addition of local content and project-based activities is an important part of developing students' abilities to be ready to face the dynamics of the modern world without ignoring Islamic values.

In terms of learning methods, madrasahs are moving away from one-way lectures and toward more interactive and contextualized learning. Teachers utilize various digital technologies such as online learning applications, video media, and online quiz platforms to increase student engagement. Even the traditionally taught yellow Islamic classic book (*kitab kuning*) lessons are now equipped with digital teaching materials that facilitate students' understanding in a more systematic way. This method has been proven to significantly improve students' learning motivation and competency outcomes.

In addition, the madrasah also implements administrative digitization, which plays a major role in supporting management effectiveness. Student attendance is carried out through an application-based digital system, and grade management is also processed online, making it easier for teachers to collect data and report. The process of registering new students and reporting madrasah finances began using a website and application-based system, increasing transparency and speed of administrative services. This digitalization step also supports madrasahs to be more responsive and adaptive to technological developments in the industrial era 4.0.

3. Challenges and Impacts of Transformation on Education Identity and Quality

The transformation of Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan in the face of the Industrial Revolution 4.0 brings a number of challenges that must be taken seriously. One of the main challenges is the limited technological infrastructure, such as the uneven internet network and insufficient digital devices in all classrooms. This condition becomes an obstacle in the implementation of technology-based learning optimally. In addition, teachers'

competence in using technology still varies; some of the more senior teachers face difficulties in adopting digital learning media, which requires continuous training and mentoring.

Another challenge comes from concerns about the impact of technology on pesantren values. Some parties feel that technological advances can erode the religious traditions and norms that have been the identity of madrasah. Therefore, madrasahs must be able to balance the use of technology with the strengthening of spiritual and moral values, so that students still have a religious character despite being accustomed to digital tools. Despite facing various challenges, this transformation has had a significant positive impact on the identity and quality of education in madrasah. The identity of madrasah as an adaptive pesantren institution is getting stronger, where Islamic values are maintained while adopting technological advances. This makes madrasahs not only known as centers of traditional religious education, but also as institutions that are able to innovate and are relevant to the times.

In terms of education quality, this transformation improves student motivation and learning achievement. The use of interactive learning methods and digital media makes students more active and interested in attending lessons. In addition, transparency and efficiency in the management of madrasah administration has increased with the digitalization of the system. Public trust in the madrasah has also grown, as seen from the increasing number of applicants every year, which is an indicator of the success of the transformation in maintaining quality while strengthening the madrasah's reputation in the midst of the digital era.

D. CONCLUSIONS AND SUGGESTIONS

The transformation of Madrasah Ibtidaiyah Miftahul Ulum Kesamben Wetan in the era of Industrial Revolution 4.0 shows that the integration of pesantren values with modern technology can be done harmoniously. Through a strategy of strengthening the vision and mission, adjusting the curriculum to accommodate 21st century competencies, changing learning methods to be more interactive, and digitizing administration, the madrasah has succeeded in improving the quality of education without sacrificing the identity of the pesantren. Despite facing challenges such as limited infrastructure and human resource readiness, this transformation is able to strengthen students' religious character while increasing motivation and learning achievement, as well as increasing community trust in the institution. Future research needs to focus on developing effective technology training and mentoring models for pesantren teachers to accelerate their adaptation to digital learning. In addition, studies on the long-term impact of technology integration on students' religious character formation are also very important to ensure that the balance between modernization and pesantren values is maintained.

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