



Navigating Digital Transformation in Primary Education Curriculum Management: Trends, Challenges, and Adaptation Strategies

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Abstract:

Digital transformation has changed how primary education is delivered and requires curriculum management that can adapt to technological advancements. This study aims to analyze how primary education curriculum management navigates digital transformation by identifying trends, challenges, and adaptation strategies. The study employs a library research design with a qualitative approach. Data were gathered from relevant journal articles, academic books, proceedings, and policy documents, then analyzed through stages of selection, categorization, interpretation, and synthesis, and validated via source triangulation. The study reveals three key findings. First, digital transformation is characterized by the proliferation of various digital platforms, media, and learning resources that enhance learning flexibility. Second, curriculum adaptation faces challenges regarding human resource readiness, digital competence, the availability of facilities and infrastructure, learner characteristics, and the alignment of technology with educational goals. Third, adaptation strategies include media diversification, the integration of digital content, the strengthening of digital literacy and competence, and the tailoring of learning to meet learners' needs. Consequently, schools need to manage technology strategically through curriculum planning, the enhancement of teacher competence, the mapping of learner needs, and the continuous evaluation of technology utilization.

INTRODUCTION

Digital transformation has become a defining feature of contemporary society, reshaping how knowledge is produced, accessed, and applied, including in basic education. This development matters because schools must prepare students to navigate an increasingly technology-mediated world while maintaining educational quality and equity. Digital platforms, artificial intelligence, and collaborative technologies offer opportunities to expand learning resources and support flexible educational practices (Alam & Mohanty, 2023; Zou et al., 2025). Moreover, digital media increasingly facilitate learning across online and offline environments (Sharma et al., 2022; Wang et al., 2024). These developments demonstrate that digital transformation extends beyond technological adoption, requiring educational institutions to adapt curriculum management to changing societal needs.

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Despite these opportunities, integrating digital technologies into basic education presents substantial management challenges. Schools may experience difficulties related to infrastructure, teacher competencies, institutional readiness, and the alignment between technological innovations and curriculum objectives. These challenges matter because technology alone cannot guarantee meaningful improvements in educational quality. Effective learning depends on educators' ability to address instructional problems and adapt educational practices to students' needs (Adeoye et al., 2024; Goyibova et al., 2025). Furthermore, developing creativity, innovation, and adaptability requires curricula that respond to changing social conditions rather than remain static (Valquarisma, 2024; Wolf et al., 2024). Therefore, schools need integrated curriculum management approaches that connect technological development with educational objectives and sustainable learning improvement.

In basic education, digital transformation is reflected in the growing use of e-learning platforms, educational software, digital learning media, and online collaboration tools. These technologies can make learning more interactive and support the development of competencies required in the twenty-first century (Pustikayasa et al., 2023; Josué et al., 2023). However, their implementation requires corresponding adjustments to learning objectives, instructional materials, teaching strategies, and teacher competencies. School principals direct curriculum implementation, while teachers translate curriculum requirements into classroom practice (Katshuna & Shikalepo, 2023; Wang & Zang, 2025). This situation highlights the interdependence between institutional curriculum management and classroom implementation. Nevertheless, the presence of digital tools does not necessarily indicate that schools have developed systematic mechanisms for managing curriculum change.

Previous studies have established the potential of digital technology to improve educational practices and support the development of twenty-first-century competencies. Pustikayasa et al. (2023), for example, discuss how technology can enhance learning interactivity, enrich instructional dynamics, and support skill development. Other studies emphasize that educational quality depends on educators' capacity to respond to learning challenges and accommodate students' needs (Nurhayati et al., 2024). Meanwhile, research on curriculum management highlights the coordination of institutional responsibilities and the roles of principals and teachers in achieving learning objectives (Sanam et al., 2022; Arifin et al., 2024). Collectively, these studies establish the importance of connecting technological resources, educator competencies, and curriculum implementation to support meaningful educational improvement.

Although these studies offer valuable insights, they leave an important analytical issue insufficiently addressed: how educational institutions systematically navigate digital transformation through curriculum management. Existing discussions tend to examine technology as a learning instrument, instructional quality, or an element of educational innovation rather than connecting these dimensions within an integrated change-management perspective. Research has also emphasized the need for curricula that encourage creativity, innovation, and adaptability in response to technological developments

(Putra et al., 2025; Puspitasari & Syafitri, 2025). However, understanding how schools identify emerging digital trends, anticipate management challenges, and translate these developments into curriculum adaptation strategies remains important. Addressing this gap can clarify the institutional processes through which digital transformation becomes meaningful and sustainable educational change.

Building on this gap, the present study conceptualizes digital transformation as an ongoing process of institutional and curricular adaptation rather than merely adopting educational technologies. Its contribution lies in examining three interconnected dimensions: digital trends influencing basic education, challenges encountered in curriculum management, and strategies developed to respond to technological change. This integrated perspective connects environmental developments with institutional decision-making, human resource readiness, and changes in learning practices. It also recognizes that curriculum adaptation must remain consistent with the broader educational mandate established by Indonesian Law No. 20 of 2003, which emphasizes students' intellectual, moral, personal, and practical development (Masgumelar & Mustafa, 2021). Accordingly, digital innovation should strengthen educational purposes rather than become an end in itself.

Based on this rationale, the study investigates how basic education institutions navigate digital transformation through curriculum management. It addresses three research questions: (1) What digital transformation trends influence curriculum management in basic education? (2) What challenges do educational institutions encounter when responding to these developments? (3) What adaptation strategies are employed to address digital change sustainably? The study argues that effective digital transformation depends not simply on acquiring technological resources but on institutions' capacity to interpret emerging trends, identify contextual needs, and align curriculum policies with teaching practices. By examining the relationships among trends, challenges, and adaptation strategies, this research seeks to explain how curriculum management can become more responsive to technological developments while preserving the educational objectives and developmental needs of basic education.

RESEARCH METHODS

This research uses a literature research design with a qualitative approach. This design was chosen because the research focuses on reviewing and synthesizing literature on digital transformation in basic education curriculum management, especially trends, challenges, and adaptation strategies. Data sources were obtained from scientific journal articles, academic books, proceedings, education policy documents, and other relevant scientific sources. The selection of sources was carried out based on the criteria of relevance with the focus of the research, the credibility of the source, the traceability of information, and its contribution to the discussion of digital transformation, curriculum management, basic education, digitalization challenges, or adaptation strategies. Sources that only discuss technology in general without any connection with education and curriculum management are not used as the main source.

Data were searched systematically through Google Scholar, Garuda, and relevant scientific journal databases using keywords such as digital transformation

of education, basic education curriculum management, digital transformation in education, digital curriculum management, digital education challenges, and curriculum adaptation. The literature found was selected through titles, abstracts, keywords, and article content to ensure its suitability with the research focus. Relevant data were recorded in a literature review matrix that included the source identity, year of publication, study focus, main findings, concepts, and information on trends, challenges, and adaptation strategies. The data were then grouped into three main themes: digital transformation trends in basic education, challenges in curriculum management, and adaptation strategies to digital change.

Data analysis is carried out in four stages: selection, categorization, interpretation, and synthesis. Selection is carried out by selecting information relevant to the research objectives, then the data is categorized based on the three main themes of the research. The data is then interpreted by comparing similarities, differences, tendencies, and relationships across findings from various sources. The synthesis stage is carried out by integrating the results of interpretation to obtain a complete understanding of how the management of the basic education curriculum navigates digital transformation. The validity of the data is examined through triangulation by comparing information from journal articles, books, proceedings, and policy documents. Consistent information from several sources strengthens the findings, while differences in views are analyzed based on each source's context. Thus, the research results are constructed by comparing relevant sources and do not depend on any single source.

RESULTS AND DISCUSSION

Results

Foundations and Orientations of Basic Education Curriculum Management

Basic education is a nine-year level of education consisting of six years at Elementary School/Madrasah Ibtidaiyah (SD/MI) and three years at Junior High School/Madrasah Tsanawiyah (SMP/MTs) or equivalent education units (Secondary, 2025; Secondary, 2026). In this study, basic education curriculum management is understood as a series of processes of managing goals, content, implementation, and curriculum development to meet the development needs of students while achieving educational goals. Curriculum management is not only oriented towards academic achievement, but also includes the formation of students' character, skills, and readiness to continue education (Hikmawati et al., 2023; Perdana, 2023). Thus, curriculum management becomes the basis for schools in determining the direction of learning that is in accordance with the educational goals and characteristics of students.

The findings of the study show that the management of the basic education curriculum needs to consider the development and characteristics of students. Santrock (2020) through Piaget's theory emphasizes the suitability of learning with the child's cognitive development stage, while Sihaloho and Sihombing (2023) through the Vygotsky perspective emphasize social interaction, collaboration, and support from more competent individuals. Meanwhile, Andriani et al. (2022) show the importance of strengthening behaviors in learning through Skinner's theory of behaviorism. Dewey and Bruner's constructivist perspectives place learners as active learners who build knowledge through experience, while Maslow's

humanistic theory and Gardner's dual intelligence expand attention to the needs, potentials, and diversity of students' abilities (Santrock, 2020; Mahrus & Itqon, 2020). These various perspectives show that curriculum management cannot use a uniform approach, but needs to be adjusted to the conditions, needs, experiences, and abilities of students.

Based on this synthesis, there is a relationship between educational objectives, student characteristics, curriculum development, and learning implementation. Educational objectives are the basis for determining the direction of the curriculum, the characteristics of students are considered in determining the content and learning strategies, while curriculum management connects the two through the process of planning, implementation, and evaluation. In the context of digital transformation, this relationship develops by including the use of technology as part of the curriculum development and implementation process. Technology is not positioned as a stand-alone component, but as a means to provide a more diverse learning experience and support the achievement of learning goals. The researcher interprets that curriculum adaptation to digital developments needs to continue to depart from educational goals and student needs, not solely follow technological developments.

Thus, the core findings of the study show that the management of the basic education curriculum is a management process that is oriented to educational goals, student-centered, and adaptive to changes in the educational environment. Various theories of development and learning provide the basis that the curriculum needs to pay attention to cognitive development, social interaction, behavior formation, learning experiences, individual needs, and the diversity of students' intelligence. In the face of digital transformation, these principles lead to the need to develop a curriculum that is able to utilize technology appropriately without losing orientation to educational goals and student needs. Therefore, the success of curriculum management in the digital era is not only determined by the use of technology, but also by the ability of schools to integrate technology into learning objectives, content, strategies, and contextual evaluations.

Table 1. Patterns, tendencies, similarities, and differences in sources

Author/Year	Study Focus	Key Concepts	Tendencies/Findings	Relevance to Curriculum Management
Ahmad & Nurhidaya (2020)	Basic education	Basic education level	Basic education lasts for nine years	Becoming the context of the curriculum management level
Hikmawati et al. (2023)	Curriculum management	Effectiveness and efficiency	The curriculum plays a role in the development of character and academic abilities	Affirm the strategic function of curriculum management
Prime (2023)	Curriculum objectives	Learners' skills	The curriculum prepares learners for life and secondary education	Become the basis for determining the

					direction of the curriculum
Santrock (2020)	Piaget	Cognitive development	Learning needs to be adapted to the child's developmental stage		Become the basis for content adjustment and learning strategies
Sihaloho & Sihombing (2023)	Vygotsky	Social interaction and ZPD	Learning thrives through social interaction and support		Supporting collaborative learning
Andriani et al. (2022)	Skinner	Reinforcement of behavior	Reinforcement can encourage expected learning behaviors		Support the management of learning behaviors
Santrock (2020)	Dewey & Bruner	Constructivism	Students build knowledge through experience		Supports active and contextual learning
Santrock (2020)	Maslow	Needs and self-actualization	Learning needs to pay attention to the needs of students as a whole		Supporting a learner-centred approach
Mahrus & Itqon (2020)	Gardner	Dual intelligence	Students have various forms of abilities		Supporting differentiation in learning management

Table 1 shows three main patterns. First, almost all sources place students as the center of curriculum development, even though they use different perspectives. Second, there is a tendency that the curriculum needs to be adjusted to the conditions of students, both in terms of cognitive development, social interaction, behavior, experience, needs and diversity of abilities. Third, these sources indirectly provide the basis for the need for an adaptive curriculum, because learning cannot be separated from changes in the characteristics of students and the educational environment.

However, there is a difference in emphasis. Piaget focuses on cognitive development, Vygotsky on social interaction, Skinner on behavior, Dewey and Bruner on experience and the construction of knowledge, Maslow on individual needs, and Gardner on diversity of intelligence. This difference can be synthesized into an understanding that the management of the basic education curriculum requires flexibility to accommodate the various dimensions of student development.

Digital Technology in Education

Digital technology in this study is understood as digital system-based technology that allows information to be processed, stored, accessed, and used through computer-readable devices to support educational purposes. KBBI defines technology as a scientific method to achieve practical goals, while Hidayat et al. (2020) view technology as a device or system that provides convenience for users. Marpaung et al. (2023) explained that digital technology works through computer-readable systems and formats with less need for manual intervention. In the

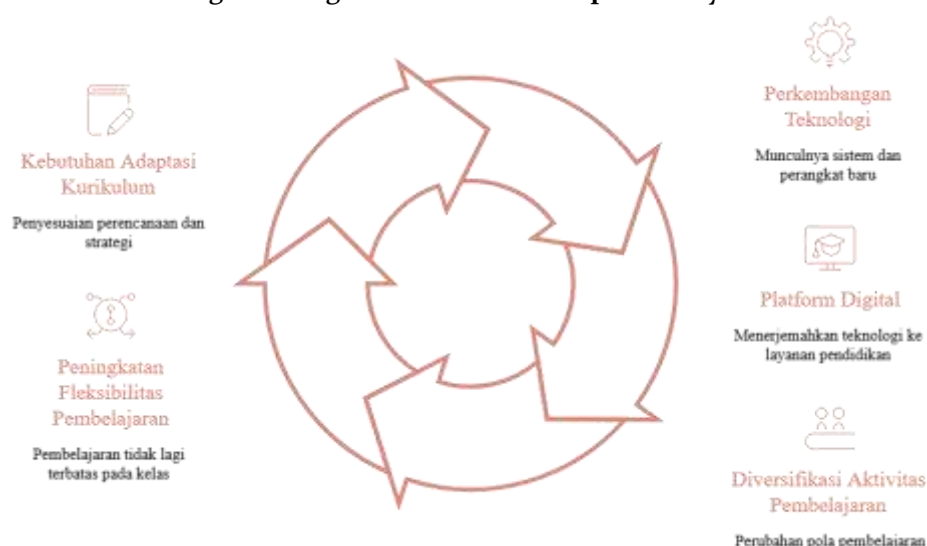
context of education, digital technology does not only include hardware, but also systems, applications, and platforms that support learning. Its development shows a shift from the use of conventional media to the use of digital systems that allow the learning process to take place more flexibly, connected, and documented.

The development of digital technology in education is shown through the emergence of various platforms with diverse functions and characteristics. Ambarwati et al. (2022) identified platforms such as Quipper Video, Ruang Guru, Zenius, Kelase, Quintal, and HarukaEdu that provide services in the form of learning videos, discussions, practice questions, independent learning, and online learning management. This diversity shows that the development of educational technology does not take place in one form, but develops according to the needs of users. The researcher interprets that platform diversification provides an alternative for schools and students in choosing technology that suits learning goals. Thus, the development of digital technology can be understood as an expansion of learning facilities that provide various forms of services to support the educational process.

These technological developments also change the character of learning from a pattern that depends on space and time to a more flexible learning. Marpaung et al. (2023) show the character of digital technology that allows information to be processed through computer systems, while Ambarwati et al. (2022) show its use in online learning, discussions, practice questions, independent learning, and learning management. This shows that technology no longer only functions as a tool for delivering material, but has supported various activities in the learning ecosystem. These changes have an impact on curriculum management because schools need to consider the use of technology in learning planning, learning resource selection, learning strategies, implementation, and evaluation. Thus, the wider the function of technology, the greater the need to adapt curriculum management to the digital environment.

The synthesis of the study shows that there is a relationship between technological development, the emergence of digital platforms, diversification of learning activities, increased learning flexibility, and the need for curriculum management adaptation. Hidayat et al. (2020) provide a basis for technology as a means to achieve practical goals, Marpaung et al. (2023) explain the character of digital systems, while Ambarwati et al. (2022) show its application through various educational platforms. These three sources show that digital technology has developed from just an auxiliary device to a part of the learning system. However, the diversity of technology does not automatically result in curriculum transformation. Transformation occurs when schools are able to choose, integrate, and manage technology in accordance with curriculum goals, student needs, and learning conditions. Therefore, the ability to navigate digital transformation in curriculum management does not lie in the number of technologies used, but in the accuracy of its use in supporting the educational process.

Figure 1. Digital Curriculum Adaptation Cycle



Curriculum Management Adaptation Strategy to Digital Transformation

The curriculum management adaptation strategy to digital transformation is a series of efforts to adjust the planning, implementation, and development of the curriculum to technological developments and the needs of students. Rahmawati & Sulasmi (2025) explained that digital-based curriculum design is an important element in responding to the times and student needs. In basic education, this adaptation can be realized through the use of digital classrooms, the use of various learning media, the integration of digital content, and the selection of technology that suits the characteristics of students. Thus, the digital curriculum is not only oriented towards the use of technological devices, but also on adjusting learning strategies so that technology can support the achievement of educational goals.

Faiqoh et al., (2025) show that the implementation of digital classrooms can be done through the selection of tools such as Google Classroom, Edmodo, and Moodle, the use of various learning media, student involvement in the creation of learning blogs, and the use of digital content and e-books. Nurhayati et al. (2024) also show that the use of the internet, websites, electronic books, blogs, and electronic dictionaries can support the learning process. The findings show that technology adaptation in the curriculum does not depend on one platform, but can be done through a combination of various media and digital resources according to learning needs. The researcher interprets that the diversity of media provides space for teachers and schools to adapt technology to the characteristics of the material, learning objectives, and abilities of students.

The adaptation of the digital curriculum is also related to the readiness of educators and the characteristics of students. Adawiyah (2022) explained that technological developments provide convenience in various educational activities, while Resti et al., (2024) emphasized the importance of understanding the characteristics of students, the ability to use technology appropriately, and the use of digital devices that have been used by students as a means of communication and learning. This shows that the use of technology is not enough to be viewed from the perspective of device availability, but needs to be supported by the digital

competence of teachers and students. The researcher interprets that curriculum adaptation requires an integration between technological readiness, user competence, and student characteristics so that digitalization truly supports the learning process.

Based on various sources, curriculum management adaptation strategies can be understood through the flow of technological development and student characteristics, technology and media selection, integration of digital content, increased engagement and learning flexibility through curriculum management adjustments. This flow shows that education managers are not enough to provide digital tools or platforms, but need to ensure their suitability with curriculum goals, student needs, teacher competence, and the condition of facilities and infrastructure. Thus, curriculum adaptation is a multidimensional process that connects technological, pedagogical, learning resources, and student characteristics in learning management.

The synthesis of the study shows three main trends in the adaptation of curriculum management to digital transformation, namely diversification of learning media, strengthening digital literacy and competence, and adjusting learning to the characteristics of students. Rahmawati & Sulasmi (2025) emphasizes digital curriculum design, Faiqoh et al., (2025) focuses on digital classroom strategies, Nurhayati et al. (2024) on the use of various digital resources, and Adawiyah (2022) on the ease of technology for the educational process. Although they have different pressure points, all sources show the need to integrate technology in a relevant way into learning. Therefore, curriculum digitalization does not simply mean moving learning to digital media, but changing the way technology is used to align with educational goals, student needs, teacher competence, and curriculum management.

Discussion

The results of the study show that the management of the basic education curriculum in the era of digital transformation is oriented to educational goals and the needs of students. These findings are in line with Hikmawati et al. (2023) and Perdana (2023) who place the curriculum as an instrument for the development of students' academic abilities, character, and skills. The findings are also in line with the perspectives of Piaget, Vygotsky, Skinner, Dewey, Bruner, Maslow, and Gardner who emphasize the importance of paying attention to cognitive development, social interaction, behavior, experience, needs, and the diversity of students' abilities (Santrock, 2020; Sihalohe & Sihombing, 2023; Andriani et al., 2022; Mahrus & Itqon, 2020). These similarities show that curriculum management cannot be applied uniformly, while this study expands on previous findings by linking orientation in students with the need to adapt to digital transformation. Theoretically, these results strengthen the concept of curriculum management as a student-centered and adaptive process, while practically schools need to make student characteristics the basis for determining content, strategies, media, and learning evaluation.

The research also found that digital technology has evolved from just a tool to being part of the learning ecosystem. These findings are in accordance with Hidayat et al. (2020) and Marpaung et al. (2023) regarding the function and

character of digital systems, as well as Ambarwati et al. (2022) who show the diversity of educational platforms for learning videos, discussions, exercises, independent learning, and online learning management. The adaptation strategies found include media diversification, digital content integration, strengthening digital competencies, and adjusting learning to the characteristics of learners, which is in line with Muzaki (2021), Nurhayati et al. (2024) and Adawiyah (2022). The difference is that this study does not only look at technology from the existence of devices or platforms, but connects it to the process of planning, implementing, and developing the curriculum. Theoretically, this shows that the adaptation of the digital curriculum is multidimensional because it involves technology, pedagogy, educators, students, and infrastructure; practically, schools need to choose technology based on its suitability with the curriculum goals and the needs of students, not just following technological developments.

Overall, the results of the study show that digital transformation does not automatically result in curriculum transformation. Meaningful change occurs when technology is appropriately integrated into learning objectives, content, strategies, implementation, and evaluation. The research synthesis produced a relationship between orientation in students and the selection of integrated technology in learning adaptation of curriculum management. These findings strengthen the previous literature while emphasizing that technology should be positioned as a supporting instrument for achieving educational goals. The theoretical implication is to strengthen the understanding of curriculum management as a dynamic, student-centered, and responsive system to changes in the educational environment. The practical implication is that schools need to map the needs of students, teacher readiness and infrastructure, choose relevant platforms, improve educators' digital competence, and evaluate the use of technology periodically so that digital transformation truly supports the achievement of curriculum goals.

CONCLUSION

The results of the study show that digital transformation in basic education is not only related to the use of technology, but requires curriculum management that is adaptive to technological changes, student characteristics, teacher competence, and the readiness of facilities and infrastructure. The main lesson of this study is that technology should not be placed as a goal, but as a means that is chosen and integrated according to educational goals and the needs of students. The strength of this study lies in the synthesis of three interrelated aspects, namely digital transformation trends, curriculum management challenges, and adaptation strategies, so as to provide an understanding that technological changes can affect the planning, implementation, and development of the curriculum as a whole. This study has limitations because it uses literature research so that it has not directly described the practice of curriculum management adaptation in various basic education units with different conditions of facilities, teacher competence, and characteristics of students. Therefore, further research can develop empirical studies through case studies, field research, or mixed approaches to test the application of curriculum adaptation strategies in a real context. Future research can also be directed at school digital readiness, teachers' digital competence, the

integration of artificial intelligence in the curriculum, and the relationship between digital curriculum adaptation and student learning processes and outcomes.

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CONFLICTS OF INTEREST

The author declares no conflict of interest related to this study.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

During the preparation of this manuscript, AI-assisted technology was used to support language refinement, structural organization, and academic writing improvement. All generated content was carefully reviewed, revised, and validated by the author. The author takes full responsibility for the scientific accuracy, originality, and integrity of the final manuscript.

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