



Leadership in the Age of Artificial Intelligence in Elementary Education Management

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Abstract: *The rapid development of Artificial Intelligence (AI) has transformed educational leadership practices, including at the elementary school level, which raises distinctive pedagogical and ethical considerations. This study aims to examine AI-based educational leadership in elementary education, emphasizing the balance among data utilization, pedagogical wisdom, and humanistic values. A Systematic Literature Review (SLR) was conducted by analyzing peer-reviewed articles published between 2015 and 2025 that address educational leadership, AI, and primary education. The findings indicate that AI significantly supports data-driven leadership by enhancing responsive and evidence-based decision-making; however, it cannot replace the role of school principals as interpreters of data who consider students' social-emotional development and the unique context of elementary education. The successful implementation of AI is also highly dependent on establishing teachers' psychological safety, fostered by supportive, ethical leadership that encourages reflective adaptation to technology without undermining professional autonomy. Furthermore, AI has strong potential to support differentiated and inclusive learning, provided it is managed fairly and does not lead to labeling or learning inequalities. This study underscores that elementary school leadership in the AI era must be grounded in a strong ethical commitment to child protection, equity, and inclusivity, positioning AI as a means to strengthen educational practices rather than an end in itself.*

Keywords: *Artificial Intelligence in Education; Educational Leadership; Elementary School; Data-Driven Leadership; Ethical Leadership*

Introduction

The development of Artificial Intelligence (AI) has brought significant changes to the management and practice of education at various levels. Unlike conventional digital technology, which functions as an operational tool, AI presents itself as an intelligent system capable of analyzing large-scale data, recognizing patterns, and providing prediction-based recommendations to support educational decision-making (Zhu et al., 2025; Lin et al., 2024). This transformation has driven the emergence of increasingly data-driven educational leadership models, organizational efficiency, and the use of intelligent technology in school management (Sain et al., 2024; Rismawati et al., 2024).

In the context of elementary schools (SD), AI integration has more complex characteristics and implications than at other levels of education. Elementary education is a crucial phase in character formation, social-emotional development, and the development of students' cognitive foundations. Therefore, elementary school leadership should not only focus on academic achievement and administrative efficiency, but also on nurturing, role modeling, and humanistic relationships between the principal, teachers, students, and parents (Udhma et al., 2025; Retnivia et al., 2025). The use of AI without reflective, values-based leadership has the potential to encourage technocratic educational practices and neglect the human dimension of elementary education.

Numerous studies have shown that AI offers strategic opportunities for educational leadership, particularly in improving the effectiveness of decision-making, resource management, and real-time monitoring of learning processes (Zhu et al., 2025; Rismawati et al., 2024). However, other studies have also highlighted serious challenges related to ethics, student data privacy, algorithmic bias, and the risk of diminishing the professional role of teachers (Efendi et al., 2025; Sain et al., 2024). At the elementary school level, these risks are even more acute because students are at an early developmental stage and are more vulnerable to the impacts of educational policies and technology (Retnivia et al., 2025).

Furthermore, the success of AI integration in schools is significantly influenced by teachers' psychological safety. Teachers who feel psychologically safe tend to be more open to innovation, including the use of AI in teaching and school administration (Shahid & Din, 2021; Imran & Akhtar, 2023). Conversely, anxiety about data-based supervision, limited digital literacy, and fears of being replaced by technology can trigger resistance and hinder the meaningful use of AI (Khofi, 2025; Surjaningrum et al., 2024). This situation emphasizes the strategic role of principal leadership in fostering a safe, collaborative, and adaptive work environment for technological transformation.

In the pedagogical realm, AI also offers significant potential in supporting differentiated and personalized learning in elementary schools. AI-based adaptive learning systems allow for adjustments in pace, content, and learning support to meet student needs (Ritonga et al., 2024; Rahardian et al., 2025). However, without leadership management oriented toward equity and inclusivity, the use of AI risks creating labeling, segregation, and disparities in technology access in elementary schools (Fradana & Suwarta, 2025; Aprilia, 2024).

While research on AI and educational leadership continues to expand, existing studies predominantly focus on secondary and higher education contexts and emphasize technological efficiency, organizational performance, and digital leadership competencies (Zhu et al., 2025; Lin et al., 2024). At the elementary school level, empirical and conceptual studies that specifically address AI-based leadership remain scarce, particularly those that integrate ethical considerations, teacher psychological safety, and the humanistic mission of elementary education. More importantly, the current literature has not yet provided an integrated conceptual framework that explains how elementary school principals can balance data-driven decision-making with pedagogical wisdom, socio-emotional considerations, and ethical responsibility in the use of AI. Existing studies tend to examine these dimensions separately, focusing either on technological adoption, ethical risks, or teacher attitudes without synthesizing them into a coherent leadership perspective suitable for the unique developmental context of elementary education. As a result, there is limited theoretical guidance for school leaders on how to implement AI in ways that are both effective and inclusive, and morally grounded.

This gap indicates the need for a contextual and integrative examination of AI-based educational leadership that moves beyond technical adoption models toward a human-centered leadership perspective. In particular, there is a lack of systematic synthesis that positions the elementary school principal as a reflective leader who mediates among technological innovation, teacher psychological safety, and students' holistic development.

In light of this gap, this study aims to examine AI-based educational leadership in elementary schools through a systematic literature review, positioning principals as key actors in balancing technological capabilities, pedagogical leadership, and ethical values. This research seeks to formulate a *human-centered AI leadership framework* that conceptually integrates data utilization, teacher psychological safety, and child-centered educational principles. The findings are expected to contribute theoretically to the discourse on educational leadership in the AI era and provide practical guidance for policymakers and elementary school leaders in managing AI integration in an equitable, inclusive, and student-centered manner.

Method

1. Research Design

This study uses a Systematic Literature Review (SLR) approach to comprehensively examine research addressing educational leadership in the era of Artificial Intelligence (AI), with a specific focus on management and leadership practices in elementary schools. The SLR approach was chosen because it allows for the systematic identification, critical evaluation, and synthesis of empirical and conceptual evidence, resulting in a unified understanding of the use of AI in educational leadership that maintains ethical, pedagogical, and humanistic values at the elementary education level.

The literature review process follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The PRISMA framework consists of four sequential stages: identification, screening, eligibility, and inclusion. The application of this framework ensures that the literature search and selection process is systematic, transparent, and replicable.

2. Data Sources and Search Strategy

Relevant literature was obtained from various international and national academic databases, including Scopus, Web of Science, ERIC, Google Scholar, DOAJ, and Garuda. These databases were selected because they have strong coverage in the fields of education, educational leadership, educational technology, and the use of Artificial Intelligence in the context of learning and school management.

The literature search was conducted using a combination of structured keywords representing the main research variables. The keywords used were as follows: “*educational leadership*” OR “*school leadership*” OR “*principal leadership*” AND “*artificial intelligence*” OR “*AI in education*” OR “*educational technology*” AND “*elementary school*” OR “*primary education*”.

This strategy was designed to identify research that explicitly addresses the intersection between educational leadership, the use of AI, and the context of elementary education. To maintain relevance and recency, the search was limited to publications from 2015 to 2025. Included documents included reputable journal articles and accredited conference proceedings published in Indonesian or English. The scope of the study is limited to the context of Elementary Schools to align with the research objectives.

3. Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were systematically established to ensure the thematic relevance and methodological quality of the studies analyzed. Included articles explicitly addressed educational leadership or school leadership related to the use of AI or advanced digital technologies, leadership practices, decision-making, management, or school policy in the elementary school context, and the ethical, pedagogical, or humanistic implications of the use of AI in educational leadership. Included studies were articles from reputable or indexed journals, used qualitative, quantitative, or mixed methods research designs, had clear empirical or conceptual findings, and were available in full text. Conversely, articles that focused on educational levels beyond elementary school, were irrelevant to leadership or AI, were non-academic publications (editorials or opinion pieces), had significant methodological weaknesses, were duplicates, or were not available in full text were excluded from the review.

Table 1. Inclusion and Exclusion Criteria

No.	Criteria	Inclusion Criteria	Exclusion Criteria
1	Topic relevance	Studies on AI-based educational leadership in elementary schools	Studies outside the elementary school context or not related to educational leadership and AI
2	Type and source of publication	Peer-reviewed articles published in reputable or indexed journals (Scopus, Web of Science, SINTA, or equivalent)	Non-academic publications and grey literature
3	Research design and findings	Qualitative, quantitative, or mixed-methods studies with clearly reported findings	Studies with unclear methodology or lacking substantive findings
4	Accessibility and originality	Articles with accessible full-text availability	Duplicate articles or studies without full-text access
5	Language and publication period	Articles published in Indonesian or English between 2015 and 2025	Articles published outside the specified languages and time frame

4. Literature Selection Process

The study selection process followed the PRISMA framework to ensure methodological rigor and transparency. A total of 49 records were identified from databases ($n = 43$) and registries ($n = 6$). Before the screening stage, 13 records were excluded: duplications ($n = 7$), records determined not to meet the criteria by an automated tool ($n = 4$), and other reasons ($n = 2$). Next, 36 records were screened based on title and abstract, and 7 were excluded for irrelevance. A total of 21 full-text articles were assessed for eligibility. At this stage, articles were excluded due to topic discrepancy ($n = 5$), limited access to or duplication of full text ($n = 1$), publication in a disreputable journal ($n = 3$), and publication before 2015 ($n = 2$). Ultimately, 10 studies met all inclusion criteria and were included in the systematic review. The entire literature selection process is presented in a PRISMA flowchart that systematically illustrates the stages of article identification, screening, eligibility, and inclusion.

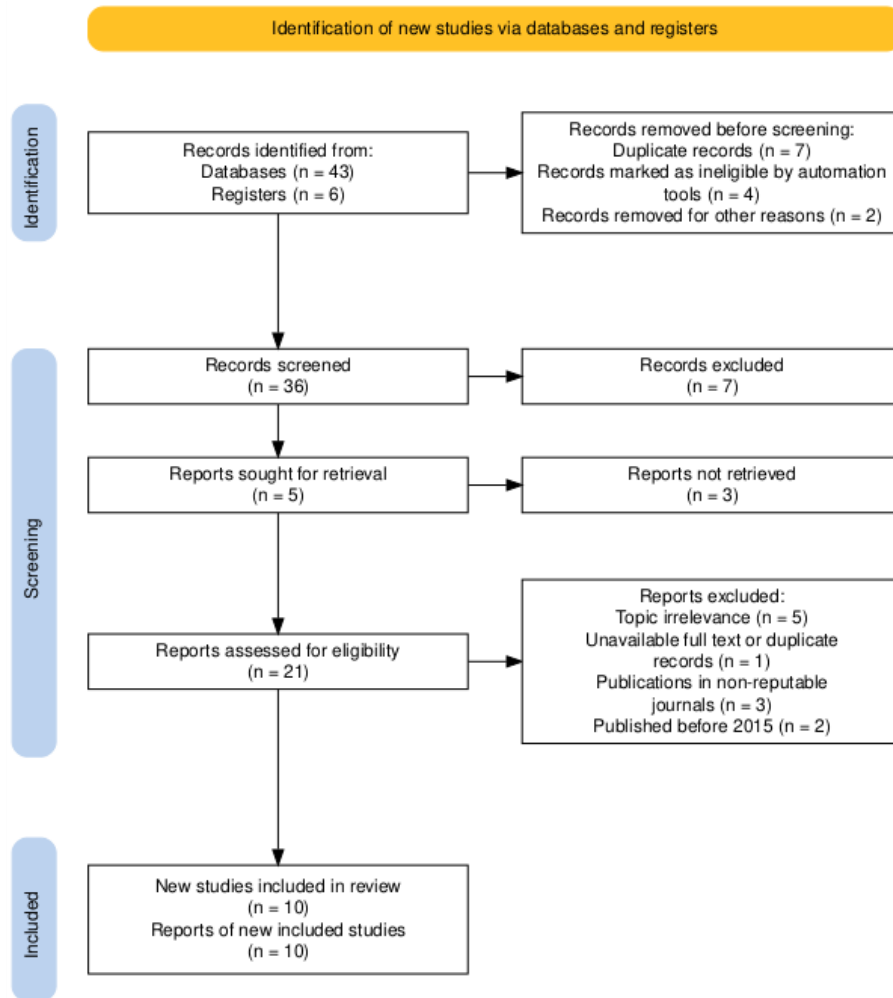


Figure 1: Flow of Article Selection with Prisma

5. Summary of Selected Articles

The final sample consisted of 10 articles that met all inclusion criteria and served as the basis for this study's analysis. These articles were evaluated based on their relevance to elementary school leadership, methodological rigor, and alignment with the research focus on AI integration in educational management and leadership.

Table 2. Summary of Analyzed Research Articles

No.	Author(s)	Year	Journal / Source	Main Focus	Method
1	Zhu et al.	2025	<i>Journal of Education and Learning</i>	Concepts and determinants of digital leadership in education	Systematic Literature Review
2	Efendi et al.	2025	<i>Jurnal Pendidikan, Kebudayaan dan Keislaman</i>	Opportunities, ethical challenges, and pedagogical implications of AI	Systematic Literature Review
3	Sain et al.	2024	<i>Didaktika</i>	Impact of AI integration on educational leadership performance and ethics	Quantitative
4	Retnivia et al.	2025	<i>Pendas: Jurnal Ilmiah Pendidikan Dasar</i>	AI ethics in elementary school management	Qualitative

5	Rismawati et al.	2024	Jurnal Tahsinia	Role of information systems in improving educational service quality	Qualitative
6	Khofi	2025	ICHES Proceedings	School principals' strategies to enhance teachers' digital competence	Qualitative
7	Shahid & Din	2021	International Journal of Educational Leadership and Management	Teachers' psychological safety and the role of school leadership	Quantitative
8	Imran & Akhtar	2023	Academy of Education and Social Sciences Review	Ethical leadership and teachers' psychological safety in elementary schools	Quantitative
9	Rosyada et al.	2024	JIEPP	Teachers' administrative workload and learning effectiveness	Quantitative
10	Rahardian et al.	2025	EDU Research	Effectiveness of AI use in school learning	Quantitative

Of the articles analyzed, four used a qualitative approach, four used a quantitative approach, and two used a systematic literature review. All articles were published within the last ten years in reputable national and international journals, demonstrating that the study of AI-based educational leadership in elementary schools is a relevant and evolving issue.

6. Data Analysis Techniques

Data analysis was conducted using thematic analysis. The analysis phase began with a familiarization process through repeated readings of all selected articles. Next, open coding was conducted to identify units of meaning related to leadership practices, AI use, ethical considerations, and human-centered educational values.

These codes were then grouped into broader conceptual categories to generate key themes, including data-driven leadership, psychological safety for teachers, ethical decision-making, administrative automation, and AI-based inclusive learning. The final stage, a thematic synthesis, was conducted to develop an integrated conceptual understanding of AI-based educational leadership in elementary schools.

7. Data Validity

To enhance the credibility and validity of the findings, this study implemented an audit trail by systematically documenting each stage of the literature search and selection process. Furthermore, source triangulation was conducted by comparing findings from various studies using different methodological approaches and educational contexts, thereby strengthening the reliability of the synthesis results.

8. Research Outputs

This research yielded three main outputs. First, a systematic thematic mapping was presented in tabular form to identify dominant themes and leadership challenges in AI integration in elementary schools. Second, a conceptual synthesis of the relationships among AI utilization, leadership practices, ethical considerations, and human-centered educational values. Third, a conceptual framework positioning

elementary school principals as key actors in orchestrating responsible, inclusive, and student-centered AI integration.

Result and Discussion

1. Result

Through a thematic synthesis of the literature, this study formulates a conceptual framework that delineates the interrelationships among the core dimensions of AI-based educational leadership in elementary schools. This framework foregrounds the school principal as the primary integrator of AI-driven practices with pedagogical leadership, ethical principles, and fairness in educational management (see Figure 2).

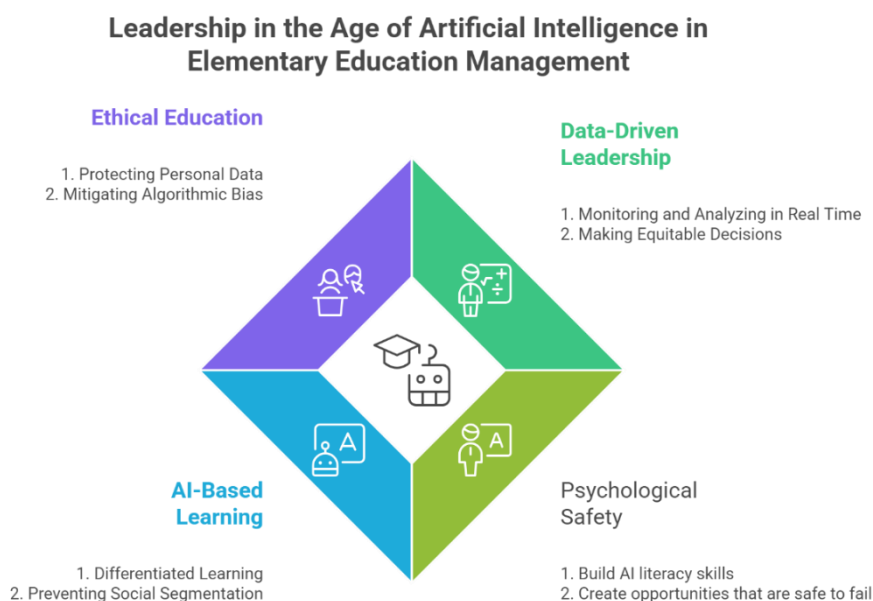


Figure 2. Conceptual Framework of Leadership in the Age of Artificial Intelligence in Elementary Education Management

a. Data-Driven Leadership

Data-driven leadership in elementary school principalship emphasizes the use of data as a basis for responsive, evidence-based decision-making, without displacing human wisdom, empathy, and responsibility. With the support of Artificial Intelligence (AI), principals can identify student academic and non-academic patterns that are difficult to detect manually, and monitor the educational process in real time and continuously (Zhu et al., 2025).

From a managerial perspective, AI supports administrative automation and dynamic data provision, thereby increasing the effectiveness of school management and enabling faster responses to student learning needs (Rismawati et al., 2024). AI-based systems also help monitor learning progress and support early intervention for students requiring additional support (Anam, 2024), while strengthening the principal's role as a liaison between learning data, pedagogical practices, and school policies (Maulana, 2025).

In the pedagogical dimension, real-time and predictive analytics enable early detection of changes in learning behavior and potential learning loss, thereby encouraging preventive leadership oriented toward student development (Efendi et al., 2025). However, in the context of primary education, data cannot be the sole basis for decision-making. Educational decisions are always linked to values, social

context, and children's socio-emotional development. Therefore, AI should be positioned as an analytical tool, while the final decision remains with the principal as the pedagogical leader and guardian of educational ethical values.

Fair decision-making requires contextual interpretation of data, taking into account the child's developmental stage, family background, and social and emotional factors. AI plays a role in identifying learning patterns and symptoms, but it should not be the sole determinant of educational diagnosis or intervention (Nuralim & Ghafirin, 2023; Idris et al., 2025). Leadership in the AI era is characterized by the principal's ability to reflectively integrate professional intuition with digital evidence, resulting in more proportionate decisions oriented toward students' best interests (Wahyudi & Pratama, 2025).

The principle of fairness is a key foundation for the use of AI in elementary schools. Principals need to ensure that the use of AI does not widen social inequalities or disadvantage students from disadvantaged backgrounds due to data bias. With ethical management, AI has the potential to support more equitable and inclusive decision-making (Retnivia et al., 2025; Pratama, 2024).

b. Psychological Safety for Teachers

Psychological safety for teachers is a condition in which teachers feel safe to express opinions, try new approaches, and acknowledge their limitations without fear of blame or negative judgment. In elementary schools, this condition is a crucial prerequisite for the success of innovation, including the implementation of Artificial Intelligence (AI) in learning and school management. The implementation of AI often raises teachers' anxieties, including concerns about being replaced by technology, limited digital competence, and data-based assessments perceived as less humane (Shahid & Din, 2021). Without a sense of psychological safety, teachers tend to be resistant or implement AI policies formally without meaningful involvement (Imran & Akhtar, 2023).

Therefore, school principals play a strategic role in creating a supportive work environment that positions teachers as professional learners. Improving AI literacy should be part of school leadership to reduce fears and build teacher confidence in using AI as a pedagogical tool rather than a threat to their professional roles (Khofi, 2025). This effort cannot be achieved through short training sessions alone; it requires ongoing mentoring that encompasses a basic understanding of AI, data literacy, and information security and protection (Surjaningrum et al., 2024). Beyond technical aspects, ethical discussion spaces are also crucial to provide teachers with a clear moral framework for using AI (Widiyanti et al., 2025).

Furthermore, principals need to implement a fail-safe approach by creating policies that protect teachers from sanctions when responsibly piloting AI. A safe work environment encourages teachers to experiment, reflect on their practices, and develop innovations incrementally, with failure viewed as part of professional learning (Khofi & Santoso, 2024; Murti et al., 2025).

Conversely, high administrative burdens pose a structural challenge by diverting teachers' attention from their core pedagogical roles (Rosyada et al., 2024). Utilizing AI for administrative automation, such as grade management, adaptive scheduling, and integrated reporting allows for a more proportional redistribution of teachers' work time (Syawitri, 2025; Munawaroh & Purnomo, 2005). The saved time can be redirected to lesson planning, pedagogical reflection, and student social and emotional support, which are crucial in elementary education (Nadifa et al., 2025). Thus, the use of AI is not only seen as a means of technical efficiency but also as a

leadership strategy to strengthen the quality of pedagogical and relational interactions between teachers and students.

c. AI-Based Learning

Artificial Intelligence (AI)-based learning is a learning approach that utilizes intelligent systems to analyze student learning data and adapt material, pace, and difficulty levels. The goal is to support more personalized, effective, and responsive learning that addresses students' diverse needs. In elementary education, AI serves as a pedagogical support tool that helps teachers monitor learning progress and provide ongoing feedback, without replacing teachers' professional roles, thereby retaining the role of human teachers in pedagogical decisions.

Similarly, differentiated learning aims to adapt instruction to differences in student readiness, interests, and learning profiles, so that each student can develop to their potential (Ritonga et al., 2024). While ideal, its implementation requires teachers' readiness and creativity as learning facilitators (Purnawanto, 2023). Effective implementation of differentiation requires a deep understanding of student learning needs and the management of variations in content, processes, products, and learning environments, resulting in more optimal, equitable, and inclusive learning (Amalia et al., 2023; Himmah & Nugraheni, 2023).

In elementary schools, the implementation of differentiated learning is often hampered by time constraints and large student populations (Urfa et al., 2024). In these situations, Artificial Intelligence (AI) can provide a supportive solution through more personalized, adaptive learning. AI can adjust the pace, presentation format, and difficulty level of material according to student responses, so that students who grasp quickly receive enrichment, while those who take longer receive appropriate support. This approach increases learning engagement, reduces stress caused by ability differences, and supports more inclusive and sustainable learning (Rohana et al., 2024; Rahardian et al., 2025).

AI-based differentiated learning can help meet students' diverse learning needs. However, if not managed properly, this approach risks creating social segregation in the classroom, such as the emergence of labels of "smart students" and "slow students." This can undermine student self-confidence and damage social relationships among students. Therefore, principals play a crucial role in maintaining fairness and inclusivity in the use of AI in schools.

Principals need to ensure that AI is used as an invisible support tool for students, not as a basis for labeling abilities. Teachers are encouraged to avoid terms or groupings that can stigmatize students. Learning support should be provided individually, while maintaining students' sense of safety, self-esteem, and belonging in the classroom (Fradana & Suwarta, 2025). Furthermore, student grouping should be flexible and not permanent. A student may need more help in one subject but excel in another. Understanding that abilities can develop and differ across contexts helps prevent students from feeling trapped by a particular label (Aprilia, 2024). Equitable access to AI technology is also a key concern. Principals need to ensure that all students have equal opportunities to utilize technology, not just specific groups or classes. Equitable access prevents the digital divide and ensures that AI is used for equitable learning opportunities.

d. Ethical Education in the AI Era

Ethical education in the AI era places moral values, justice, and human responsibility as the primary foundation for the use of Artificial Intelligence (AI) in elementary

education. While AI offers technical benefits in management and learning, its application also presents ethical risks, such as data misuse, algorithmic bias, and the reduction of students to data objects, which have the potential to undermine the human dimension and equity of access to education (Udhma et al., 2025; Dita et al., 2025). In this context, elementary school principals play a strategic role not only as academic administrators but also as ethical leaders and protectors of children's rights.

As guardians of ethical governance, principals need to establish clear policies regarding the access, storage, and use of student data. The use of AI must be accompanied by strict access restrictions, including for technology developers, and the implementation of anonymization to protect children's privacy (Rafid & Nurita, 2025). Transparency with parents is a leadership responsibility, particularly in explaining the types of data collected, the purposes for which it is used, and the protection mechanisms, to ensure that data is not misused for non-educational or commercial purposes.

In addition to data protection, managing AI bias is a key ethical responsibility for elementary school principals. AI systems trained on historical data have the potential to reproduce inequities, particularly in assessments and learning recommendations that may favor certain groups of students and limit the opportunities of others based on their social background, culture, language styles, or specific learning needs (Santoso, 2023). Therefore, principals need to ensure mechanisms for monitoring, evaluation, and transparency and accountability for the technology used to ensure that AI-based decisions remain fair and contextual.

Ultimately, the use of AI in elementary schools should be directed toward expanding learning opportunities and supporting the development of all students, not labeling or limiting their potential. School leadership grounded in ethical sensitivity and social justice ensures that AI functions as a humane and inclusive pedagogical tool. Therefore, principal leadership in the AI era requires not only technological proficiency but also a strong moral commitment to child protection, equity, and educational inclusivity.

Table 3. Summary of Key Findings

Main Theme	Brief Explanation	Impact on Teachers and Students	School Leadership Strategies
Data-Driven Leadership	AI supports data-driven decision-making through real-time and predictive analytics; however, it cannot replace principals' professional judgment.	School decisions become more responsive and evidence-based but risk losing contextual sensitivity if data are used mechanistically.	a. Positioning AI as an analytical support tool rather than a decision-maker. b. Interpreting data by considering students' social-emotional context. c. Integrating data with pedagogical and ethical considerations.
Psychological Safety for Teachers	AI implementation generates teachers' anxiety related to data-based monitoring, digital	Teachers tend to become resistant or passive in using AI when psychological	a. Building a supportive and collaborative work climate.

	competence, and threats to professional autonomy.	safety is not ensured.	b. Providing continuous AI literacy training and mentoring. c. Applying a safe-to-fail approach in instructional innovation.
AI-Based Learning	AI has the potential to strengthen differentiated learning through the personalization of pace, content, and learning support.	Student engagement and learning effectiveness increase, yet risks of labeling and ability-based segregation may emerge.	a. Using AI as invisible pedagogical support. b. Promoting flexible and non-permanent differentiation. c. Ensuring equitable access to AI-supported technologies for all students.
Ethical Education in the AI Era	The use of AI raises ethical concerns related to data privacy, algorithmic bias, and the protection of children's rights.	Risks of injustice, stigmatization, and the reduction of students to data objects arise if AI is not managed ethically.	a. Establishing student data protection policies. b. Monitoring and mitigating potential algorithmic bias. b. Maintaining transparency with teachers and parents.

2. Discussion

The findings of this study indicate that Artificial Intelligence (AI)-based educational leadership at the elementary school level cannot be reduced to mere technology adoption; rather, it must be understood as a strategic leadership practice that integrates data utilization, pedagogical wisdom, and humanistic values. AI has been shown to support data-driven leadership, particularly by enabling more responsive, evidence-based managerial and pedagogical decisions. These findings corroborate those of [Zhu et al. \(2025\)](#) and [Rismawati et al. \(2024\)](#), which emphasize the crucial role of information systems and data analytics in enhancing the effectiveness of school leadership.

This research makes a significant scientific contribution to the study of AI-based educational leadership, particularly in the context of elementary schools, an area of the literature that remains relatively underdeveloped. The main contribution of this research is the formulation of a conceptual framework for human-centered AI leadership that positions the principal as a key actor in integrating data utilization, pedagogical wisdom, and ethical values in AI-based decision-making. Unlike previous research that emphasized the technological aspects of technology adoption, this study highlights the reflective, humanistic, and inclusive dimensions of AI leadership in elementary education. Thus, this study broadens the perspective on data-based leadership by incorporating considerations of students' socio-emotional development, teachers' psychological safety, and the principles of justice and the protection of children's rights as the main foundations for AI utilization in elementary schools.

However, this study expands the discourse on data-driven leadership by emphasizing that, in the context of elementary education, data cannot be used as a mechanistic basis for decision-making. Principals retain a central role as data interpreters, considering students' socio-emotional development, family backgrounds, and classroom learning dynamics. Within this framework, AI is positioned as an analytical

tool that supports leadership reflection, not as a substitute for the principal's professional judgment and moral responsibility (Efendi et al. 2025).

Another important finding is the role of teacher psychological safety as a key prerequisite for successful AI implementation in elementary schools. Teachers who feel psychologically safe tend to be more open to AI-based pedagogical innovation and experimentation. These findings align with those of Shahid and Din (2021) and Imran and Akhtar (2023), which show that ethical leadership significantly contributes to teacher performance and engagement. This study further emphasizes that principal leadership plays a strategic role in reducing teacher anxiety about AI through ongoing training, AI literacy mentoring, and the implementation of a fail-safe approach. This approach helps position AI as a professional support tool that strengthens teachers' pedagogical roles, rather than a threat to their professional identity and autonomy.

In the pedagogical realm, the study's findings indicate that AI has significant potential to strengthen differentiated learning through personalized pacing, materials, and learning support. These findings align with those of Ritonga et al. (2024) and Rahardian et al. (2025), which highlight AI's contribution to increased learning engagement and effectiveness. However, this study also emphasizes the risk of labeling and segregation of students if AI-based learning is not managed reflectively. Therefore, the principal serves as a guardian of the principle of inclusivity by ensuring that AI-based differentiation is flexible, non-stigmatizing, and oriented towards the holistic development of students.

Ethical aspects are the common thread connecting all research findings. The use of AI in elementary schools carries serious implications regarding data privacy, potential algorithmic bias, and equitable access to technology. Consistent with Sain et al. (2024) and Retnivia et al. (2025), this study emphasizes the role of school principals as ethical leaders responsible for data governance, transparency in systems, and the protection of children's rights. The study's primary contribution lies in formulating a human-centered AI leadership perspective, which positions technology as a means to strengthen decision-making quality, pedagogical relationships, and the goal of humanizing elementary education.

Overall, this discussion demonstrates that the success of AI-based leadership in elementary schools is largely determined by the principal's ability to balance technological sophistication with ethical values, empathy, and justice. Without reflective, values-based leadership, the use of AI risks fostering technocratic educational practices and shifting away from the primary goal of elementary education as a process of holistic human development.

Despite providing a comprehensive conceptual synthesis, this study has several limitations. First, the use of a systematic literature review approach renders the research findings conceptual and does not yet reflect empirical AI-based leadership practices in the field. Second, the limited number and context of studies specifically addressing the elementary school level necessitate caution in generalizing the findings. Third, variations in theoretical and methodological frameworks across the analyzed studies could potentially impact the depth and consistency of the thematic synthesis.

Given these limitations, future research is recommended to test the human-centered AI-based leadership framework through empirical studies, such as multi-site case studies, in-depth qualitative research, or mixed-methods approaches, in elementary schools that have implemented AI. Furthermore, longitudinal research is needed to understand the long-term impact of AI-based leadership on school culture, teacher well-being, and student development. Future studies should also explore the

perspectives of other stakeholders, including teachers, parents, and students, to gain a more holistic understanding of the implications of AI leadership in elementary education.

Conclusion

This study concludes that Artificial Intelligence (AI)-based educational leadership in elementary schools is a strategic leadership practice that demands a balance between data utilization, pedagogical wisdom, and humanistic values. 1) AI contributes to supporting data-driven leadership by strengthening more responsive and evidence-based decision-making, but cannot replace the role of the principal as a data interpreter who considers the socio-emotional development of students and the context of elementary education. 2) The success of AI implementation also depends heavily on the creation of psychological safety for teachers. Supportive and ethical leadership encourages teachers to adapt to technology reflectively, while utilizing AI as a pedagogical and administrative tool without threatening professional autonomy. 3) In learning, AI has the potential to strengthen differentiated and inclusive learning, provided its use is managed fairly and does not lead to labeling or learning gaps. 4) Principal leadership in the AI era must be based on a strong ethical commitment to child protection, justice, and inclusivity. AI needs to be positioned as a means to strengthen the quality of educational decisions and practices, not as an end in itself, so that technological transformation in elementary schools remains aligned with the essence of education as a humanization process.

From a practical perspective, the findings indicate several key recommendations for school principals: (1) Prioritize developing AI literacy through ongoing professional development and collaborative learning communities; (2) Establish clear institutional guidelines for using AI in pedagogy to ensure technology supports differentiated and inclusive learning rather than reinforcing student labeling or academic segregation; (3) Foster psychologically safe school environments by promoting mentoring, open professional dialogue, and a culture of safety thus enabling teachers to experiment with AI-based innovations without fear; (4) Implement strong ethical governance of AI, including transparent data management, protection of students' personal information, and systematic monitoring for potential algorithmic bias; and (5) Proactively engage parents and the school community to foster shared understanding and trust regarding responsible AI use in elementary education.

Overall, AI must be seen as a means to improve educational decision-making and teaching practices, not an end in itself. This approach keeps technological transformation in schools aligned with education's fundamental purpose: to support humanization and holistic student development.

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