

## Integration of Digital Literacy in Curriculum Management to Optimize Learning Quality in Elementary Schools

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**Abstract:** Adaptive and innovative curriculum management plays a central role in optimizing learning quality in the digital era. This study aims to describe the implementation of digital literacy integration within curriculum management in Elementary Schools, as well as to identify its challenges. Using a descriptive qualitative approach, this case study was conducted at SD Muhammadiyah Condongcatur. Informants were selected through purposive sampling, consisting of the vice head of curriculum, digital literacy coordinator, and class teachers. Data was collected through in-depth interviews, participatory observation, and document analysis, then thematically analyzed. The research findings show that digital literacy integration is implemented comprehensively across every aspect of curriculum management: planning, organizing, implementation, and evaluation. This proactive implementation positively correlates with an increase in learning quality, characterized by students who are more literate in information, media, and technology, as well as more interactive learning. Nevertheless, the main challenges found are the need for continuous technology adaptation for teachers and infrastructure constraints. This study concludes that an adaptive curriculum management strategy for digital literacy is proven to be effective, but requires holistic support from human resources and facilities.

**Keywords:** integration; digital literacy; curriculum management; learning quality

In the era of the 4.0 industrial revolution, marked by digital disruption, the concept of an excellent school no longer focuses solely on academic achievement. Educational institutions are now required to be adaptive and able to prepare students to face global challenges, where digital literacy is the foundation of 21st-century skills (4Cs) that are crucial for deep learning (Hasibuan et al., 2024; Kailani et al., 2021; Suyatno, 2023). The introduction of planned and comprehensive digital literacy at the elementary school level is a long-term strategic investment, which includes not only the use of technology, but also ethics, cyber security, and the ability to select information (Markwick & Reiss, 2024; Nababan, 2022). Therefore, the ability of schools to integrate digital literacy holistically, covering pedagogical, technological, and ethical aspects, is directly correlated with the quality of learning outcomes (Asri Ismail et al., 2023; Devi & Winangun, 2024).

Although the urgency of this issue is widely understood, the reality on the ground shows that many

elementary schools still face substantial challenges in implementation. These obstacles often include gaps in teacher competence in the use of technology, limited structured curriculum management models, and pedagogical transition constraints that have not fully adopted the potential of technology for innovative and personalized learning (Dano Ali, 2023; Wiguna, 2023; Setyowati et al., 2023). Failure to manage this transition results in suboptimal use of technology, which in turn hinders schools' ability to produce adaptive and innovative graduates. This condition underscores the need to strengthen curriculum management as a key element in driving transformation towards excellence in schools in the digital era.

Curriculum management is a systematic and efficient management process to ensure that teaching objectives are achieved properly (Fauzi & Afriansyah, 2019; Ramadhan & Suklani, 2024). This management is the main substance in schools, which encourages teachers to develop and refine learning strategies on an ongoing basis. The stages include planning, organizing, implementing, and evaluating (Bahri et al., 2024). In the context of integrating digital literacy into curriculum management, effective curriculum planning and implementation are required, involving analysis of student needs, alignment with labor market demands, and integration of innovative learning methods such as project-based learning and technology (Angana et al., 2025; Wirtati et al., 2025).

The integration of digital literacy into curriculum management is not just a matter of replacing or updating lesson materials, but also includes how to organize the curriculum, design creative learning activities, and adapt programs to meet the diverse needs of students (Andini et al., 2020; Ibrahim & Bilqhis, 2024). This approach enables schools to prepare students with 21st-century skills and not just focus on academic achievement (Suyatno, 2023). The success of this integration is highly dependent on supporting elements such as the dedication of the principal, foundation support, collaboration with parents, and the availability of adequate technological resources (Kailani et al., 2021).

A number of relevant studies have highlighted the importance and effectiveness of digital literacy integration. Studies by Maula and Hadi (2024) and Jordan et al. (2025) show that innovation strategies involving e-learning and teacher training can improve the quality of learning and student engagement. Similarly, Mawardi et al. (2024) indicate that the integration of digital literacy effectively increases motivation and collaboration. However, although these studies provide valuable insights, there is still a significant gap in the literature. The lack of in-depth exploration of specific curriculum management practices, especially at the elementary school level, and how these managerial aspects holistically orchestrate the implementation of digital literacy, remains a void that needs to be filled.

Research on the integration of digital literacy in curriculum management to optimize learning quality is highly urgent and aims to fill this gap. This study presents an in-depth case study of implementation at SD Muhammadiyah Condongcatur, a model school. The purpose of this study is to reveal managerial strategies that enable effective integration from the planning to evaluation stages, as well as the challenges involved. The novelty of this research lies in its in-depth examination of innovative practices that not only emphasize technical aspects but also integrate visionary leadership, multi-stakeholder collaboration, and dynamic adaptation. The results are expected to provide rich empirical insights and serve as a reference

model for similar educational institutions seeking to harmonize digital modernity with fundamental educational values.

## **METHOD**

This study adopts a descriptive qualitative approach to explore a deep understanding of the implementation and impact of digital literacy integration in curriculum management, as well as the optimization of learning quality in elementary schools (Rukajat, 2020). The descriptive qualitative approach allows for the exploration of phenomena in their natural context, focusing on the perspectives of participants and developing rich narratives about the processes observed (Creswell & Poth, 2018). This design was chosen for its ability to reveal the complexity, meaning, and real experiences of stakeholders in the context of education. The research was conducted at SD Muhammadiyah Condongcatur, which has shown progressive initiatives in integrating digital literacy, with the aim of identifying best practices and relevant challenges in curriculum management to achieve learning excellence.

Research informants were selected using purposive sampling (Andrade, 2021), ensuring that the data obtained came from individuals with in-depth understanding and relevant experience related to the integration of digital literacy in curriculum management. The criteria for selecting informants included school principals, vice principals in charge of curriculum, digital literacy coordinators, and classroom teachers who actively implemented digital literacy in learning. The number of informants was determined flexibly until data saturation was achieved, which is the point at which no significant new information emerged, ensuring the depth and completeness of the data for the research focus analysis.

Data sources are subjects from which data can be obtained (Arikunto, 2019). Data were collected through in-depth interviews with the deputy head of the curriculum department, multimedia teachers, and teachers. These structured but flexible interviews aimed to explore perceptions, experiences, challenges, and strategies related to the integration of digital literacy in curriculum management and its impact on the quality of learning. Participatory observation was conducted in classrooms that implemented digital literacy and school activities related to this observation, focusing on student and teacher interactions with digital technology, the use of digital resources, and digital literacy-based projects. Document Analysis: Relevant documents analyzed included school curricula, lesson plans (RPP) that integrated digital literacy, school policies related to technology, and visual documentation (photos and videos) of digital-based learning activities.

Creating a quality learning environment in elementary schools requires an innovative approach to curriculum management, particularly through the integration of digital literacy. Curriculum management, which includes the planning, implementation, and evaluation cycles, must be directed toward maximizing the relevance and positive impact of digital literacy on the quality of learning. Curriculum management theory serves as the framework for this study, with data collected through observation, interviews, and documentation.

The collected data was then analyzed. The data was analyzed using thematic analysis (Majumdar,

2019), a systematic qualitative approach to identifying patterns or themes. The process consisted of six phases. First, familiarization with the data through transcription and the use of Atlas.ti for in-depth understanding. Second, initial coding by labeling each important segment of the data. Third, searching for themes by grouping codes into sub-themes and potential themes. Fourth, reviewing themes to ensure suitability and consistency with all data. Fifth, defining and naming themes to compile final themes that answer the research questions. Finally, compiling a report by presenting each theme narratively, supported by direct quotations from the data to reinforce the findings.

Data analysis process: The collected data were analyzed using thematic analysis techniques (Majumdar, 2019). This analysis process was interactive and systematic, comprising the following stages:

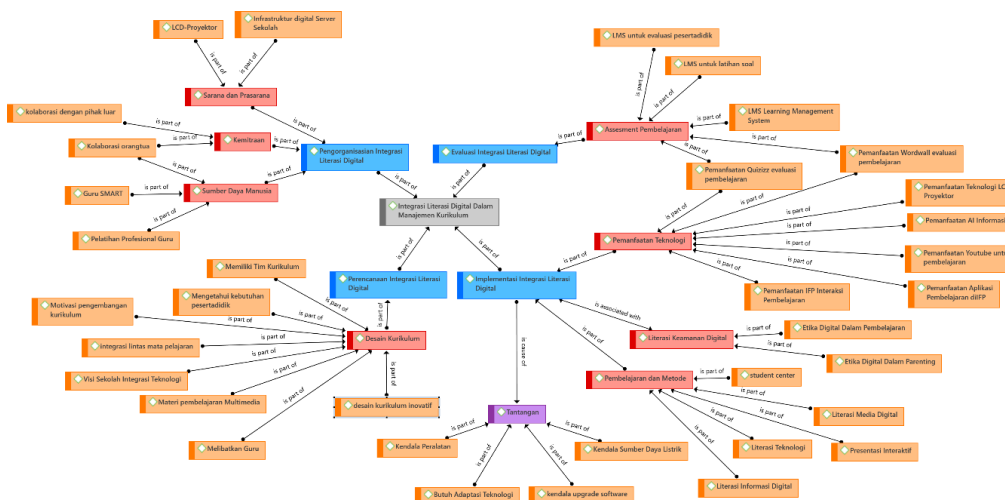


**Figure 1.** Data Analysis Flowchart  
Source: Researcher, 2025

## RESULTS AND DISCUSSION

### RESULTS

Field research results Field data analysis revealed six central themes that elaborate on innovative practices of digital literacy integration in curriculum management. These themes include: characteristics that define excellent schools, innovation in curriculum planning, organizational innovation, implementation innovation, evaluation innovation, and challenges faced. Each of these main themes is supported by detailed



findings categorized into relevant sub-themes, providing a comprehensive picture of effective curriculum management models.

**Figure 2.** ATLAS.ti 9 Research Data Analysis  
Source: Researcher, 2025

### **Planning for the Integration of Digital Literacy in Curriculum Management**

The plan to integrate digital literacy into curriculum management at SD Muhammadiyah Condongcatur was driven by a strong motivation to remain relevant in this day and age and to compete with other schools. This was revealed by P1, who stated:

*“Initially, we observed the development of other schools in our surrounding area, such as GIS and Al-Azhar. This indicates that if we do not take similar steps or make progress, we will fall behind them. Therefore, a training program on designing an innovative curriculum was conducted, as it is necessary for us to keep pace with these developments.” [P1]*

In line with this, P3 also added that:

*“The rapid advancement of technology has also become a strong driving force for us to design an adaptive and innovative curriculum. We aim to ensure that our students are well prepared to face future challenges, and this begins with the curriculum we design.” [P3]*

SD Muhammadiyah Condongcatur has also integrated digital literacy into its subjects, viewing it not as a separate subject but as an embedded dimension across various other subjects. P3 emphasized the relevance of this approach:

*“Essentially, cross-curricular integration between intramural multimedia instruction and other subjects is highly relevant. As I initially considered, through multimedia instruction, students are already taught Microsoft Office applications such as Excel and PowerPoint. These skills can then be directly aligned with and applied in other subjects, which in fact provides substantial support to the learning process.” [P3]*

The planning of learning materials integrating digital literacy at SD Muhammadiyah Condongcatur is carried out through the active involvement of teachers to ensure alignment with students' needs. P1 further explained that this teacher involvement is also related to competency development:

*“Therefore, the planning of learning materials involves all teachers. Previously, we also conducted training sessions that engaged all teachers in developing instructional materials and understanding students' needs, so that the prepared materials align with students' levels of understanding and interests.” [P1]*

The organizational structure of SD Muhammadiyah Condongcatur supports digital literacy curriculum planning through the presence of a dedicated curriculum team. P1 explained the role of this team:

*“In terms of planning, we have a curriculum team that is specifically responsible for reviewing, developing, and monitoring curriculum implementation, including the continuous integration of digital literacy.” [P1]*

### **Organizing the Integration of Digital Literacy in Curriculum Management**

The organization of digital literacy integration in curriculum management at SD Muhammadiyah Condongcatur involves external partnerships, optimization of facilities and infrastructure, and collaboration among human resources, including teachers and parents. The school establishes partnerships with external parties and actively involves parents to support digital literacy practices.

P2 provided an example of this collaboration:

*“In relation to intramural multimedia practices, we also collaborate with external parties. For instance, we invite IT practitioners or training institutions to provide additional workshops for students and teachers, so that they gain up-to-date knowledge directly from experts.” [P2]*

Parental involvement is also considered essential, as expressed by P3:

*“The integration with learning actually also takes place at home. Sometimes, teachers assign tasks such as creating simple reports using computers. Students may work on these tasks using computers, decorate them, and access external sources, such as online articles. This certainly requires parental support at home, both in terms of supervision and facilities.” [P3]*

The optimal utilization of available digital infrastructure is a key priority in organizing digital literacy. P1 explained this as follows:

*“What already exists must indeed be used as effectively as possible. So, it is not only about having smart tools, but also about ensuring that teachers are competent. In other words, having sophisticated facilities is meaningless if their use is not maximized.” [P1]*

Human resource development, particularly among teachers, constitutes a crucial element in the organization of digital literacy at SD Muhammadiyah Condongcatur. Collaboration with parents also plays a supportive role. P3 highlighted individual teacher initiatives in digital content development:

*“I am not very involved, but there are colleagues at our school who are more active in developing digital content. One fourth-grade teacher, for example, frequently creates learning-related content and uploads it on Instagram. If I am not mistaken, they even received an award from UAD as an educational content creator.” [P3]*

The involvement of all stakeholders is also evident in the process of procuring and adapting digital tools, as explained by P2:

*“Usually, both teachers and parents are involved in this process, particularly during semester transitions or grade promotions. Since it relates to digital literacy, equipment is certainly needed. Especially during the COVID-19 pandemic, we had to identify what tools were required. Initially, this improvement occurred out of necessity due to COVID-19. Subsequently, the curriculum division collaborated with the facilities and infrastructure unit, as well as teachers, to gather input on the conditions at the time, so that human resource needs and training requirements could be properly identified.” [P2]*

### **Implementation of Digital Literacy Integration in Curriculum Management**

The implementation of digital literacy integration at SD Muhammadiyah Condongcatur is reflected



in various aspects of learning and instructional methods, including information literacy, media literacy,

technological literacy, digital safety literacy, as well as the use of interactive and student-centered approaches.

**Figure 3.** Interactive Learning in Digital Literacy Integration

Source: Researcher, 2025

SD Muhammadiyah Condongcatur facilitates the development of digital information literacy through the use of digital media to visualize complex information and to train students' source-searching skills. P3 provided an example of how digital visualization supports students' understanding:

*“Especially when providing examples that closely resemble real-life situations. For instance, when explaining a volcanic eruption, using static images is not sufficient. Through digital media, students can see how the process actually occurs. There was also a lesson on rocks and minerals. Students asked what marble looks like and where it comes from. They learned that marble comes from mountains that are cut into blocks, not molded from cement. The process involves cutting the marble, transporting it with heavy machinery, bringing it into industrial processing, and then slicing it into different sizes. This illustrates the use of digital media to visualize complex information in a way that closely reflects reality.” [P3]*

The implementation of digital media literacy encourages students to become not only media consumers but also media producers. P2 provided a concrete example of student media production:

*“Even third-grade students have already produced their own work. They were given a project-based assignment in which they sold food products and created promotional posters. With guidance from teachers, they searched for images of snacks, added text, designed the layout, and printed the posters. This demonstrates the production and creation of digital media for promotional purposes.” [P2]*

Students' creative initiatives are also supported in arts learning, as conveyed by P4:

*“For art assignments, students are sometimes asked to create digital posters using simple applications or to design digital greeting cards for holidays. This helps them express themselves through digital media and understand how visual messages are communicated.” [P4]*

Technological literacy in learning is further supported by the availability of appropriate devices and adequate guidance.



**Figure 4.** Technological Literacy

Source: Researcher, 2025

P4 explained the availability and use of interactive devices utilized by teachers at SD Muhammadiyah Condongcatur:

*“These devices are used in Grade 2 and Grade 6 classrooms. Each classroom is equipped with a*

large TV monitor known as an Interactive Flat Panel (IFP). At this stage, the implementation is limited to Grade 2 and Grade 6. Through this device, students can practice searching for information and writing directly on the screen, demonstrating the use of hardware and basic features for direct interaction.” [P4]

P4 further added:

*“In addition, teachers have already implemented learning through games. For example, they use quiz-based applications such as Quizizz and Wordwall, which are interactive and gamified applications designed to increase student engagement.”* [P4]

The implementation of digital literacy at SD Muhammadiyah Condongcatur also includes the cultivation of digital ethics and digital safety, particularly through the active involvement of parents and the communication of rules to students. Recognizing the importance of parental guidance and supervision of device use, the school actively engages parents in monitoring students’ gadget use at home to ensure safety and maintain a focus on learning objectives. P3 explained how this message is communicated to parents:

*“In addition to parent group chats, there are also parent meetings where messages are conveyed to parents. Essentially, we ask for their assistance in accompanying their children at home, especially regarding smartphone use. When students are working on assignments, parents are encouraged to supervise them, so that the children do not work briefly and then become distracted by other activities. This emphasizes the importance of parental supervision when children use smartphones for learning tasks.”* [P3]

Although not always delivered through formal forums, messages regarding supervision are also conveyed implicitly through other interactions, as indicated by P4:

*“It is usually conveyed implicitly, not in a formal forum. Sometimes it is also communicated during lessons, especially at the beginning of the school year. We usually explain the rules when students first start school.”* [P4]

### **Evaluation of Digital Literacy Integration in Curriculum Management**

Evaluation of digital literacy integration is conducted through various assessment methods to measure students’ achievement and skill development. Digital literacy assessment is carried out using diverse approaches, ranging from informal evaluations to project-based assignments. P3 mentioned the use of interactive quizzes as part of the evaluation process:

*“For evaluation, in certain situations, we use tools such as Quizizz. These game-based activities are used as enjoyable informal and formative evaluation tools.”* [P3]

P4 explained a more formal evaluation approach:

*“In addition, we also conduct formative evaluations through direct observation when students use digital devices during learning activities, as well as through the digital products they create, such as presentations or simple reports. This provides a direct picture of their understanding and skills.”* [P4]

### **Challenges in Integrating Digital Literacy into Curriculum Management**

The primary challenge faced is the urgent need to adapt to rapid technological developments, both

for teachers and students. P1 highlighted the importance of teachers' adaptation to modern technology:

*“Different methods lead to different outcomes. Traditional lecturing, especially in today’s context, is no longer sufficient. Teachers, particularly the younger generation, are expected to be technologically literate. Therefore, whether we like it or not, we must be willing to learn and adapt to new technologies.”* [P1]

The availability and condition of digital equipment constitute significant obstacles in the implementation of digital literacy. P2 specifically pointed out issues related to hardware:

*“The obstacles are usually related to equipment. First and foremost, it is the equipment itself. Sometimes there are cable errors. Even if spare equipment is available, it still takes time to retrieve it, which disrupts the learning process.”* [P2]

In addition to hardware malfunctions, P3 implicitly indicated challenges related to equipment procurement or maintenance, particularly in relation to software upgrades:

*“For example, when there is a new application that we consider very important and more engaging for students, it becomes a challenge in itself. We also have to learn how to access and operate the application, and that requires compatible equipment.”* [P3]

P4 added that equipment-related challenges are not limited to physical availability but also involve resource support for maintenance and sustainability:

*“The second issue is resource support. It is not only about the tools, but also about updating human resources through training, seminars, and similar activities, as well as cooperation with parents. This indicates that keeping equipment functioning optimally requires continuous resources and support.”* [P4]

Although not explicitly mentioned by other informants, dependence on electricity for software upgrades and device operation—implicitly referenced by P3 in relation to new applications—suggests that unstable electricity supply would hinder these processes. Overall, electricity-related issues represent a fundamental infrastructural challenge that affects the smooth implementation of all digital-based activities in schools. The need for continuous software updates also constitutes an ongoing challenge, particularly given the rapid development of digital applications. P3 explicitly articulated this challenge from a teacher's perspective:

*“For instance, when there is a new application that we consider very important and more attractive to students, it becomes a challenge for us as teachers because we also have to learn how to access and operate the application.”* [P3]

Similarly, P4 emphasized that teachers must continuously update their knowledge in response to students' fast-paced technological awareness:

*“The challenge also comes from the students. Sometimes, some students say, ‘I already know this, Ma’am,’ while others do not. This means teachers have to be even more up to date. Today, students require teachers to always keep up with the latest applications and technological developments.”* [P4]

Although not directly related to software upgrades, P1 also referred to the necessity for teachers to be “technologically literate” and willing to “learn” in order not to fall behind. This implicitly includes the need to understand and operate the latest software to effectively support the learning process.

## **DISCUSSION**

This discussion elaborates on the research findings regarding the integration of digital literacy in curriculum management to optimize the quality of learning at the elementary school level, particularly in the contexts of planning, organizing, implementation, and evaluation, as well as the challenges involved. The findings indicate that comprehensive efforts to integrate digital literacy are positively correlated with improvements in learning quality.

### **Planning**

In the aspect of curriculum planning, a strong motivation to maintain school relevance and competitiveness drives the design of an innovative and adaptive curriculum that responds to technological developments. These findings indicate that proactive curriculum management—characterized by monitoring innovations in other schools and responding to technological dynamics—is a key factor. This aligns with the view that adaptive and innovative curricula are essential for preparing students to face future challenges (Hasibuan et al., 2024). The integration of digital literacy across subjects, rather than treating it as a separate subject, reflects a holistic approach that enables students to apply digital skills in diverse learning contexts. This strategy is consistent with the concept of digital literacy as a transversal competence that must be internalized across all aspects of the curriculum (Marpaung et al., 2024). Furthermore, the involvement of teachers in planning digital-based learning materials and in understanding students' specific needs reinforces a student-centered approach that is crucial for curriculum effectiveness (Calderón et al., 2020). The presence of a dedicated and comprehensive curriculum team serves as the backbone of well-structured planning, ensuring continuous monitoring and evaluation of digital literacy implementation.

### **Organizing**

The organizing aspect highlights partnerships with external stakeholders and parents as essential elements in supporting a digital literacy ecosystem. Collaboration with IT practitioners and training institutions provides access to up-to-date knowledge, while parental involvement ensures the continuity of support within the home environment. This reinforces the notion that digital literacy education is a shared responsibility between schools and the broader community (Giddens, 2019). The optimization of digital infrastructure facilities, such as school servers, LCD projectors, and Interactive Flat Panels (IFPs), demonstrates the school's commitment to providing adequate supporting facilities. However, the emphasis on teachers' ability to maximize the use of these facilities underscores the importance of human resource development in parallel with infrastructure investment. The effective utilization of human resources, including teachers' initiatives in developing digital content and parental involvement in identifying needs, reflects strong internal capacity in advancing digital literacy.

### **Implementation**

At the implementation stage, the findings reveal diverse practices in the development of information

literacy, media literacy, technological literacy, as well as digital ethics and safety literacy. The use of digital media to visualize complex information and to train students in searching for credible sources significantly enhances students' information literacy, in line with the importance of information discernment in the digital era (Lahaya et al., 2023). The implementation of digital media literacy that encourages students to act as content producers, rather than merely consumers, represents a progressive step in fostering creativity and digital expressive skills (Leaning, 2019; Raji et al., 2025). The utilization of technologies such as Interactive Flat Panels (IFPs) and online applications (e.g., Google Forms, Quizizz, and Wordwall) reflects a shift toward interactive and student-centered learning. This approach, which incorporates gamification and visualization, has been shown to enhance student engagement and learning motivation (García-López et al., 2023; Zainudin & Zulkipli, 2023). Furthermore, the cultivation of digital ethics and digital safety constitutes an integral component of this implementation. The school actively involves parents in supervising students' device use at home, emphasizing the importance of parental guidance to maintain focus on learning tasks and to prevent misuse. Messages regarding ethical conduct and discipline in digital information seeking are also directly conveyed to students from the beginning of their schooling. Consistent teacher guidance, particularly for younger students, remains crucial to ensuring safe and responsible technology use, in accordance with the literature on responsible digital parenting (Titarenko, 2024).

### **Evaluation**

Digital literacy evaluation is conducted through a variety of learning assessments, ranging from interactive quizzes to project-based assignments. Direct observation of students' digital products and the application of digital skills across different subjects provide a comprehensive picture of the program's effectiveness. These formative and summative evaluations enable the school to measure the extent of students' digital literacy skill development as well as the overall effectiveness of the curriculum. This approach is consistent with the curriculum management cycle, which emphasizes the importance of continuous evaluation for ongoing improvement (Hariyanto, 2018; Maulina et al., 2020).

### **Challenges**

Nevertheless, the integration of digital literacy is not without challenges. The need for continuous technological adaptation among teachers and students requires ongoing training and professional development (Fitria et al., 2024). Equipment-related issues, such as cable malfunctions, the need for software upgrades, and limitations in electrical resources, constitute infrastructural barriers that demand careful planning and sustained investment. These challenges underscore that innovation in curriculum management—particularly in relation to digital literacy—requires holistic support across multiple dimensions, ranging from human resource competencies to the availability and maintenance of infrastructure. Overall, the integration of digital literacy in elementary school learning reflects adaptive and innovative curriculum management practices. The outcomes include improved learning quality, characterized by students who are more proficient in information, media, and technology literacy, as well

as learning processes that are more interactive and student-centered. Although challenges related to technological adaptation and infrastructure remain, proactive strategies in planning, organizing, implementation, and evaluation have proven effective in optimizing students' learning experiences in the digital era.

## CONCLUSION AND SUGGESTION

### CONCLUSION

This study concludes that the comprehensive integration of digital literacy into curriculum management at the elementary school level is positively correlated with the optimization of learning quality. Adaptive curriculum management strategies—including proactive planning, partnership-based organization, holistic implementation, and continuous evaluation—serve as key factors for success. This approach not only enhances students' information, media, and technological literacy but also fosters an interactive and student-centered learning environment. Nevertheless, this success is accompanied by significant challenges, particularly those related to the need for continuous technological adaptation among educators and infrastructural constraints.

### SUGGESTION

Based on these findings, future researchers are encouraged to expand the scope of studies to further enrich the academic field. Future research may explore the long-term impact of digital literacy on students' learning outcomes and their readiness to face 21st-century challenges. In addition, comparative studies involving schools with different characteristics are recommended to more broadly validate this implementation model. Further research may also focus on developing practical frameworks or intervention models to address infrastructural challenges and teachers' competencies, thereby providing more applicable guidance for other educational institutions.

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