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Transforming Digital Curriculum Management through the Integration of Interactive Digital Boards in Advanced Classes

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Abstract

This research aims to analyze the transformation of digital curriculum management through the integration of Interactive Digital Boards in advanced classes. The research focus is directed toward changes in the curriculum planning process, the efficiency of managing learning documents, the improvement of teachers' digital competence, and its implications for teaching practices. which includes data reduction, data presentation, and continuous conclusion drawing. This study involved three key informants, consisting of a vice principal for curriculum, a curriculum coordinator, and advanced class teachers. Data were collected through semi-structured interviews, classroom observations, and document analysis. The analyzed documents included lesson plans, syllabi, curriculum guidelines, and school policy documents related to digital learning implementation. Data analysis was conducted using the interactive model of Miles and Huberman, which involves data reduction, data display, and conclusion drawing. The research findings indicate that the integration of promotes a shift in curriculum management from a static administrative system toward a more flexible, adaptive, and collaborative system. The use of has been proven to improve the efficiency of curriculum document management, save up to 40% of lesson preparation time, and strengthen teachers' digital competence and confidence. This research provides a theoretical contribution to the development of digital curriculum management studies and a practical contribution as a reference for schools in optimizing interactive technology as part of a sustainable curriculum management system.

INTRODUCTION

Digital transformation in education has evolved into a crucial issue that can no longer be understood solely as a matter of adopting learning technologies, but rather as a structural change affecting curriculum governance, pedagogical practices, and the relationship between teachers, students, and knowled. This

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phenomenon is multidimensional (Shard et al., 2024). Quantitatively, the digital transformation of education is marked by a growing investment by educational institutions in digital devices, learning platforms, and technological infrastructure. Qualitatively, this shift is demonstrated by changes in the ways that students interact with their teachers, a shift in the role of the teacher from one of merely imparting knowledge to one of facilitating learning, and increasing demands for the development of 21st-century skills like digital literacy, critical thinking, and teamwork.

International literature in the last five years confirms that the success of digital transformation is not determined solely by the level of technology adoption, but rather by the extent to which education systems are able to reconstruct curriculum management to align with the characteristics of digital learning and its accompanying social dynamics (Ghobakhloo & Iranmanesh, 2021; Tan et al., 2021).The curriculum is now viewed as a dynamic system that needs to be flexible, reflexive, and focused on meaningful learning rather than as a static, normative document (Chergui et al., 2025; Fielding et al., 2024).

However, various empirical findings indicate that in many educational institutions, digitalization is still technocentric and symbolic, where technology is presented as a representation of modernization without being accompanied by fundamental changes in curriculum planning, implementation, and evaluation (Khan et al., 2023; Machado & Davim, 2023). The divergence between the aspirational objectives of digital transformation and the practical implementation renders the study of digital curriculum management significant, pertinent, and pressing in an academic context.

This phenomenon is a significant physical manifestation observed in the implementation of Interactive Digital Boards ,particularly in more advanced educational institutions. An exemplary classroom is conceived as an educational environment that requires the deployment of innovative, flexible learning activities aimed at maximizing student development. In the field of educational policy and practice, advanced classes are frequently regarded as a benchmark or exemplary standard for other courses offered by the same institution (Franklin-Rahkonen, 2017; Katz et al., 2021). The use of technology in advanced classrooms has significant implications, influencing both the quality of education received by students and the overall direction of the school's curriculum growth.

Interactive digital boards are advocated as a technology that facilitates the representation of abstract concepts, collaborative learning, and the concurrent integration of diverse digital learning resources.Multiple studies indicate that the regular incorporation of interactive whiteboards into lesson design and curriculum can improve classroom engagement and augment the adaptability of learning processes (Luo et al., 2023; Reguera & Lopez, 2021). However, empirical evidence indicates that the use of interactive whiteboards in many advanced classrooms is still limited to one-way presentational functions, where technology merely replaces the conventional blackboard without changing the structure of learning interactions.

This illustrates that the teaching potential of interactive technology is overlooked, requiring comprehensive investigation into its structural and administrative implementation within a digital curriculum.Various previous studies have made significant contributions to explaining the relationship between digital technology and learning.Studies on smart classrooms and digital learning environments show that interactive technology can enhance student motivatfocusement, and learning outcomes, especially when used to support active and collaborative learning (Lu et al., 2022; Mhlongo et al., 2023).

Additional research identifies several obstacles to the adoption of educational technology, including teacher resistance to change, disparities in digital literacy, time limitations, and insufficient ongoing institutional policy support (Granić, 2022; Timotheou et al., 2023). Although these studies enrich our understanding of the pedagogical and technical dimensions of technology use, the main focus of research remains at the micro level of learning and user perception. Relatively little research explicitly examines how learning technologies are integrated into curriculum management systems as the structural foundation for technology implementation (Grainger et al., 2021; Landa et al., 2023).

Therefore, there is a lack of comprehensive explanation in the current literature regarding the reasons behind the ineffectiveness of technological solutions in elite classrooms, where innovation is expected and management complexity is high (Akram et al., 2022; Haefner et al., 2021). Because of these issues, additional research is required, and studies of educational technology should be more comprehensive. This study stands out as it examines the potential of Interactive Digital Boards to transform digital curriculum management through a qualitative approach. Unlike previous research that positioned technology as an instructional or pedagogical variable, this study positions technology as a structural element within the curriculum management system.

Curriculum management in this study is understood as an ongoing process that includes planning a digital curriculum based on the real needs of the school, organizing interactive learning strategies, and conducting systematic and reflective learning evaluations (Abbasnejad et al., 2024; Mhlongo et al., 2023). With this perspective, this research aims to address the shortcomings of previous studies by providing an in-depth analysis of the managerial dynamics, learning leadership, and school culture that influence the optimization of interactive technology (Tan & Sidhu, 2022). The specific objective of this research is to deeply analyze how the transformation of digital curriculum management is carried out through the integration of interactive digital boards in advanced classes.

The research focus is directed toward three main aspects: the process of digital curriculum planning, strategies for implementing interactive learning based on IDB, and the learning evaluation mechanisms employed by schools and teachers.This objective is substantially different from most previous research, which tended to assess the effectiveness of technology based on learning achievement, user satisfaction levels, or the intensity of device usage. This research aims to supplement existing literature by explaining the managerial processes underlying the success or failure of technology integration, thus providing a more holistic understanding of how learning technologies can be optimized within a sustainable and contextual digital curriculum framework.

The main argument to be tested in this study is that the effectiveness of integrating interactive digital boards in learning is not determined solely by the sophistication of the technology but rather by the quality of the digital curriculum management that governs it. This research is based on the assumption that without a transformation of the managerial paradigm which includes directed digital curriculum planning, the organization of interactive learning strategies, and systematic learning evaluation interactive technology risks being reduced to a mere visual medium that reproduces conventional learning practices in a digital format (Dredge, 2022).

Therefore, this study qualitatively attempts to prove that curriculum

management transformation is a key prerequisite for the integration of interactive digital boards to produce interactive, meaningful, and sustainable learning in advanced classes.Thus, this research is expected to empirically explain the relationship between digital curriculum management practices and the optimization of interactive learning technology utilization.

METHODS

This research employs a qualitative approach with a case study design to deeply understand the transformation of digital curriculum management through the integration of Interactive Digital Boards in advanced classes. A qualitative approach was chosen because this study focuses on exploring the managerial processes, meanings, and practices that occur in the context of real-world learning, rather than on the quantitative measurement of technology effectiveness. Case studies are used to comprehensively examine contemporary phenomena within specific institutional contexts, allowing for in-depth analysis of the interconnections between policy, curriculum practices, and the use of learning technologies (Creswell & Poth, 2018).

This study was conducted in one of the Islamic junior secondary schools in Indonesia that has integrated interactive digital boards into advanced class instruction. The research site was selected purposively based on the availability of digital learning infrastructure, institutional policy support for curriculum digitalization, and the sustainability of interactive digital board use in the learning process. The research process involved preparation, field data collection, simultaneous data analysis, and verification of findings conducted concurrently.

The research subjects included the vice principal for curriculum, the curriculum coordinator, and advanced class teachers who actively used interactive digital boards. The informants were selected using purposive sampling techniques to obtain data from individuals with experience and strategic roles in the management and implementation of digital curricula. This approach enabled the researchers to gain a deep and contextual understanding of digital curriculum management transformation practices (Miles et al., 2020).

data collection was carried out through semi-structured interviews, classroom observations of the gifted program, and examination of relevant documents. Interviews were used to explore the views and experiences of informants regarding digital curriculum management strategies. Observations were conducted to examine actual teaching practices and the interactions between teachers, students, and IDB technology. Document studies included an examination of curriculum materials, lesson planning documents, and relevant madrasah policies to strengthen and confirm the data from interviews and observations.

Data analysis was conducted simultaneously and continuously using an interactive analysis model that included data reduction, data presentation, and conclusion drawing (Busral et al., 2025; Engkizar et al., 2018; 2024; 2025; Kasheem et al., 2025; Kassymova et al., 2025; Seminikhyna & Lutsenko, 2024). Data integrity protocols include checking three different data sources, making sure that study subjects are real, and setting up an audit trail to make sure that the study method is clear and can be tracked. The study results from this method should be reliable and easy to understand so that IDB-based digital education management can be made better in high-tech classrooms.

RESULT AND DISCUSSION

Digital curriculum management emphasizes the alignment between curriculum planning, instructional implementation, and evaluation processes within a digitally supported learning environment. Previous studies argue that effective digital curriculum management requires teachers to possess not only technological skills but also the ability to integrate technology into pedagogical decision-making and curriculum design (Althubyani, 2024; Tzafilkou et al., 2023). Expert perspectives highlight that interactive learning technologies, such as Interactive Digital Boards (IDBs), can function as managerial tools that support flexible curriculum planning, collaborative documentation, and adaptive instructional strategies when embedded within a coherent curriculum management framework (Grainger et al., 2021; Timotheou et al., 2023). Building on these theoretical and empirical foundations, the following section presents the research findings related to the transformation of digital curriculum management through the integration of IDBs in advanced classes.

Improving Teachers' Digital Competencies in Curriculum Planning

The findings of this study, derived primarily from semi-structured interviews with advanced class teachers and supported by classroom observation data, indicate that the integration of Interactive Digital Boards (IDBs) significantly enhances teachers' digital competence in curriculum planning. Educators are no longer focused solely on delivering instructional content; instead, they increasingly integrate digital elements such as multimedia resources, real-time annotations, and interactive assessments into lesson design. Curriculum planning, which was previously linear and administrative in nature, has become more flexible and dynamic. Classroom observations further reveal that teachers demonstrate greater creativity in selecting and utilizing learning media, resulting in more varied and interactive instructional practices.

The interview results support these findings. A teacher from an advanced class stated: "*Before using the Interactive Digital Board, lesson planning strictly followed the lesson plan administratively. After its implementation, teachers can adjust learning strategies in real time by adding visualizations and interactive quizzes according to students' needs* (informant 1)."

Similar views were also expressed by the Vice Principal for Curriculum, who stated that: "*The incorporation of Interactive Digital Boards has resulted in more flexible curriculum management adjustments, including greater teacher innovation and increased student participation in learning* (informant 2)"

In line with these statements, the curriculum coordinator explained that: "*The implementation of the Interactive Digital Board allows teachers to achieve greater autonomy and responsiveness in lesson plan development by employing multimedia and interactive content* (informant 3)"

Based on the results of interviews and classroom observations, it can be concluded that educators experienced significant changes in planning and managing learning after the implementation of Interactive Digital Boards. Teachers more frequently employed digital media, adapted instructional methods flexibly, and demonstrated innovation in material preparation. At the curriculum management level, planning practices became more flexible, accompanied by increased teacher engagement in integrating digital technologies into lesson design.

Efficiency of Curriculum Management and Learning Document Preparation

The research results indicate that the use of Interactive Digital Boards (IDBs) is associated with increased efficiency in curriculum management and the preparation of learning documents. The teacher prepares integrated digital

Lesson Plans, syllabuses, and teaching materials. The process of document creation and updating is done directly thru digital devices, making it easier to access and distribute learning materials to relevant parties.

The results of observations on the process of managing learning documents show that teachers no longer use paper-based documents in lesson planning. All learning documents can be accessed through various devices and stored in a centralized digital storage system. Also, interviews with teachers show that lesson preparation takes up to 40% less time than traditional methods. IDB integration also allows teachers to digitally archive learning materials, making curriculum documents more structured and easier to retrieve.

A summary of the results of using the Interactive Digital Board to support the efficiency of curriculum management and learning document management is presented in table 1.

Table 1. Efficiency of Curriculum Management and Learning Documents through the Use of Interactive Digital Boards

Aspect	Standard	Target	Results / Visualization of IDB Use
Curriculum Planning	Lesson plans (RPP), syllabus, and teaching materials are well-organized and aligned with the curriculum	Teachers prepare and update documents digitally	Teachers design lesson plans and teaching materials directly on the IDB; documents are edited, stored, and shared digitally
Time Efficiency	Lesson preparation is conducted optimally	Reduction in preparation time compared to conventional methods	Teachers report up to 40% time savings; classroom observations indicate a faster and more structured preparation process
Teacher Collaboration	Teachers collaborate in preparing instructional documents	Documents can be accessed and revised collaboratively	Documents can be accessed, edited, and commented on by other teachers through the IDB
Integration of Learning Media	Teaching materials are supported by instructional media	Materials are enriched with visual and interactive media	Teachers add animations, videos, and interactive quizzes into the IDB
Archiving and Documentation	Curriculum data are properly stored	Documents are easily accessible and traceable	Learning materials are automatically stored within the IDB digital system

Teachers' digital skills in managing the curriculum get better using the Interactive Digital Board

The study's results indicate that the utilization of interactive digital boards enhances instructors' digital proficiency in managing digital curricula in

advanced classrooms. Teachers' ability to conceive, carry out, and evaluate technology-based curricula has also improved. This happened because IDB requires teachers to understand a wide range of digital learning apps, interactive media, and new ways of teaching that are part of the curriculum. Empirical evidence was obtained from interviews with teachers who stated that they became more accustomed to using technology in learning and were motivated to attend professional development training. Additionally, the analysis of learning planning documents indicates an improvement in the quality of digital teaching materials prepared by teachers. Classroom observations revealed that educators exhibited increased confidence in utilizing technology to facilitate the attainment of curriculum objectives. The findings suggest that the implementation of interactive digital boards has an effect on students and makes a contribution to the professional development of teachers in terms of meeting the demands of digital curriculum management during the process of educational reform.

Figure 1 depicts the improvement in teachers' digital skills in curriculum management that occurred as a direct result of the implementation of interactive digital boards.

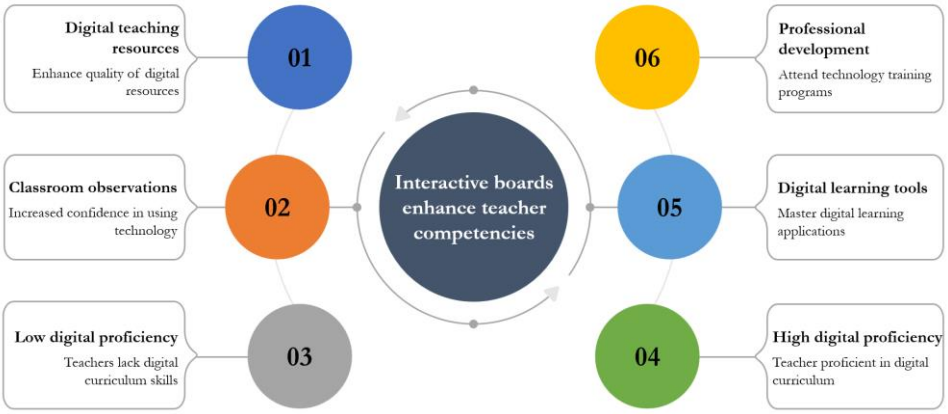

Fig 1. Model for Improving Teachers' Digital Competencies in Curriculum Management through the Integration of Interactive Digital Boards

This discussion synthesizes the empirical findings of the study with established theories, expert perspectives, and previous research on digital curriculum management, teacher digital competence, and pedagogical innovation. The findings indicate that the integration of Interactive Digital Boards (IDBs) contributes to a significant transformation in curriculum management practices, shifting them from rigid, administrative procedures toward more flexible, adaptive, and technology-supported processes. This transformation aligns with contemporary curriculum management theories, which emphasize that effective curriculum implementation in the digital era requires responsiveness to learner needs, contextual flexibility, and the meaningful integration of digital technologies (Almusawi & Durugbo, 2024; Mourtzis et al., 2022). Curriculum management is conceptualized not merely as an administrative function but as a dynamic process encompassing curriculum planning, implementation, and evaluation within an evolving learning environment. In the traditional paradigm, curriculum management is often perceived as an administrative activity that is linear, rigidly structured, and heavily reliant on paper-based written documents. Nonetheless, due to advancements in digital technology and the demands of 21st-century education, this approach is regarded as inadequate for addressing the evolving, contextual, and learner-centered requirements of students.

Research findings indicate that the implementation of interactive digital boards facilitates significant improvements in instructors' information management within advanced classroom settings. Educators are no longer confined to a rigid curriculum; instead, they utilize a flexible framework that can be adjusted dynamically to meet the unique needs of each student (Niemi, 2021). This conclusion aligns with contemporary curriculum theory, which posits that the curriculum must be dynamic, adaptive, and responsive to student development and shifts in the learning environment. In this context, the IDB is a tool for planning lessons and for ongoing improvement and change in teaching.

The enhancement of teachers' digital competence identified in this study can be elucidated within the theoretical framework of professional teacher competence (Althubyani, 2024). Digital competence constitutes a fundamental element of teachers' pedagogical and professional expertise within the context of digital transformation (Tzafilkou et al., 2023). The Technological Pedagogical Content Knowledge (TPACK) framework asserts that the effectiveness of technology-enhanced instruction relies significantly on the teacher's ability to simultaneously integrate content expertise, pedagogical methods, and technological skills (Tseng et al., 2022; Zhang et al., 2025). Research findings suggest that the implementation of IDB necessitates that instructors proficiently utilize diverse digital applications, interactive media, and innovative pedagogical approaches in alignment with curriculum objectives. This suggests that enhancing teachers' digital competence occurs gradually through adaptation, acclimatization, and ongoing professional development.

Interview data revealing that teachers became more confident and motivated to participate in professional development training strengthens the theory of continuous professional development. A work environment that actively facilitates the use of technology tends to encourage teachers to continue learning and improve their self-capacity. In this context, the IDB serves not only as a learning aid but also as a stimulus for teachers to broaden their horizons, improve digital literacy, and develop more innovative pedagogical practices. According to self-efficacy theory, teachers who are more competent in using technology will also be more confident in their own abilities.

The effectiveness of managing learning papers is another aspect that reflects the transition that has taken place in the management of the curriculum. According to the findings of the research, educators are able to develop digital lesson plans, syllabi, and other instructional resources that are easily reversible and integrated. This aligns with educational management theory, which underscores the importance of efficiency and effectiveness in the administration of educational resources, including time and academic materials (Oguguo et al., 2021; Okonkwo, 2024). The digitization of instructional documents via IDB significantly reduces teachers' workload, evidenced by a thirty to forty percent decrease in lesson preparation time. Time traditionally designated for administrative tasks can be repurposed for more innovative and reflective lesson planning. Time previously allocated to administrative activities can be redirected towards the creation of more innovative and reflective lectures.

The discovery of increased teacher collaboration has significant theoretical implications, in addition to the time savings it delivers. It is commonly known that educator collaboration is critical in the context of professional learning communities, with the goal of improving learning quality and curricular oversight. The cloud storage and real-time document editing tools included into IDB allow educators to work more efficiently and transparently while designing and changing educational resources. Based on this, it appears

that implementing digital technology in educational settings has the potential to develop a collaborative culture in which curriculum administration is shared rather than individual.

From a teaching point of view, using IDB makes students more involved and helps them understand what they are learning. The constructivist learning theory says that students learn best when they are involved in their own education and can build their own knowledge through practice (Marougkas et al., 2023). When you use multimedia, digital quizzes, and idea visualization through IDB, it makes the learning environment more interactive and relevant. The claim that engaging technology can help learner-centered education is supported by research results that show more involved students. The change in how IDB manages the curriculum has an effect on both teachers who manage the curriculum and the level of learning experiences for students. When IDB is used in the classroom, it leads to more active involvement and better understanding of the material by the students. The idea behind constructivist learning is that students learn best when they are involved in the process and can build their knowledge through practice (Alkhudiry, 2022; Marougkas et al., 2023). More interactive and relevant learning is made possible by multimedia, digital quizzes, and idea visualization through IDB. The idea that engaging technology can help learner-centered learning is backed up by research that shows more engaged students. In this way, the change in curriculum management brought about by IDB affects both teachers as curriculum administrators and the level of learning experiences for students.

Researchers found that traditional educators faced increased challenges in adopting modern teaching techniques. The innovation adoption theory asserts that humans are more likely to accept new technologies when adequately trained, informed, and supported by their institutions (Nobil et al., 2020). The supervision of the digital transformation curriculum necessitates comprehensive guidance. This plan must incorporate measures for professional development, academic oversight, and administrative policy direction to ensure efficacy. Adopting this method is crucial due to the challenges related to adaptation. Robust support is crucial for technologies like IDB to reach their full potential and actualize their capabilities.

Overall, this data discussion confirms that the integration of the Interactive Digital Board is a strategic instrument in the transformation of digital curriculum management in advanced classes. The empirical findings of the study support theories that emphasize the importance of teachers' digital competence, curriculum flexibility, the efficiency of educational management, and student-centered learning. The IDB not only functions as a learning tool but also as a curriculum management support system, allowing for more adaptive and long-term planning, implementation, and evaluation. The efficacy of digital curriculum transformation is significantly reliant on teachers' ability to employ technology both pedagogically and administratively, alongside the support of educational institutions in fostering a conducive digital ecosystem (Borin et al., 2022).

CONCLUSION

This study addresses the research question of how the integration of Interactive Digital Boards (IDBs) contributes to the transformation of digital curriculum management in advanced classes. The findings demonstrate that IDBs play a strategic role in shifting curriculum management from a static and administrative approach toward a more flexible, adaptive, and collaborative system that supports curriculum planning, document management, and

instructional evaluation. The novelty of this study lies in conceptualizing IDBs not merely as instructional media, but as an integral component of digital curriculum management that strengthens teachers' digital competence and institutional curriculum governance. In terms of implications, this study suggests that effective digital curriculum transformation requires alignment between technological integration, continuous teacher competence development, and school-level managerial support to ensure sustainable and meaningful educational innovation.

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