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Research Paper

A Framework for Ethical AI in Grade 4 Lesson Planning

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Abstract

The integration of artificial intelligence (AI) in education is rapidly transforming teaching practices, particularly in lesson planning. In the Philippines, Grade 4 teachers are beginning to explore AI tools to enhance instructional design, personalize learning experiences, and improve student engagement. However, this technological shift raises critical ethical concerns, including data privacy, algorithmic bias, and the adequacy of teacher preparation. These issues are especially pressing in diverse educational contexts where disparities in access and cultural relevance must be addressed. This study aims to develop a framework for the ethical use of AI in lesson planning for Grade 4 educators. It investigates teachers' perceptions of AI, identifies perceived benefits and challenges, and explores how ethical principles can be embedded in AI-supported teaching practices. The research employs a mixed-methods approach, combining qualitative data from interviews and focus group discussions with quantitative survey analysis. Triangulation ensures a comprehensive understanding of the ethical dimensions of AI integration. Key findings reveal that while teachers are optimistic about AI's potential to support personalized and efficient instruction, they express concerns about the risks of bias, loss of human connection, and insufficient training. Teachers in urban and rural settings emphasize the need for culturally responsive AI tools that reflect Filipino learners' developmental needs and identities. The study also highlights a strong demand for professional development focused on AI ethics and responsible implementation. The resulting framework offers practical guidance for educators, policymakers, and developers. It promotes inclusive, transparent, and accountable AI use in education, ensuring that technological innovation aligns with human-centered values. By foregrounding teacher agency and ethical governance, this study contributes to the creation of a future-ready educational system that leverages AI responsibly while safeguarding equity and integrity in learning environments.

Keywords: *Artificial Intelligence, Ethics, Lesson Planning, Teacher Perceptions, STEM Education*

INTRODUCTION

Artificial intelligence (AI) is reshaping educational landscapes worldwide, offering tools that personalize learning, streamline lesson planning, and enhance student engagement. In the Philippines, the Department of Education (DepEd) has taken notable steps toward integrating AI into classrooms, particularly through the launch of the Education Center for AI Research (E-CAIR) in 2025. This initiative aims to develop AI-driven solutions that improve teaching efficiency and educational management across all levels, including primary education. Complementing this effort, DepEd's partnership with Microsoft has introduced programs such as the AI Immersion Program and Copilot Classroom Hack, which have trained over 500 teachers from 65 schools in using generative AI tools. These tools have significantly reduced administrative workloads and improved student assessment efficiency, with some schools reporting a reduction in reading assessment time from two days to just two hours. Despite these advancements, many public schools continue to face challenges related to infrastructure, equitable access, and teacher readiness, highlighting the need for ethical and inclusive AI integration.

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As AI becomes more embedded in educational practice, its immense potential to simplify and transform teaching also raises critical ethical concerns. These include issues of data privacy, algorithmic bias, and the risk of diminishing human-centered teaching approaches. This study investigates the ethical implications of AI deployment in education, focusing specifically on how Grade 4 teachers perceive and apply AI tools in lesson planning. By examining both the benefits and drawbacks, the research aims to develop a framework for the ethical and responsible use of AI in primary education. Through this lens, the study contributes to the broader discourse on AI in education by emphasizing the importance of teacher agency, professional development, and culturally responsive practices in shaping a future-ready and ethically grounded learning environment.

A substantial corpus of research exploring the connection between AI and education has emerged in recent years Chai et al. (2013). The integration of artificial intelligence (AI) into educational practice can be meaningfully examined through the lens of Technological Pedagogical Content Knowledge (TPACK), a framework that emphasizes the interplay between technology, pedagogy, and subject matter expertise. Chai et al. (2013) argue that effective technology integration requires teachers to develop a nuanced understanding of how digital tools intersect with pedagogical strategies and content delivery. In the context of AI, this means educators must not only understand how AI functions but also how it can be ethically and pedagogically aligned with curriculum goals. For instance, AI-powered tools that offer personalized learning pathways or automate assessment must be critically evaluated for their impact on student engagement, equity, and learning outcomes. The TPACK framework thus provides a valuable foundation for guiding teachers in the responsible adoption of AI, ensuring that its use enhances rather than disrupts the educational process.

They did warn about the dangers of algorithmic prejudice and the risk that AI might exacerbate current educational inequities. Hao et al. (2020) explored the ethics of AI in education, emphasizing responsibility, transparency, and fairness. They argued that it was necessary to develop AI algorithms to remove bias and provide fair access to educational opportunities. They also emphasized that teachers should be skilled enough to evaluate and employ AI technologies for better use.

AI's rapid progress has enabled the creation of a wide range of educational applications, including intelligent tutoring systems, automated grading systems, and personalized learning platforms. Even if these technologies improve educational outcomes, they raise ethical concerns. The use of AI-powered surveillance devices to monitor student conduct, for example, poses privacy concerns.

Due to algorithmic prejudice, AI-driven decision-making may potentially serve to perpetuate current injustices. These studies demonstrate that there are several ethical implications of AI in education that require thoughtful consideration. This study aims to contribute to the current discourse by developing a framework that allows Grade 4 teachers to use AI responsibly and ethically while creating lesson plans.

This project intends to contribute to the field by creating inclusive frameworks for building Grade 4 lesson plans that address ethical challenges related to artificial intelligence. The framework will guide teachers in the following ways:

Identify any ethical difficulties with AI techniques.

- To explore Grade 4 teachers' perceptions of AI tools.
- To identify ethical challenges faced in lesson planning.
- To develop a practical framework for ethical AI integration.

Discourse on ethical governance with regards to AI in education therefore, entails this research fulfilling its principles in whatever context one might find himself or herself, including conditions that favor him or her but not necessarily in a manner where one could expect to find everyone. Clearly defined frameworks, if so designed, may help protect teachers from extremes of risk-taking and maximization of benefits or full use; they should therefore make educated decisions about the usage of AI. Further, this will facilitate the evolution of ethical norms and standards for AI in education that will inform governmental and corporate policymakers.

LITERATURE REVIEW

One of the most revolutionary and contentious trends in recent years has been the incorporation of artificial intelligence (AI) into education. AI is being investigated more and more as a tool to improve teaching and learning because of its potential to provide real-time analytics, simplify lesson planning, and personalize instruction. But as the educational sector adopts these innovations, it is crucial to address the moral dilemmas they raise, especially about the responsibility of educators in ensuring the responsible use of AI technologies. Particularly as AI becomes ingrained in routine teaching procedures, concerns about data privacy, algorithmic fairness, teacher autonomy, and student equity require immediate attention. This expanding corpus of work reflects a common understanding that although AI presents many opportunities, its application needs to be directed by ethical and human-centered values that safeguard the rights and dignity of all stakeholders in education. These values must include transparency in how AI systems make decisions, accountability for outcomes influenced by AI, and inclusivity to ensure that no learner is left behind. Educators must be empowered not just as users but as informed decision-makers who can critically evaluate and guide the integration of AI tools in their practice. Policies and guidelines should be established to support equitable access, protect sensitive data, and promote digital literacy among both teachers and students. In the end, the true promise of AI in education will only be realized if its implementation is guided by a deep commitment to justice, empathy, and the holistic development of every learner.

The intersection of AI and education has been widely explored in recent years, with scholars emphasizing both its transformative potential and ethical pitfalls. Weller (2020) underscores the need for ethical standards in AI tools, advocating for teacher training to critically assess AI's impact on learning. Selwyn (2021) echoes this concern, highlighting the tension between technological efficiency and the preservation of human agency in teaching.

According to Tan et al. (2025), the role of artificial intelligence in enhancing teacher professional development. Their findings suggest that AI can offer personalized learning pathways that support teachers in acquiring new knowledge and skills. Nonetheless, they also cautioned that overreliance on AI might undermine the essential human elements of creativity and interpersonal engagement in educational settings.

Studies have shown that AI-driven platforms can support teachers by automating administrative tasks and offering real-time feedback (Tan et al., 2025). These tools not only enhance efficiency but also allow teachers to focus more on instructional innovation. Alenezi (2023) explores the ethical dimensions of artificial intelligence in higher education, emphasizing the urgent need to address algorithmic bias and safeguard data privacy. The study highlights how AI systems, if not carefully designed and implemented, can perpetuate existing inequalities and compromise student data security. Moreover, Alenezi (2023) underscores the importance of equipping educators with the tools to foster digital literacy and critical thinking among students, enabling them to navigate the complex ethical landscape of AI technologies. These insights align with the broader goals of this research, which seeks to develop a framework that empowers Grade 4

teachers to integrate AI ethically and responsibly into lesson planning, ensuring equitable and informed use of technology in educational settings.

The study by Luckin et al. (2020), on the other hand, has a more positive stance about AI's potential in education, suggesting that it can assist differentiated instruction and offer real-time feedback, so facilitating deeper learning. The authors warn that the use of AI could worsen already-existing educational disparities in the absence of a strong ethical foundation. They advise educational institutions to create explicit guidelines for the use of AI, placing a strong emphasis on openness and inclusivity in the adoption of new technologies.

Luckin et al. (2020) adopt a more optimistic stance, suggesting that AI can support differentiated instruction and real-time feedback. However, they warn that without ethical safeguards, AI could exacerbate existing inequalities. Williamson and Piattoeva (2021) argue that educators must consider the broader societal implications of AI, not just its technical capabilities.

Building on these concerns, Berson et al. (2025) provide a focused examination of AI's ethical dimensions in early education. Their study underscores the necessity of developmentally appropriate AI design and the protection of student data, warning that poorly regulated AI systems may exacerbate existing educational inequities. They advocate for embedding ethical literacy into teacher training programs and AI development processes to ensure that technology supports, not undermines, equity and inclusion in the classroom. This aligns with the current study's emphasis on professional development and ethical frameworks for Grade 4 teachers, reinforcing the need for a proactive and informed approach to AI integration.

The concept of establishing a "right to an explanation in everything but name" reflects the growing expectation that AI systems, particularly in education, should offer sufficient transparency to support informed decision-making, even when formal legal rights to explanations are absent. Selbst and Powles (2017) argue that qualified transparency, providing contextual and operational insights rather than full algorithmic disclosure, serves a functional role in enabling accountability. In educational settings, this means teachers and students should be able to understand how AI tools influence learning outcomes, what data they use, and how biases may emerge, without needing to grasp the technical intricacies of the algorithms. This form of transparency empowers educators to critically evaluate AI systems, fosters trust, and ensures that AI supports rather than undermines ethical and equitable learning environments. Thus, functional transparency becomes a practical substitute for a formal right to explanation, reinforcing the ethical responsibility of developers and institutions to make AI systems understandable and accountable.

Holmes et al. (2021) advocate for inclusive AI design, emphasizing the need to accommodate diverse student backgrounds. Cukurova et al. (2022) highlight teachers' concerns about losing the human element in instruction, while O'Neil (2022) calls for transparency and accountability in AI deployment. Together, these studies paint a complex picture of AI in education, one that demands careful ethical consideration, robust teacher training, and inclusive policy frameworks. The concept of establishing a "right to an explanation in everything but name" reflects the growing expectation that AI systems, particularly in education, should offer sufficient transparency to support informed decision-making, even when formal legal rights to explanations are absent. Selbst and Powles (2017) argue that qualified transparency, providing contextual and operational insights rather than full algorithmic disclosure, serves a functional role in enabling accountability. In educational settings, this means teachers and students should be able to understand how AI tools influence learning outcomes, what data they use, and how biases may emerge, without needing to grasp the technical intricacies of the algorithms. This form of transparency empowers educators to critically evaluate AI systems, fosters trust, and ensures that AI supports rather than undermines ethical and equitable learning environments. Thus, functional transparency becomes a practical substitute for

a formal right to explanation, reinforcing the ethical responsibility of developers and institutions to make AI systems understandable and accountable.

Cukurova et al.'s (2022) study explores how educators view AI in lesson planning and how it affects teaching methods. Although many educators acknowledge the potential advantages of AI in improving lesson design, the authors discovered that many are also worried about the loss of the human element in instruction. This study adds to the ethical debate by supporting AI tools that enhance rather than replace teachers' creativity and intuition, underscoring the significance of striking a balance between technical improvements and the human aspects of teaching.

Finally, O'Neil (2022) offers a critical evaluation of AI's involvement in educational settings in a literature review, advising teachers to embrace a framework that places a high value on accountability and transparency. O'Neil (2022) advises educators to pursue ongoing professional development to comprehend the moral implications of AI tools and make well-informed lesson design decisions. This all-encompassing strategy improves every student's learning experience while empowering teachers to use AI responsibly.

This literature review is grounded in the Technological Pedagogical Content Knowledge (TPACK) framework, which provides a comprehensive model for understanding how teachers integrate technology into their instructional practices. Traditionally, TPACK emphasizes the intersection of three core domains: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). It guides educators in aligning digital tools with curriculum goals and effective teaching strategies.

However, in the context of artificial intelligence (AI) integration, this study extends the TPACK framework to include a fourth, critical dimension: ethical knowledge (EK). This adaptation acknowledges that AI technologies introduce unique ethical challenges, such as data privacy, algorithmic bias, and transparency, that are not fully addressed by the original TPACK model. By incorporating ethical considerations into the framework, the review recognizes that teachers must not only understand how to use AI tools effectively but also how to evaluate their impact on student rights, equity, and well-being.

This expanded TPACK-EK model supports a more holistic approach to AI in education, encouraging teachers to make informed decisions that balance technological innovation with ethical responsibility. It also provides a lens through which existing studies can be synthesized, highlighting the need for professional development, inclusive design, and policy support to ensure that AI enhances rather than compromises the educational experience.

Synthesis

The Promise and Risk of AI in Education

AI in education brings both exciting possibilities and serious concerns. It can help teachers personalize lessons, give quick feedback, and reduce time spent on routine tasks. For example, studies by Luckin et al. (2020) and Tan et al. (2025) show that AI can help teachers adjust lessons to fit each student's needs, which can improve learning and engagement. However, researchers like Weller (2020) and Alenezi (2023) warn that AI can also cause problems if not used carefully. AI systems might be unfair or biased, especially if they make decisions without clear explanations. This means schools need to use AI in ways that help students while avoiding harm.

Teachers' Role and Training

Many studies agree that teachers should play an active role in how AI is used in classrooms. Instead of just following instructions from technology, teachers need to understand how AI works and how it fits with their teaching goals. Chai et al. (2013) suggest that teachers need knowledge that combines technology, teaching methods, and subject content. Selwyn (2021) and Tan et al.

(2025) also highlight the importance of training teachers, not just in how to use AI tools, but in thinking about their impact. When teachers are well-prepared, they can make better choices about using AI in ways that support learning and protect students.

Ethical Concerns and Human Connection

AI can raise ethical issues, especially when it's used to make decisions about students. Researchers like Hao et al. (2020) and O'Neil (2022) point out risks such as unfair grading, constant monitoring, and loss of student privacy. Cukurova et al. (2022) add that teachers worry AI might reduce the personal connection between them and their students. Teaching is not just about delivering content; it's also about building relationships, showing empathy, and understanding students' emotions. The studies agree that AI should support teachers, not replace them, and that human values must be at the center of AI design.

Inclusivity and Cultural Relevance

Another important issue is making sure AI works for all students, especially in places like the Philippines, where schools vary widely. Holmes et al. (2021) and Williamson & Piattoeva (2021) say AI tools should reflect students' different cultures, languages, and learning needs. In the Philippines, some schools have more resources than others, and AI tools that don't consider these differences might not be useful, or could even make things worse. The research suggests that AI should be developed with input from local teachers and communities to make sure it's fair and helpful for everyone.

Transparency and Trust

Teachers need to trust the AI tools they use, but that's hard when they don't understand how those tools make decisions. Weller (2020) and O'Neil (2022) explain that many AI systems are complex and not easy to explain. This can lead to confusion and mistrust, especially when AI is used for grading or tracking behavior. The studies recommend making AI systems more transparent, showing how they work, what data they use, and how decisions are made. This helps teachers feel more confident and ensures that AI is used responsibly.

Support from Schools and Policymakers

Finally, the research shows that ethical AI use needs support from the whole education system. Holmes et al. (2021) and Luckin et al. (2020) say schools and governments should create clear rules for using AI, protect student data, and make sure all students have access to technology. These policies should be made with help from teachers, so they fit real classroom needs. Ongoing research and teamwork between educators, developers, and policymakers is also important to keep up with changes in technology and make sure AI supports good teaching and learning.

RESEARCH METHOD

This study employed a convergent mixed-methods design (Creswell, 2014) to explore the ethical integration of artificial intelligence (AI) in Grade 4 lesson planning. The approach combines quantitative survey data with qualitative insights from interviews and focus group discussions to ensure a comprehensive understanding of teacher perceptions, ethical concerns, and contextual challenges.

This outlines the procedure

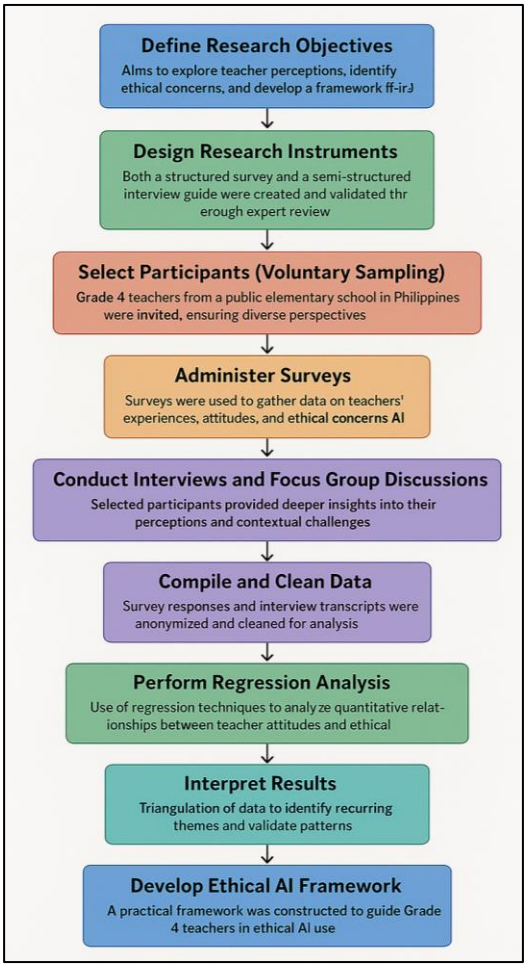


Figure 1. Research Procedures

Participants were selected through voluntary sampling, targeting Grade 4 teachers from public elementary schools in Metro Manila. Recruitment was facilitated through formal invitations coordinated with school administrators. The planned sample includes at least 30 survey respondents and 10–12 participants for interviews and focus groups. This sample size is considered sufficient for exploratory research. Creswell (2014) recommends a minimum of 30 participants for basic statistical analysis, while Guest et al. (2006) suggest that data saturation in qualitative studies often occurs within the first 12 interviews.

The survey instrument was self-developed and informed by the TPACK framework (Chai et al., 2013) and ethical AI literature (Weller, 2020; Hao et al., 2020). It included Likert-scale items, multiple-choice questions, and open-ended prompts to assess teachers' familiarity with AI, perceived benefits and risks, and ethical concerns such as data privacy, bias, and transparency. The interview guide was semi-structured, allowing for consistency across sessions while enabling participants to elaborate on their experiences. Each interview lasted approximately 30–45 minutes and was conducted either in person or via video conferencing.

For the quantitative component, data were cleaned and screened for missing values and outliers. A multiple linear regression analysis was conducted to examine the relationship between teachers' AI usage frequency (independent variable) and their ethical awareness scores (dependent variable). Assumption checks for normality, linearity, multicollinearity, and homoscedasticity were performed to ensure statistical validity. The analysis was conducted using SPSS software.

For the qualitative component, data from interviews and focus groups were analyzed using thematic coding. An inductive approach was used to allow themes to emerge from the data, supported by NVivo software. Coding was conducted in two cycles: initial open coding followed by axial coding to refine categories. To ensure qualitative rigor, the study employed member checking (participants reviewed summaries of their responses), peer debriefing, and an audit trail documenting coding decisions and theme development.

To enhance validity, methodological triangulation was applied by cross-validating findings from surveys with qualitative data from interviews and focus groups (Patton, 1999). For example, patterns identified in survey responses, such as concerns about algorithmic bias, were compared with narratives from interviews to confirm consistency. This process ensured that the emerging framework was grounded in both broad trends and in-depth teacher experiences.

The findings were synthesized to develop a context-sensitive ethical AI framework, anchored in the Framework of Intelligent Learning Platforms (Thongprasit & Wannapiroon, 2021). This model emphasizes user roles, data-driven personalization, and ethical AI functionalities such as transparency, reasoning, and adaptability. The framework aims to guide Grade 4 teachers in making informed, ethical decisions when integrating AI into lesson planning.

FINDINGS AND DISCUSSION

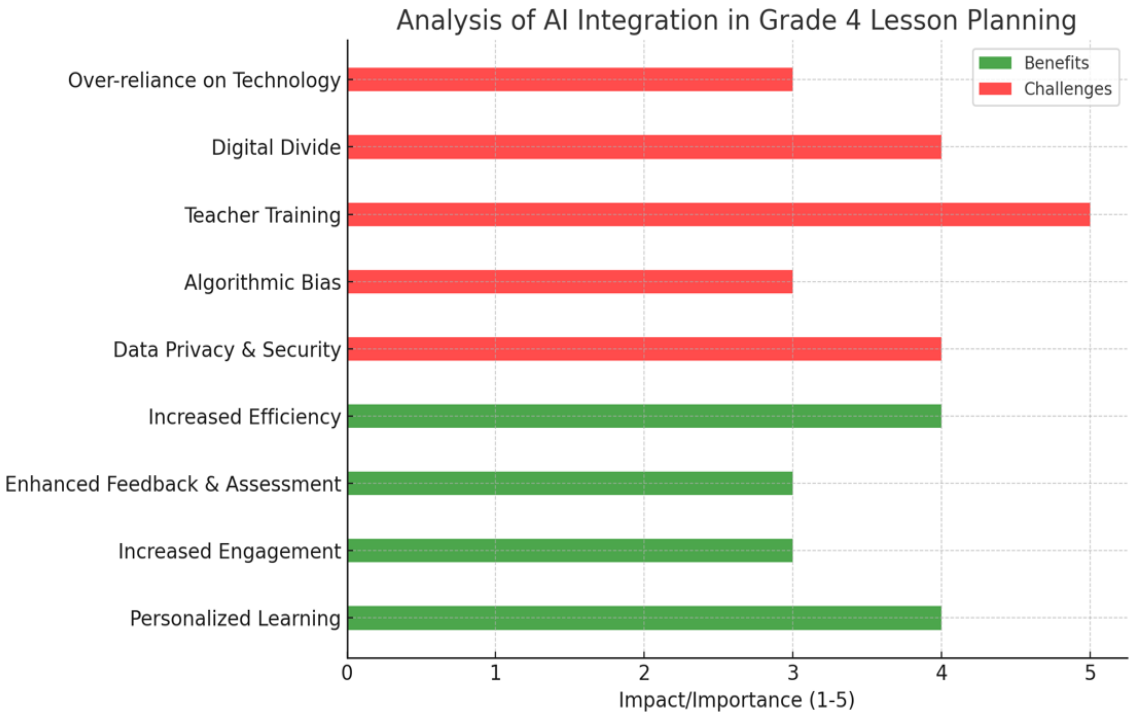
The study also aims to determine the extent of teacher preparedness and the level of support they receive in integrating AI tools into their instructional planning. It considers how factors such as access to technology, training opportunities, and administrative guidance shape the ethical use of AI in lesson creation. A focus is placed on whether teachers can identify potential risks in AI tools, such as biased algorithms or violations of student data privacy. By highlighting both best practices and problem areas, the research hopes to guide future efforts in developing ethical frameworks for AI in basic education.

Table 1. Key Respondent Information

Category	Details
Number of Teachers	30
Gender Distribution	18 Female, 12 Male
Years of Teaching Experience	5–25 years (Mean: 12.3 years)
Grade Level Taught	Grade 4

The learning environment is rapidly evolving as artificial intelligence (AI) is introduced into education. Teachers in the Philippines, particularly at San Agustin Elementary School, are increasingly interested in how artificial intelligence technologies might improve learning. The moral implications of AI in education remain a key concern.

The objective of this research study is to analyze how Grade 4 teachers in San Agustin Elementary School perceive and apply AI in ethical ways as they prepare lessons. This paper explores the opportunities and challenges related to AI implementation within the classroom to maintain ethical and responsible practices towards the welfare and justice of students. It does this by looking into instructor data that concerns AI use frequency, attitude toward AI, implementing ethical standards, and qualitative information.



Graph 1. Analysis of AI Integration in Grade 4 Lesson Planning

The related graph presents a study of the integration of AI in Grade 4 lesson preparation, highlighting the benefits and challenges of this approach. The green bars indicate the benefits, while the red bars indicate the challenges. A number between 1 and 5 is assigned to each factor's importance or effect (see the table in Annex B).

Recently, much attention has been focused on the ethical implications of AI in education regarding the responsible use of AI by educators. Weller's 2020 article thus places emphasis on the need for setting the ethical norms of AI tools in schools.

Weller (2020) highlights that educators must carefully balance the potential benefits of AI, such as individualized learning experiences, against the risks of algorithmic bias and data privacy concerns. His model suggests educators receive training in the critical assessment of AI technologies and their effects on student learning to guarantee that technology promotes educational equity rather than compromises it.

Similarly, Selwyn's (2021) research investigates the relationship between AI and teaching methods. Selwyn (2021) admits that artificial intelligence (AI) could improve the efficiency of lesson planning and assessment, but he is concerned about how teachers' duties will evolve in a society that is becoming more technologically sophisticated.

Table 2. Privacy and Data Protection Concerns

Response Option and Percentage of Respondents	Teacher Comment
Moderately Effective (40%) This aligns with findings from Luckin et al. (2020) suggesting AI can improve lesson planning, but necessitates careful consideration of ethical concerns (Weller, 2020).	Teacher P1: "I see AI as a tool to personalize learning, but I'm cautious about data privacy and bias."

Response Option and Percentage of Respondents	Teacher Comment
Highly Effective (25%), Alenezi (2023) reflects teachers' views that while AI enhances engagement, it also risks student over-reliance and must be used with ethical safeguards like bias mitigation.	Teacher P2: "AI can be very helpful for creating engaging activities, but I worry about students becoming over-reliant on technology."
Not Effective (20%) reflects concerns raised by Selwyn (2021) about AI diminishing teacher roles and the importance of human oversight (Cukurova et al., 2022).	Teacher P3: "I don't think AI can replace the human element in teaching. I prefer to create my materials."
Unsure (15%) highlights the need for teacher training on AI ethics as advocated by UNESCO (2019) and Spillane & Diamond (2021) to navigate AI integration complexities.	Teacher P4: "I'm not sure how to use AI effectively in my classroom. I need more training and guidance."

The data presented in Table 2 reveals a nuanced understanding of teachers' perceptions regarding AI integration in lesson design, particularly with privacy and data protection concerns. A significant portion of respondents (40%) rated AI as moderately effective, aligning with Luckin et al. (2020), who suggest that while AI can enhance lesson planning, ethical considerations such as algorithmic bias and data privacy remain critical (Weller, 2020). Teacher P1's comment reflects this balance, recognizing AI's potential for personalization while expressing caution about bias and privacy risks.

Meanwhile, 25% of teachers found AI to be highly effective, echoing Alenezi (2023), who notes that AI can boost student engagement but must be implemented with safeguards to prevent over-reliance. Teacher P2's perspective supports this, highlighting both the benefits of engaging activities and the concern that students may become too dependent on technology. In contrast, 20% of respondents viewed AI as not effective, a sentiment that resonates with Selwyn (2021) and Cukurova et al. (2022), who warn against the diminishing role of teachers and emphasize the irreplaceable value of human oversight. Teacher P3's preference for creating their materials underscores this skepticism.

Notably, 15% of teachers were unsure about AI's effectiveness, pointing to a broader issue of insufficient training and guidance. This uncertainty aligns with calls from UNESCO (2019) and Spillane & Diamond (2021) for more comprehensive professional development to help educators navigate the complexities of AI integration. Teacher P4's comment illustrates this need, expressing a lack of confidence and clarity in using AI tools effectively.

The gap between the moderately and highly effective ratings may be attributed to contextual factors such as school location and teacher experience. Although the data does not explicitly differentiate between rural and urban educators, disparities in access to technology and support systems likely influence these perceptions. Rural teachers may face infrastructural challenges that hinder effective AI use, while urban teachers might have more exposure but still grapple with ethical concerns. Experience level also plays a role; seasoned educators may be more resistant to AI due to a strong attachment to traditional methods, whereas newer teachers might be more open but lack the necessary training.

Anomalies in the data include the relatively high percentage of teachers who remain unsure, which could indicate systemic gaps in professional development or inconsistent access to AI resources. However, the absence of demographic details such as location and experience level

limits the ability to draw definitive conclusions. Overall, the findings highlight the importance of addressing ethical concerns, providing targeted training, and ensuring equitable access to AI tools to support effective and responsible integration in education.

Table 3. Preserving Human Connection Through Professional Preparedness

Response Option and Percentage of Respondents	Teacher Comment
Positive Impact (70%): A significant majority of teachers perceive the ethical implications of using AI in education for young learners positively. This suggests optimism regarding the potential benefits of AI while acknowledging the need for careful and responsible implementation.	Teacher P7: "I believe AI can be a powerful tool for personalized learning, but we need to ensure student data is protected and used responsibly."
Neutral Impact (20%): A portion of teachers remain neutral in their perception, indicating a need for further information and clarification regarding the ethical considerations of AI in education.	Teacher P5: "I'm not sure how AI will impact the teacher-student relationship. We need to be careful not to let technology replace human interaction."
Negative Impact (5%): A small percentage of teachers perceive the ethical implications negatively, due to concerns about potential risks and challenges.	Teacher P3: "I'm concerned about the potential for bias in AI algorithms to impact how students are assessed and taught."
Unsure (5%): A small group of teachers remains unsure about the ethical implications, highlighting the need for more information and education on the topic.	Teacher P4: "I think AI can be beneficial, but we need clear guidelines and training on how to use it ethically and effectively in the classroom."

The data reveals a generally positive outlook among teachers regarding the ethical implications of using AI in education for young learners. A substantial majority (70%) perceive AI as having a positive impact, particularly in its potential to support personalized learning. This optimism, however, is tempered by concerns about data protection and responsible use, as highlighted by Teacher P7, who emphasizes the importance of safeguarding student information. These concerns are echoed in recent research by Berson et al. (2025), which identifies data privacy, algorithmic bias, and the lack of developmentally appropriate AI design as critical ethical challenges in early childhood education.

Despite the favorable view, a notable gap exists between the majority and the remaining respondents, which may be influenced by contextual factors such as school location and teacher experience. About 20% of teachers expressed a neutral stance, suggesting uncertainty or a lack of sufficient information about AI's ethical dimensions. Teacher P5's comment reflects this ambiguity, particularly regarding the potential impact of AI on the teacher-student relationship. This neutrality may be more prevalent among educators in rural areas or those with limited exposure to AI technologies, where infrastructure and professional development opportunities are less accessible. Additionally, less experienced teachers might be unsure how to critically assess AI's ethical implications, contributing to this middle-ground perspective.

Only 5% of respondents viewed AI's ethical impact negatively, citing risks such as

algorithmic bias and fairness in student assessment. Teacher P3's concern about biased algorithms underscores the need for transparent and equitable AI systems in education. Another 5% of teachers remain unsure, as illustrated by Teacher P4's call for clearer guidelines and training. This uncertainty points to a broader limitation in the current educational framework: the lack of comprehensive professional development focused on ethical AI use. Scholars such as Karpouzis (2024) argue that ethical implementation of AI must be guided by principles that balance innovation with human values, emphasizing the evolving role of educators and the importance of student autonomy.

The relatively small percentages of negative and unsure responses may seem minor, but they highlight critical gaps in understanding and preparedness. These anomalies suggest that while enthusiasm for AI is growing, it is not uniformly supported by adequate training or infrastructure. Furthermore, the absence of demographic data, such as whether teachers are from rural or urban settings or their years of experience, limits deeper analysis. Without this context, it is difficult to determine whether these perceptions are shaped by access to resources, institutional support, or familiarity with technology.

In summary, while most teachers view AI positively in terms of ethical implications, the presence of neutral, negative, and unsure responses reveals underlying gaps in knowledge, training, and access. Addressing these through targeted professional development and clearer ethical standards will be essential for the responsible integration of AI in education.

Table 4. Teacher Readiness and Ethical Awareness in AI Integration

Response Option and Percentage of Respondents	Teacher Comment
Question 8: Teachers rely heavily on analyzing student performance data (40%) and direct observation (35%) to evaluate the effectiveness of AI-assisted tools in improving student engagement. This suggests a focus on measurable outcomes and observable behaviors.	Teacher P1: "I observe how engaged students are when using AI-powered learning games, and I also analyze their performance on assessments."
Question 9: Most teachers (75%) believe AI-assisted tools can enhance students' understanding of ethical issues, with 25% believing it can do so significantly. This indicates a positive perception of AI's role in fostering ethical awareness.	Teacher P8: "I think AI tools can help students understand the importance of data privacy and the ethical implications of using technology."
Question 10: Teachers express a strong interest in professional development opportunities related to AI and ethics, with workshops on AI and ethics (40%) and training in AI tool integration (30%) being the most preferred options. This highlights the need for targeted professional development to support teachers effectively and ethically integrating AI into their practice.	Teacher P9: "I would benefit from workshops that not only teach me how to use AI tools but also address ethical considerations and potential biases."

The data from Table 4 reveals a growing awareness among teachers regarding the ethical and practical dimensions of AI integration in education. When evaluating the effectiveness of AI-assisted tools in enhancing student engagement, 40% of teachers rely on student performance data,

while 35% depend on direct observation. This indicates a strong preference for measurable and observable outcomes, as reflected in Teacher P1's comment about monitoring engagement through AI-powered learning games and assessment results. However, the gap between these two evaluation methods may suggest differences in access to technology or training. For instance, teachers in urban schools may have more access to digital tools that facilitate data analysis, while those in rural areas might rely more on traditional observation due to limited infrastructure.

In terms of ethical awareness, a significant majority (75%) of teachers believe that AI tools can help students understand ethical issues, with 25% believing this impact can be substantial. Teacher P8's remark about AI fostering awareness of data privacy and responsible technology use supports this perception. This optimism may be influenced by teachers' exposure to digital citizenship frameworks or prior training in technology ethics. However, the data does not specify whether these views differ by experience level, which is a limitation. It is possible that more experienced teachers, having witnessed various educational reforms, are more cautious, while newer teachers may be more enthusiastic but less informed about ethical risks.

Professional development emerges as a critical need, with 40% of teachers preferring workshops on AI and ethics and 30% seeking training in AI tool integration. Teacher P9's comment underscores the importance of learning not just how to use AI tools, but also how to address ethical considerations and biases. This demand for training suggests that while teachers recognize the potential of AI, they feel underprepared to implement it responsibly. An anomaly worth noting is the absence of responses indicating resistance to AI, which may reflect a sample bias, perhaps those more open to AI were more likely to participate in the study.

Overall, the findings highlight a dual focus among educators: the need for technical competence in evaluating AI tools and the importance of ethical literacy in guiding their use. However, limitations such as the lack of demographic data (e.g., rural vs. urban location, years of experience) restrict deeper analysis. Addressing these gaps through targeted professional development and inclusive policy frameworks will be essential for supporting teachers in the ethical and effective integration of AI in education.

Table 5. Ethical Integration and Equity in AI-Enhanced Learning

Teacher/s Comment	Analysis
Teacher P1: "Developing age-appropriate assessments that test students' knowledge of AI ethics through scenarios and case studies is crucial, as concerns exist about the potential for AI to perpetuate existing biases and inequities in education."	The qualitative data suggests that a comprehensive assessment framework for student understanding of AI ethics should include age-appropriate assessments, incorporate ethical discussions and reflections into lesson plans, and involve observing student interactions with AI tools, while simultaneously addressing concerns about algorithmic bias (Selbst & Powles, 2017), over-reliance on technology (Selwyn, 2021), and the digital divide to ensure equitable access to AI resources and prevent the marginalization of any student group.
Teacher P8: "Incorporating ethical discussions and reflections into lesson plans, while having students create projects that address AI ethics, is crucial to ensure that AI tools are used to enhance learning and not replace human interaction and creativity."	
Teacher P9: "Using observational data to assess how students interact with AI tools and how they apply ethical considerations in their learning is crucial, while simultaneously being mindful of the digital divide and ensuring that all students have equal	

Teacher/s Comment	Analysis
access to technology and AI-powered learning resources."	

The qualitative data from Table 5 reveals a strong consensus among teachers on the importance of ethically integrating AI into classroom instruction, particularly through age-appropriate assessments and reflective learning activities. Teacher P1 emphasizes the need for assessments that explore AI ethics through scenarios and case studies, citing concerns about algorithmic bias and educational inequities. This aligns with findings by Selbst and Powles (2017), who warn that AI systems can unintentionally reinforce societal biases if not carefully designed. Teacher P8 further advocates for embedding ethical discussions into lesson plans to ensure that AI enhances learning without replacing human interaction and creativity, a concern echoed by Selwyn (2021), who cautions against over-reliance on technology in education. Teacher P9 highlights the importance of using observational data to evaluate how students engage with AI tools and apply ethical reasoning, while also being mindful of the digital divide. The gap in perception may stem from disparities in access to resources and training between rural and urban schools. Urban teachers often have greater exposure to AI tools and professional development opportunities, which may explain their more confident stance on ethical integration. In contrast, rural educators may face infrastructural limitations that hinder both access and implementation, contributing to uncertainty or cautious optimism. Experience level also plays a role; veteran teachers may be more skeptical of AI's role in replacing traditional pedagogies, while newer teachers might be more open but less equipped to navigate its ethical complexities. An anomaly worth noting is the absence of resistance to AI among respondents, which could indicate a sampling bias, perhaps only those already interested or engaged in AI integration participated in the study.

Recent research supports these observations. Gillani et al. (2023) emphasize the need for educators to develop AI literacy and collaborate with developers to ensure ethical and equitable design. Similarly, Betaubun et al. (2025) highlight the dual potential of AI tools like ChatGPT to enhance learning while raising concerns about equity and access, particularly for students from lower socioeconomic backgrounds. These findings reinforce the need for comprehensive frameworks that guide ethical AI use in education, ensuring that all students benefit regardless of their background or location.

In the evolving landscape of artificial intelligence in education and governance, the notion of a "right to an explanation in everything but name" refers to the growing expectation that AI systems should be understandable and accountable, even when formal legal rights to explanations are not explicitly granted. This concept implies that while users may not be legally entitled to a detailed breakdown of every algorithmic decision, institutions and developers are increasingly expected to provide functional transparency, a level of clarity sufficient to support scrutiny, trust, and redress.

Selbst and Powles (2017) argue that qualified transparency plays a crucial role in enabling accountability. Rather than demanding full algorithmic disclosure, which may be technically infeasible or legally restricted, qualified transparency focuses on providing contextual and operational insights that allow stakeholders, such as teachers, students, and policymakers understand how AI systems influence outcomes. This includes explaining the logic behind decisions, the data inputs used, and the potential limitations or biases embedded in the system.

In educational settings, this concept is particularly relevant. Teachers using AI tools to support lesson planning or student assessment may not need to understand every line of code, but they do require clear, actionable information about how the system works, what data it uses, and

how it might affect different learners. This form of transparency supports ethical integration, empowers educators to make informed decisions, and fosters trust in AI systems without overwhelming them with technical complexity.

Ultimately, establishing a de facto right to an explanation through qualified transparency ensures that AI remains a tool for empowerment rather than exclusion. It bridges the gap between technical opacity and ethical responsibility, reinforcing the idea that accountability in AI is not just about access to information, but about the ability to act on it meaningfully.

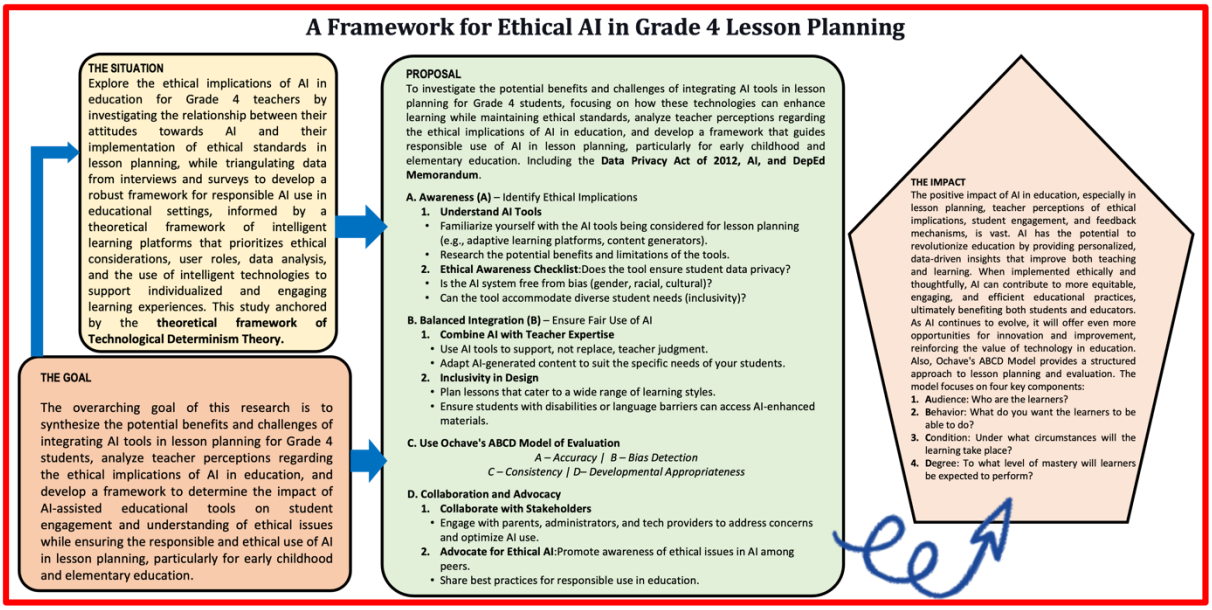


Figure 2. A Framework for Ethical AI in Grade 4 Lesson Planning

The framework provides a strong foundation for studying the ethical use of AI in Grade 4 education. It emphasizes the importance of exploring teacher perceptions, the moral implications of AI, and how these influence curriculum design. Using an infographic, the research introduces the "Situation" by examining how teachers integrate ethics into AI-supported lesson planning, employing surveys and interviews for data triangulation. The study has three main goals:

- Analyze teacher perceptions of AI.
- Discuss the benefits and drawbacks of AI implementation.
- Develop an ethical framework for AI use in lesson planning.

The "Proposal" section outlines a research strategy focused on responsible and ethical AI use in early education. The "Impact" emphasizes AI's potential to enhance teaching and personalized learning, benefiting both students and teachers while maintaining ethical standards. Ultimately, this work aims to help educators, policymakers, and developers create a balanced approach to AI that improves learning outcomes without compromising on ethics.

CONCLUSIONS

This study finds that Grade 4 teachers view AI as a valuable tool for lesson planning and personalized learning, but they also express concerns about data privacy, algorithmic bias, and equitable access. To address these issues, the study recommends ethical frameworks and targeted professional development.

A key contribution is the proposed expansion of the TPACK framework to include ethical reasoning, ensuring that educators consider the broader implications of AI use in classrooms.

The study suggests practical steps such as mandatory AI ethics training, national policy guidelines, and integration of ethical AI use in teacher education. Overall, it calls for responsible and inclusive AI integration, empowering teachers with both technical skills and ethical awareness to shape a fair and future-ready education system.

LIMITATION & FURTHER RESEARCH

The findings of this study reveal that while Grade 4 teachers recognize the potential of AI to enhance lesson planning and student engagement, their perceptions are shaped by concerns over data privacy, algorithmic bias, and the need for professional development. However, the study's design presents limitations that may have influenced these interpretations. The reliance on voluntary sampling may have led to a participant pool that is not fully representative, potentially skewing the results toward those more familiar or comfortable with AI. Additionally, the study was confined to a single school context, limiting the generalizability of the findings across different educational settings. The qualitative nature of the data, while rich in insight, may not fully capture the complexity of AI integration or the diversity of teacher experiences. Furthermore, the absence of student perspectives restricts a holistic understanding of AI's classroom impact. These limitations underscore the need for further research that includes broader and more diverse samples, longitudinal studies to track evolving perceptions, and the inclusion of student voices. Such efforts would help fill existing knowledge gaps and support the development of more robust, inclusive, and ethically grounded frameworks for AI use in education.

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