



# AI Literacy in Education: Balancing Innovation, Ethics, and Equity in the Digital Age

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## Original Research

## Abstract

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Artificial Intelligence (AI) is rapidly reforming education by transforming how learning materials are accessed, personalized, and delivered. Its integration into classrooms and higher education offers opportunities to foster deeper engagement, enhance literacy, and provide adaptive support for learners with diverse needs. AI also empowers educators by streamlining assessment, facilitating differentiated instruction, and opening new possibilities for collaborative learning. Despite this potential, significant challenges accompany AI adoption. Concerns over data privacy, unequal access, and algorithmic bias, threaten to exacerbate existing educational inequalities and undermine trust in digital technologies. These issues highlight the importance of approaching AI not merely as a technological innovation, but as a social practice requiring transparency, accountability, and ethical safeguards. This paper reviews current literature on AI in education, critically evaluates its ethical and pedagogical implications, and outlines strategies for responsible integration. By foregrounding principles of fairness, inclusivity, and learner protection, the study advocates for the development of AI literacy among both educators and students. The conclusion emphasizes the need for a balanced framework that leverages AI's benefits while mitigating risks, ensuring its role in building equitable, future-ready educational systems.

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## 1. Introduction

Artificial Intelligence (AI) literacy has transitioned from being a forward-looking concept to becoming a vital element in modern education as schools and universities undergo rapid digital transformation. AI's pedagogical promise is considerable: it enables learning to be personalized, supports diverse learner profiles, and increases engagement through interactive, adaptive platforms (Du & Daniel, 2024; Jia et al., 2022). In language education, for example, AI-powered tools contribute to vocabulary growth, listening comprehension, and oral fluency by offering automated feedback and computer-assisted learning systems (Barjesteh & Isae, 2024; Zou & Wang, 2024). Such

applications not only improve retention but also prepare learners for participation in a workforce that increasingly depends on AI technologies (Vijayarajam et al., 2025). Despite these advantages, the adoption of AI in education raises complex issues. Concerns related to data protection, ethical management, and the large-scale collection of student information call for clear policies and strong safeguards (UNESCO, 2021; Arab et al., 2025). Bias embedded in algorithms often stemming from unrepresentative datasets or exclusive design practices can reinforce inequalities and perpetuate stereotypes (Isae & Barjesteh, 2025a). Moreover, overreliance on automated grading and instruction prompts questions about the evolving role of teachers, and the necessity of maintaining creativity, empathy, and

critical reasoning in classrooms (Isaac & Barjesteh, 2025a; Baskara, 2023).

Access inequities add another layer of challenge. Students from marginalized or resource-limited communities may not have reliable access to AI-driven tools, which risks widening the digital divide (Azamatova et al., 2023). Bridging this gap requires targeted policies and localized solutions adapted to cultural and contextual needs (Arqam & Asrifan, 2024; Isaac, Barjesteh, & Rad, 2024).

This paper therefore calls for the development of robust AI literacy. Such literacy must go beyond technical skills, incorporating ethical reflection, critical awareness, and responsible decision-making (Isaac & Barjesteh, 2024; Luckin et al., 2016). Empowering both educators and students with this broader understanding ensures that AI strengthens, rather than undermines, human-centered values of inclusivity and fairness. Ultimately, advancing AI literacy is not only key to supporting academic progress but also essential to preparing students for meaningful engagement in a society increasingly shaped by intelligent systems (Moundridou et al., 2024; Zhai et al., 2024).

### 1.1. Understanding AI Literacy in Educational Contexts

AI literacy encompasses more than simple recognition of artificial intelligence; it requires a deep understanding of how AI systems function, their advantages, limitations, and the ethical questions they raise (Luckin et al., 2016). Taking this multidimensional view equips individuals with the ability to navigate the challenges of a world where intelligent technologies increasingly shape everyday life.

Central to AI literacy is the cultivation of critical thinking that enables learners to question how algorithms work, how decisions are generated, and what consequences follow from their use. As AI becomes embedded in decision-making across sectors such as healthcare, education, law, and employment, fostering a well-informed and critically aware citizenry is essential for responsible adoption (Du & Daniel, 2024; Jia et al., 2022). Educators play a pivotal role in this process, encouraging problem-solving, adaptability, and intellectual curiosity among students (Barjesteh & Isaac, 2024; Arab et al., 2025).

However, the expansion of AI technologies also intensifies social and ethical concerns. The widespread use of personal data raises issues of privacy and consent (UNESCO, 2021), while algorithmic bias often resulting from flawed or incomplete datasets—can reproduce social inequities within education and beyond (Baskara, 2023). Moreover, overdependence on automated grading or instructional platforms risks marginalizing the human qualities of creativity, empathy, and judgment

that are integral to teaching and learning (Isaac & Barjesteh, 2023b; Baskara, 2023).

AI literacy also extends into civic engagement. As AI influences policy-making and economic development, informed communities are better positioned to hold institutions and corporations accountable for how these technologies are deployed (Azamatova et al., 2023; Vijayarajnam et al., 2025). Through dialogue and critical reflection, societies can contribute to ethical standards and governance models that ensure AI serves the public interest (Moundridou et al., 2024). Alongside these civic and ethical dimensions, AI literacy provides individuals with the technical knowledge necessary to work effectively with AI-driven systems (Zou & Wang, 2024). Ultimately, embedding AI literacy within educational systems prepares students to engage critically, thoughtfully, and responsibly with intelligent technologies. When schools prioritize AI literacy, they not only enhance personal and academic growth but also promote equity and sustainability in future applications of AI (Isaac & Barjesteh, 2025b; Zhai et al., 2024). In this way, AI literacy becomes both a safeguard against misuse and a catalyst for human progress.

### 1.2. Challenges to Achieving AI Literacy in Schools

In today's world, AI literacy has become a core skill rather than an optional add-on, as artificial intelligence increasingly shapes industries, job markets, and everyday experiences (UNESCO, 2021). Yet embedding AI literacy into school curricula is not straightforward. The obstacles extend beyond technical training to encompass access, ethics, and pedagogical readiness (Luckin et al., 2016).

One of the most pressing challenges is the persistence of the digital divide. Many schools, especially in rural or underfunded areas, lack the infrastructure, hardware, and connectivity required to support AI-focused education. This uneven access risks widening educational inequities, leaving disadvantaged learners less prepared for an AI-driven future (Azamatova et al., 2023). Addressing this requires deliberate policies to expand equitable access to devices, internet resources, and open-source platforms (Arqam & Asrifan, 2024). Another obstacle lies in teacher readiness. Teaching AI requires interdisciplinary expertise that blends computing, data science, and ethics. However, many educators receive little to no professional training in these domains, leaving them ill-equipped to guide students effectively (Baskara, 2023). Comprehensive professional development programs are therefore essential, equipping teachers not only with technical skills but also with strategies to address ethical dilemmas, privacy issues,

and the broader social implications of AI (Heilala et al., 2023).

Curriculum development presents further difficulties. The rapid pace of technological change means that educational content often lags behind, becoming outdated within a few years. Students thus need more than foundational knowledge; they must also cultivate adaptability and critical thinking to engage with continuously evolving AI applications (Du & Daniel, 2024; Lai & Lee, 2024; Zhai et al., 2024).

Ethical considerations add another layer of complexity. Risks such as algorithmic bias, surveillance, and excessive data collection can undermine fairness and compromise student privacy if left unaddressed (Moundridou et al., 2024). Integrating ethical reasoning into AI education is therefore crucial, enabling learners to appreciate both the benefits and dangers of emerging technologies (Vijayarajam et al., 2025). Without clear strategies and coordination, however, initiatives risk being fragmented and unsustainable. Inclusive dialogue among educators, students, policymakers, and other stakeholders is necessary to ensure curricula reflect diverse perspectives and prepare learners to help shape AI's ethical and societal frameworks (Moundridou et al., 2024; Zou & Wang, 2024; Song et al., 2023).

### 1.3. Developing a Comprehensive AI Education Framework

Advancing AI literacy requires the establishment of a clear and adaptable educational framework. Such a framework should define age-appropriate learning objectives, milestones, and outcomes, while allowing flexibility to address diverse needs, varying skill levels, and different levels of technological access (Heilala et al., 2023).

For younger learners, the focus should be on foundational skills such as logical reasoning, sequencing, and problem-solving. Activities like coding games, logic puzzles, and interactive exercises can serve as engaging entry points to algorithmic thinking. Simple programming environments, such as Scratch or Blockly, introduce learners to concepts of flow, patterns, and decision-making in ways that are both playful and educational. These experiences spark curiosity and lay the groundwork for deeper engagement with AI as students' progress.

As students move into middle and secondary education, the curriculum should expand to include technical aspects such as data analysis, machine learning, and neural networks (Azamatova et al., 2023). At these stages, learners can experiment with projects that apply AI concepts to real-world scenarios, such as building chatbots or developing predictive models. Case studies

that explore AI's applications in healthcare, finance, or the arts help students understand its societal impact and limitations.

Beyond technical training, this framework must integrate ethical and social dimensions. Students should be encouraged to consider questions of fairness, accountability, and bias in AI design. By examining both positive applications and potential harms, learners gain a balanced understanding of AI's transformative role in society (Zhai et al., 2024).

A comprehensive framework, therefore, does not merely prepare students to use AI tools but equips them to engage with AI critically and responsibly. By combining hands-on technical learning with ethical reflection, schools can ensure students acquire the skills and judgment necessary to navigate and shape an AI-driven future.

### 1.4. Collaborative Partnerships with Industry, Academia, and Policymakers

Strengthening AI education depends not only on curriculum design but also on collaboration between schools, technology companies, universities, and policymakers. These partnerships provide learners with authentic opportunities to engage with current AI tools, resources, and professional practices (Song et al., 2023). Industry involvement can take multiple forms: guest lectures, workshops, or mentorship programs led by AI practitioners expose students to real-world expertise and innovations. Internships and hands-on projects allow learners to apply classroom knowledge in professional contexts, working alongside engineers, data scientists, and researchers. Such experiences help students develop essential skills, including coding, analytical thinking, and teamwork, while also fostering insight into the practical uses of AI (Arqam & Asrifan, 2024).

Academic collaborations can bridge theory and practice by connecting schools with universities and research institutions.

This not only introduces learners to the latest advancements but also provides teachers with professional development opportunities. Policymakers play an equally crucial role by ensuring that supportive regulations, funding, and standards are in place to sustain AI literacy initiatives.

Through cross-sector collaboration, education systems can move beyond isolated efforts and create a more cohesive ecosystem for AI literacy. These partnerships ensure that learners are not only exposed to the technical aspects of AI but also encouraged to reflect on its ethical, cultural, and social implications, preparing them for active and responsible participation in the AI-driven world.

### 1.5. Utilizing Open-Source Platforms and Online Resources

The growth of open-source platforms and online learning tools has significantly expanded access to AI education. These resources allow students to explore AI concepts at their own pace, ranging from introductory topics to advanced techniques in machine learning. Online courses and tutorials provide flexible opportunities for learners who may not have access to traditional classroom instruction, while also enabling them to specialize in areas of personal interest.

Open-source libraries such as TensorFlow, PyTorch, and Scikit-learn are particularly valuable for hands-on practice. By working with real datasets and models, students gain practical coding and analytical experience, which helps bridge the gap between theoretical learning and real-world application. Many of these platforms also foster collaboration through community forums, where learners can share ideas, troubleshoot problems, and connect with a global network of peers and practitioners. These freely accessible resources play an important role in addressing inequities in AI education. Students in underfunded schools or remote areas, who may lack access to advanced infrastructure, can still engage meaningfully with AI through online platforms. By integrating open-source tools into classrooms or encouraging independent exploration, educators can ensure wider participation and reduce barriers to AI literacy.

In short, the availability of open-source and digital platforms has transformed AI education from an exclusive field into a more inclusive and scalable opportunity, enabling learners everywhere to build relevant knowledge and skills.

### 1.6. Creating an Inclusive AI Education Ecosystem

Building an inclusive environment is essential to ensure that AI education benefits learners from all backgrounds, especially those who are often underrepresented in technology fields. Programs such as AI-focused camps, hackathons, and outreach initiatives can spark interest in AI while providing supportive spaces where students collaborate, experiment, and develop skills. Offering scholarships, mentorship opportunities, and internships to learners from marginalized communities further helps diversify the future AI workforce (Luckin et al., 2016). Equity also depends on how educators approach teaching. Teachers should be trained to recognize unconscious biases within curricula and classroom practices, ensuring that all learners feel welcomed and empowered to pursue AI education. By actively promoting diversity, schools can create spaces where

every student, regardless of gender, socioeconomic status, or cultural background, has the chance to contribute to shaping AI's future.

Fostering inclusivity in AI education is not only a matter of fairness but also a way to enhance innovation. Diverse perspectives bring richer problem-solving approaches, encouraging the development of ethical, socially responsible, and impactful AI technologies. By embedding inclusivity into the design of AI education ecosystems, schools can prepare students to participate meaningfully in a technological future that reflects and serves the needs of all communities.

### 1.7. The Role of Educators in Promoting AI Literacy

Teachers play a central role in embedding AI literacy into education. By weaving AI-related concepts into subjects such as mathematics, science, social studies, and the humanities, educators can provide students with a holistic understanding of how AI intersects with different domains. For example, algorithms and data analysis can be introduced in mathematics, machine learning models can be explored in science, and ethical debates about AI can be discussed in humanities classes. This interdisciplinary approach helps students see AI as part of their broader learning journey rather than as an isolated subject.

Innovative teaching strategies are also key. Project-based learning allows students to tackle real-world challenges, applying AI concepts to practical problems. Group projects, hackathons, and collaborative tasks not only encourage teamwork but also strengthen communication and problem-solving skills (Zhai et al., 2024). Interactive simulations and AI-driven platforms provide additional opportunities for students to experiment with models and datasets, offering immediate feedback that deepens their understanding of how AI systems learn and adapt over time. For educators to guide students effectively, ongoing professional development is essential. Workshops, webinars, and conferences enable teachers to stay updated with the latest AI advancements and pedagogical approaches. Building supportive networks among educators where resources, strategies, and challenges are shared further strengthens teaching capacity. Schools can facilitate this by organizing regular collaborative meetings across disciplines and institutions. Beyond the classroom, educators also serve as advocates for integrating AI literacy into national and regional curricula. By working with policymakers, they can ensure AI education receives recognition and resources as a fundamental component of modern learning. Importantly, teachers shape students' attitudes toward technology, instilling curiosity, responsibility, and adaptability. With this

guidance, students are better prepared to become not just competent users of AI, but also ethical innovators and leaders in an AI-driven society.

## 2. Strategies for Enhancing AI Literacy

Expanding AI literacy requires coordinated efforts among educators, researchers, policymakers, and industry experts. Such collaboration can create inclusive and comprehensive programs that integrate AI concepts across different educational levels while responding to the diverse needs of learners (Arqam & Asrifan, 2024).

### 2.1. Developing a Structured AI Education Framework

The first step is establishing a clear framework that sets out objectives and expected outcomes for students at each stage of learning. This structure should remain flexible to accommodate varying ages, abilities, and levels of technological exposure (Moundridou et al., 2024; Zou & Wang, 2024; Song et al., 2023).

#### 2.1.1. Early education

Young learners should focus on building logical reasoning, sequencing, and problem-solving abilities. Activities like coding puzzles, visual programming (e.g., Scratch), and interactive games can introduce algorithms and decision-making in an accessible way.

#### 2.1.2. Secondary education

Older students should progress to advanced areas such as machine learning, neural networks, and data analysis. Practical projects like designing simple chatbots, analyzing datasets, or creating predictive models allow learners to see how AI is applied in real-world contexts (Arqam & Asrifan, 2024; Luckin et al., 2016).

Interdisciplinary projects connecting AI with ethics, mathematics, and social sciences encourage critical engagement.

#### 2.1.3. Building Partnerships with Industry and Academia

Collaboration with technology companies, universities, and research organizations enriches AI education by providing authentic learning opportunities. Guest lectures and workshops led by professionals expose students to current developments, while mentorship and internship programs allow them to gain practical experience alongside experts (Arqam & Asrifan, 2024). These connections help bridge the gap between classroom knowledge and industry practice.

#### 2.1.4. Promoting Interdisciplinary Learning and Real-World Applications

AI literacy goes beyond technical competence it also includes awareness of ethical, social, and environmental implications. Case studies from healthcare, education, law, or the arts can highlight AI's benefits and potential risks, such as bias, privacy concerns, and job displacement.

Collaborative projects that combine perspectives from computer science, ethics, sociology, and policy-making encourage students to evaluate AI within a broader societal framework.

### 2.2. Creating Inclusive Opportunities

Ensuring access for underrepresented groups is crucial to building a diverse AI-literate society. Outreach programs, scholarships, hackathons, and mentorship initiatives can inspire students from marginalized communities to pursue AI. At the same time, teachers should be trained to identify and address unconscious bias in curricula so that AI education remains welcoming and equitable for all learners.

By integrating these strategies, schools can foster not only technical proficiency but also ethical and critical engagement with AI, preparing students to navigate and shape the future responsibly.

#### 2.2.1. Defining AI Literacy in Education

AI literacy goes far beyond the ability to operate AI-based applications; it represents a comprehensive set of skills that enable learners to interpret, evaluate, and engage critically with AI technologies. In essence, it functions as a bridge connecting the fast-paced advancements of AI with the needs of education. True AI literacy entails not only an awareness of how AI tools function but also an understanding of the algorithms that drive them and their wide-ranging applications across multiple domains. Developing such literacy involves examining ethical dilemmas, social implications, and economic consequences that arise as AI reshapes the modern world (Zou & Wang, 2024).

Students who acquire AI literacy learn to analyze how these systems are trained, the types of data they rely upon, and the limitations and biases embedded within them.

Recognizing these aspects equips learners to look beyond surface-level usage and understand the broader consequences of technological decisions. By instilling these skills, schools move students away from being passive users of digital tools, preparing them instead to participate actively in the evolution of AI.

Because AI influences nearly every aspect of contemporary life from healthcare and governance to finance and entertainment literacy in this field also

empowers students to contribute meaningfully to discussions on AI governance. Key issues include regulations surrounding AI, transparency in algorithmic decision-making, and the pursuit of socially beneficial applications of AI.

Learners who are well-versed in these matters are not only capable of using AI responsibly but also positioned to challenge inequities, promote ethical practices, and support the development of technologies that prioritize justice, fairness, and accountability.

### 2.2.2. Barriers to Implementing AI Literacy in Education

A major challenge in advancing AI literacy lies in the unequal distribution of resources among educational institutions (Belmekki & Koumachi, 2024). Schools in rural or underfunded areas often lack the technological infrastructure required to introduce students to AI in meaningful ways.

Essential tools such as high-speed internet, computers, tablets, or specialized software are frequently unavailable, leaving many learners without opportunities to engage with modern technologies. This imbalance deepens the digital divide and perpetuates inequalities in learning outcomes, with disadvantaged students missing out on the skills necessary to navigate an AI-driven future (Moundridou et al., 2024; Zou & Wang, 2024).

Addressing these disparities requires sustained investment in teacher development (Isaac & Barjesteh, 2023). Educators need not only access to quality training but also consistent support and opportunities to collaborate with peers and experts. Without sufficient funding, time, and institutional backing, teachers cannot build the expertise and confidence needed to integrate AI concepts effectively into their classrooms.

Another obstacle stems from the absence of a unified and comprehensive curriculum framework for AI education (Belmekki & Koumachi, 2024). In many contexts, schools lack standardized teaching materials and guidelines, leaving instructors to rely on scattered resources or design their own lessons, often without alignment to local standards.

Convincing policymakers and administrators to prioritize AI education can also be difficult, particularly when budgets are tight and other pressing priorities compete for attention. Nevertheless, treating AI literacy as an optional add-on rather than an essential skill risks leaving students unprepared for future societal and economic demands.

Finally, the ethical dimensions of AI present additional complications. Issues such as bias, privacy, accountability, and the potential misuse of AI technologies require that teachers not only understand

technical content but also guide students through critical discussions about these concerns (Zou & Wang, 2024; Belmekki, M., & Koumachi, 2024).

Unfortunately, many educators lack the resources or institutional support to address such complex questions adequately. Without tackling these ethical challenges head-on, the goal of comprehensive AI literacy remains incomplete.

### 2.2.3. The Role of Innovative Curriculum Design

Designing innovative curricula is central to building AI literacy, as it ensures that students not only grasp technical aspects but also appreciate the wider social, ethical, and practical consequences of these technologies. To achieve this, schools must embed AI concepts across different subjects and grade levels, tailoring content to be both age-appropriate and contextually relevant. A gradual, scaffolded approach enables students to begin with simple foundations and progress toward advanced knowledge, equipping them to navigate the rapidly changing digital world with confidence.

At the elementary stage, learning should focus on basic principles of computational thinking the groundwork of AI. Core skills such as logical reasoning, pattern recognition, problem-solving, and algorithmic thinking can be introduced through playful, interactive methods. Activities like coding games, block-based programming tools (e.g., Scratch or Blockly), and hands-on projects help children understand how algorithms operate in practice. Such experiences not only spark curiosity but also foster critical thinking skills that will support deeper AI learning in later years.

In secondary school, the curriculum should expand to cover more sophisticated AI topics. Students can engage in projects that involve building simple AI systems, analyzing datasets, or experimenting with chatbots and machine learning models. Practical applications encourage them to connect theoretical concepts with real-world contexts, while simultaneously developing technical proficiency.

Equally important is the integration of ethics into AI education. Alongside technical training, students should examine issues such as algorithmic bias, data privacy, automation's social consequences, and the ethical use of AI in decision-making. These discussions allow learners to reflect critically on moral dilemmas and to consider how AI can be designed and applied responsibly. Early exposure to such debates ensures that students mature into conscientious digital citizens who value fairness and accountability. Interdisciplinary approaches further enrich this process (Zou & Wang, 2024). For example, science classes might explore AI applications in

environmental conservation, while health-related subjects could examine its role in diagnostics and personalized medicine. Similarly, arts courses may engage with AI-generated music, visual art, or literature. By demonstrating how AI intersects with a variety of disciplines, students gain a well-rounded understanding of its diverse applications and its profound influence on society.

### 3. Developing a Comprehensive AI Education Framework

Promoting AI literacy requires the establishment of a clear and systematic educational framework that outlines learning goals, milestones, and outcomes at every stage of schooling (Isaac & Barjesteh, 2023; UNESCO, 2021). Such a framework should remain flexible enough to accommodate differences in technological access, students' prior knowledge, and diverse learning needs, ensuring that all learners can progress toward advanced levels of AI understanding.

For younger learners, the emphasis should be on foundational skills such as logical reasoning, sequencing, and problem-solving. Coding games, puzzles, and interactive simulations can introduce the principles behind algorithms and decision-making processes in engaging ways. Visual programming tools like Scratch or Blockly provide opportunities for students to explore these concepts through playful experimentation. These early encounters foster curiosity while laying the groundwork for later, more complex AI learning.

As students reach middle and high school, the curriculum must expand to incorporate advanced areas such as data analysis, machine learning, and neural networks.

At this stage, students can design simple predictive models, build chatbots, or run simulations that highlight how AI is used in real-world problem-solving. Ethical and social considerations such as privacy concerns, fairness in algorithms, and AI's potential to influence public discourse should also be integrated into the curriculum. Embedding such discussions alongside technical practice helps students to see AI not just as a tool, but as a transformative force with both opportunities and risks (Du & Daniel, 2024; Jia et al., 2022).

Case studies can further strengthen this framework by illustrating AI's role in diverse sectors, from healthcare and finance to entertainment and education. Through such examples, students learn how AI technologies are applied across industries and how they contribute to addressing societal challenges.

In doing so, the framework not only builds technical competence but also cultivates ethical awareness and critical thinking.

#### 3.1. Fostering Collaborative Partnerships with Industry, Academia, and Policymakers

Strengthening AI education requires close collaboration between schools, technology companies, researchers, and policymakers. Partnerships of this kind expose students to advanced tools, platforms, and expertise, providing them with the knowledge and experience needed to enter an AI-driven workforce.

Industry involvement can be particularly impactful. Through internships, mentorships, workshops, and AI-focused boot camps, students gain opportunities to apply classroom knowledge in professional environments. Working alongside experts in areas such as machine learning, robotics, or data science bridges the gap between theory and practice, ensuring that students acquire both technical and soft skills relevant to emerging job markets. Guest lectures and collaborative projects also allow learners to see firsthand how AI operates across different sectors, enriching their academic journey (Zou & Wang, 2024).

Policymakers also play a decisive role in shaping the future of AI education. By supporting open-source resources and platforms, they make it possible for schools with limited infrastructure to provide students with practical, hands-on experience. These tools not only enable experimentation with coding and machine learning but also connect learners to global communities where collaboration, problem-solving, and knowledge exchange are encouraged. In addition, online learning materials and open-access repositories help reduce disparities between well-funded and under-resourced schools. Students from disadvantaged backgrounds can still engage with AI education through virtual platforms, ensuring broader participation in the digital economy. By integrating these resources into curricula, educators can create more equitable access to AI training and prepare students for future opportunities in the field.

#### 3.2. Promoting Interdisciplinary Learning and Real-World Applications

AI literacy encompasses more than just programming and algorithms; it also involves recognizing how these technologies intersect with social, ethical, and environmental issues. Adopting an interdisciplinary approach allows students to gain a more complete understanding of AI, preparing them to address both its technical functions and its broader implications (Du & Daniel, 2024; Jia et al., 2022).

Learners should be encouraged to examine ethical concerns such as bias in algorithms, transparency,

privacy rights, and the risk of reinforcing inequalities through AI systems.

Using case studies from fields such as healthcare, education, policing, and the arts can illustrate how AI is transforming industries and reshaping global challenges. For example, discussions on climate change, healthcare access, or social justice provide opportunities to analyze how AI might contribute to solutions while also posing new dilemmas.

Projects that combine AI with other areas of study, such as sociology, philosophy, and law, further enrich students' perspectives. These cross-disciplinary engagements reveal the interconnected nature of AI's impact and highlight the responsibilities of developers, policymakers, and users in shaping equitable outcomes. By weaving together technical skills with real-world analysis, students develop the critical thinking necessary to evaluate the consequences of AI and contribute responsibly to its future use.

### 3.3. Creating an Inclusive AI Education Ecosystem

Building an inclusive ecosystem for AI education is essential to ensure that opportunities extend to students from all backgrounds. Initiatives such as AI-focused camps, hackathons, and outreach programs can encourage learners, especially those from underrepresented groups to explore careers in AI.

These experiences provide hands-on exposure, teamwork, and skill development in environments that inspire creativity and innovation. Scholarships, mentorship schemes, and targeted internships can further support marginalized students, helping to diversify the future AI workforce.

At the same time, educators play a central role in cultivating inclusivity within the classroom. Teachers must be equipped to identify and address unconscious biases that may be reflected in AI-related content or teaching practices. By adopting inclusive pedagogies, schools can create learning spaces that are welcoming and accessible to all learners, regardless of their gender, socioeconomic background, or community. Such efforts empower students to pursue AI education with confidence and contribute to the design of technologies that are fair, ethical, and socially beneficial (Isaee & Barjesteh, 2023; UNESCO, 2021)

In this way, inclusivity becomes more than just an educational principle; it shapes the ethical and societal trajectory of AI itself. An ecosystem that embraces diversity ensures not only that more students gain access to AI education but also that future technologies are developed with a stronger commitment to equity and justice.

## 4. Conclusion

Integrating Artificial Intelligence (AI) literacy into education represents a transformative step toward reshaping teaching and learning across diverse contexts. More than simple technical awareness, AI literacy equips both students and educators with the knowledge and mindset needed to thrive in a society where AI increasingly permeates daily life from work and communication to problem-solving and innovation. By embedding AI literacy within educational systems, learners gain the ability not only to use digital tools but also to critically evaluate, question, and apply them responsibly. One of the greatest advantages of AI literacy lies in its potential to personalize education. With the help of AI-powered platforms, instruction can be adapted in real time to individual learning styles, progress, and needs, fostering deeper engagement and improved outcomes. In addition, developing AI literacy cultivates crucial cognitive skills such as critical thinking and problem-solving, preparing learners to participate actively in the future workforce as innovators and informed decision-makers. Yet, significant obstacles remain. Unequal access to technology, particularly in resource-limited or underserved regions, continues to widen the digital divide. Without proper infrastructure, students in these contexts risk exclusion from the benefits of AI education. Moreover, the complexity of AI concepts poses challenges for teachers, many of whom lack adequate training or professional development opportunities to deliver such content effectively. Addressing these issues will require sustained investment in educator preparation, curriculum development, and infrastructure. Equally important are the ethical dimensions of AI. Concerns over data privacy, algorithmic bias, and misuse of AI tools in education demand careful consideration. Schools must prioritize transparent policies, strong safeguards, and the integration of ethical discussions into the learning process. Students should be encouraged to reflect on how AI can be used responsibly and how it impacts society, ensuring that future AI systems uphold principles of fairness, accountability, and inclusivity. To meet these challenges, collaboration across sectors is crucial. Policymakers, educators, and technology developers must work together to create comprehensive frameworks that embed AI literacy into national curricula and provide schools with the resources they need. Such partnerships will not only make AI education more accessible but also ensure that it is aligned with ethical, social, and cultural values. Ultimately, fostering AI literacy contributes to the development of an equitable and future-ready society. By empowering

students with the ability to engage critically and ethically with AI, education can prepare a new generation of learners to shape technologies that promote progress and positive change. In doing so, schools are not only preparing students for future careers but also nurturing responsible citizens who can guide AI toward serving humanity in just and inclusive ways.

#### Authors Contribution

All authors have contributed equally to prepare the paper.

#### Availability of data and materials

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

#### Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

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