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Türkiye's Vision for Artificial Intelligence in Education: A Document Analysis

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Artificial intelligence (AI) is increasingly reshaping the structure and pedagogy of contemporary education systems. This study examines Türkiye's strategic vision and institutional orientations toward AI in education by analyzing official policy documents and mapping their theoretical foundations within a structured conceptual framework. This study employed a qualitative document analysis design, examining 14 policy documents, strategic plans, ethical guidelines, and curriculum documents published by the Presidency of the Republic of Türkiye, the Ministry of National Education, the Council of Higher Education, and TÜBİTAK between 2021 and 2029. The data were analyzed using thematic content analysis, and the documents were thematically coded using NVivo. The findings indicate that official education policy documents frame AI as a multidimensional paradigm shaped by institutional priorities. AI integration is presented as a predominantly top-down process, with official documents emphasizing advanced engineering applications for secondary education and gifted students, while AI applications for preschool and primary education receive comparatively less attention. AI is portrayed as a tool that supports instructional design while reducing teachers' administrative and academic workload. At the same time, the 'human-in-the-loop' principle is identified as a core safeguard within the national policy framework. The analysis also reveals a restrictive approach to the use of AI in academic assessment. Based on these findings, the study proposes several policy recommendations. These include integrating age-appropriate AI activities into primary education curricula, establishing standardized data anonymization principles to protect student information, and redesigning pre-service and in-service teacher education through practice-oriented professional development aligned with teachers' evolving roles.

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Introduction

Artificial intelligence (AI) is profoundly transforming educational ecosystems. This paradigm shift in knowledge production, transmission, and processing is leading to the replacement of traditional educational models with data-driven, flexible, and personalized approaches. Although this digital transformation represents a technological innovation, it also necessitates structural reform in education (OECD, 2023). In this context, the extent to which education systems are prepared for this transformation and the strategic vision guiding their actions have become critical questions. The primary objective of this study is to examine Türkiye's strategic orientations regarding AI in education through a document analysis of key policy documents published by the Presidency of the Republic of Türkiye, the Ministry of National Education (MoNE), the Council of Higher Education (CoHE), and relevant official institutions. The significance of this study lies in providing a systematic framework for understanding the roadmap outlined in Türkiye's current vision documents, such as the "Türkiye Century Maarif Model" and the "2025–2029 AI in Education Policy Document." This is because national-level policy documents serve as foundational texts that define a country's priorities and ethical boundaries in its technological adaptation process (UNESCO, 2024). Although numerous studies have examined the classroom applications of AI in educational settings, a comprehensive analysis of national-level policy documents can serve as a strategic guide for both policymakers and practitioners.

AI in education has evolved from the rule-based systems of the 1970s to today's large language models (Williamson & Eynon, 2020). The widespread adoption of Generative AI (GAI) tools since the 2020s has accelerated global integration (Chan and Hu, 2023), moving AI from a supporting tool to the core of educational processes (WEF, 2024). Education systems around the world are now developing national strategies aimed not only at utilizing technology but also at equipping students with AI literacy. International organizations have established global frameworks for the ethical and sustainable integration of AI into education, providing baseline standards for ethics, data privacy, and human-centered design. These approaches are outlined in Table 1.

Table 1. Approaches to AI in Education by International Organizations

Organization	Documents
UNESCO	AI and Education: Guidance For Policy-Makers (2021)
OECD	Digital Education Outlook 2026: Exploring Effective Uses of GAI in Education (2026)
European Commission	Proposal for a regulation laying down harmonised rules on AI (AI Act) (2021-2027)
World Economic Forum (WEF)	Shaping the Future of Learning: The Role of AI in Education 4.0 (2024)
The World Bank	AI Revolution in Education: What You Need to Know (2024)

The guiding principles presented in the documents listed in Table 1 emphasize that technology should be viewed not merely as a technical tool, but as a strategic component capable of enhancing the quality of pedagogical processes. In particular, ethical standards and human-centered design principles have become the fundamental parameters defining the role of AI in education. According to the prevailing view in the international literature, AI should be positioned not as a replacement for human intelligence but as a tool that enhances and supports human capabilities (Miao and Shiohira, 2024).

In recent years, Türkiye has articulated its vision for AI in education through the strategic documents it has published. In particular, the "AI in Education Policy Document and Action Plan (2025–2029)" presents one of the most comprehensive roadmaps in this field. Türkiye's strategic framework for AI in education is grounded in a perspective that aims to develop AI technologies using domestic and national resources and integrate it with ethical values (MEB, 2025a). This vision is built upon three fundamental pillars: ethical principles, the production of domestic content, and curriculum alignment. Developed in alignment with the Türkiye Century Maarif Model, this vision positions AI not merely as a technical tool but as a pedagogical component that enriches learning processes.

The pace at which AI technologies are integrated into education systems often outpaces the development of institutional and legal frameworks. This situation creates tension between technology-driven educational processes and pedagogical priorities. This tension carries the risk that technology will take precedence over pedagogical objectives (Selwyn, 2022). Although national AI strategies are being rapidly formalized in policy texts in Türkiye, a systematic analysis of the conceptual foundations and policy documents underpinning these strategies has not yet been examined systematically. The current literature in Türkiye predominantly focuses on the direct effects of generative chatbots and adaptive learning platforms on student achievement (İncemen and Öztürk, 2024; Oruç et al., 2024; Zawacki-Richter et al., 2019). Recent national studies demonstrate these tools reduce cognitive load via immediate feedback, creating personalized pathways that improve academic performance and motivation (Dülger and Gümüşeli, 2023; Meço and Coştu, 2022). However, this trend in the literature generally focuses on micro-level classroom applications, achievement prediction, and stakeholder attitudes. In contrast, there is a distinct research gap regarding the in-depth analysis of macro-level official documents, which reflect national education policies' perspective on AI, their established priorities, and institutional vision, using document analysis methods. This study aims to fill this gap in the literature by analyzing the texts that formalize Türkiye's vision for AI in education and to clarify the theoretical foundations of national AI education policy. The findings aim to shed light on strategic decision-making processes for policymakers guiding AI applications in education. The findings may also provide a foundation for future research. Additionally, the findings may assist educational stakeholders and practitioners in better understanding Türkiye's vision for AI in education and shaping their own practices in line with this vision.

The value of this study lies in its application of a 'policy-mapping' approach to educational texts, delineating the theoretical foundations and official discourse of AI education policy within a systematic conceptual framework. This mapping exercise provides analytical insights that can help policymakers identify potential gaps between high-level strategic goals and concrete implementation plans. For practitioners and educators, the study clarifies the shifting pedagogical vision, specifically the transition from traditional roles to AI-supported teaching, highlighting the proposed roadmap for integrating AI literacy into different educational levels. Furthermore, by situating the National Technology Initiative within the broader AI governance debate, this research presents an instructive case for scholars studying the dynamics between centralized educational systems and rapid technological adaptation. Accordingly, the central research question asks how current national policy documents, strategic plans, ethical guidelines, and curricula articulate the institutional vision, pedagogical approaches, and strategic orientations guiding AI integration into Türkiye's education system. In line with this central research question, the study sought to address the following sub-questions.

(1) How is AI defined in an educational context, and within which conceptual frameworks is it situated?
(2) How do approaches to integrating AI differ across educational levels (primary education, secondary education, higher education, and gifted students)?
(3) In what dimensions is AI literacy addressed and conceptualized?
(4) How is the evolving role of the teacher in the AI era defined, and what strategies are proposed for teacher education?
(5) What are the prominent ethical considerations, pedagogical risks, and technological limitations in the use of AI in education?
(6) What is the future vision and socio-economic outlook presented for building an AI ecosystem within Türkiye's education system?

Methodology

Research Model

This study was conducted using the document analysis approach to determine Türkiye's vision and strategic directions regarding AI in education. Document analysis is a qualitative research method involving the systematic examination of written and visual materials that contain information about the phenomenon under investigation (Bowen, 2009). The use of document analysis was appropriate because it enabled the systematic examination of official policy documents articulating Türkiye's vision for AI in education.

Data Sources

The dataset consisted of high-level policy documents and institutional reports shaping AI strategies, ethical frameworks, curricula, and implementation guidelines in Türkiye. Criterion sampling was employed for data collection. The selection criteria were as follows:.

- Published by relevant official institutions such as the Presidency of the Republic of Türkiye, the Ministry of National Education (MoNE), the Council of Higher Education (CoHE), and the Scientific and Technological Research Council of Türkiye (TÜBİTAK),
- Focused directly on AI,
- Published between 2021 and 2029.

The documents were accessed through the official websites of the respective institutions (cbddo.gov.tr, meb.gov.tr, yegitek.meb.gov.tr, yok.gov.tr, tubitak.gov.tr). The selection of materials was guided by institutional authority, currency, and direct relevance to educational AI strategies. Detailed information about these documents is presented in Table 2.

Table 2. Key Policy Documents and Materials Analyzed

Document Code	Document Title	Publishing Organization	Year
D1	National AI Strategy 2021–2025	Presidency of the Republic of Türkiye	2021
D2	National AI Strategy 2024–2025 Action Plan	Presidency of the Republic of Türkiye	2024
D3	Presidential Annual Program for 2026	Presidency of the Republic of Türkiye	2025
D4	Policy Document and Action Plan on AI in Education (2025–2029)	MEB	2025a
D5	Ethical Guidelines for the Productive Use of AI in Scientific Research and Publications	YÖK	2024

D6	A Guide to the Responsible and Trustworthy Use of GAI in Support Processes	TÜBİTAK	2025
D7	Recommendations on AI Ethics	MEB	2025b
D8	Curriculum for the AI Applications Course (7th and 8th Grades)	MEB	2023d
D9	AI and Machine Learning Course Materials (Secondary Education)	MEB	2023a
D10	Deneyap AI Workbook (Middle School)	TÜBİTAK	2023
D11	AI Tools in Education: A Teacher's Guide	MEB	2024
D12	AI and Education: Applied Prompt Engineering for Teachers and Innovative Learning Strategies with Generative Tools	MEB	2025c
D13	Teacher's Guide to AI Applications (Middle School–High School)	MEB	2023b
D14	BİLSEM Summer School AI Workshop Course Program	MEB	2023c

The documents listed in Table 2 reflect Türkiye's multidimensional approach to AI in education. To facilitate systematic analysis, each document was assigned a code (D1, D2…D14). The distribution by year shows that the vast majority of documents were published in 2023 (f = 5) and 2025 (f = 5). The documents represent a wide range of document types, including high-level strategies and action plans (f = 3), sectoral policy documents (f = 1), ethical guidelines (f = 3), curricula and instructional materials (f = 5), and implementation guides (f = 2).

Data Analysis

Fourteen policy documents were analyzed using an iterative, data-driven thematic content analysis using NVivo software. Thematic content analysis involves synthesizing similarities and differences across textual data derived from the examined policy documents through researcher-developed themes and coding templates (Au, 2007). The analysis involved continuous movement between raw textual data and conceptual abstraction. In the initial open coding phase, the raw texts were analyzed line by line to identify concrete and action-oriented codes. For example, specific phrases in elementary education documents referring to "drag-and-drop tools," "gamified tasks," and "basic algorithmic logic" were clustered to form the initial codes. Through continuous comparative analysis, these micro-level codes were semantically grouped, resulting in the creation of the "Block-Based Approach" subcategory; this category was ultimately synthesized under the overarching theme of "Elementary Education: Awareness." A similar inductive abstraction process was applied to all data segments; thereby ensuring that the "Contextual Focus" presented in the findings directly reflected the summarized abstractions of the raw policy discourse. The data analysis proceeded through the following steps:.

(1) *Review of Documents and Familiarization:* All documents were read with the overall objective in mind to identify their main themes, key points, and general structure.
(2) *Development of the Conceptual Framework:* In line with the theoretical framework and research questions outlined in the introduction, themes and categories (ethics, policy, practice, curriculum, etc.) were identified to guide the analysis.
(3) *Coding and Identification of Categories:* The documents were examined using the established conceptual framework and themes, and relevant sections were coded. The

codes were refined, and contextual focal points were identified by taking into account the relationships and repetitions among the resulting codes.

(4) *Organization and Interpretation of Categories:* The resulting categories were organized in accordance with the research objective and interpreted using direct quotations from the documents.

Trustworthiness

The trustworthiness of this study was established based on the Trustworthiness criteria proposed by Lincoln and Guba (1985).

Document Selection Criteria: The 14 documents analyzed in this study were purposively selected based on specific inclusion and exclusion criteria. Within the scope of the study, a "core document" was defined as a finalized, strategically or pedagogically binding text (such as strategic plans, policy documents, and curricula) explicitly focused on AI in education and published by relevant state institutions (Presidency of the Republic of Türkiye, MoNE, CoHE, TÜBİTAK) between 2021 and 2029. Draft reports, unofficial press releases, and general technology documents mentioning AI but lacking a direct focus on national educational policies were excluded from the dataset.

Data Analysis and Thematic Transformation: The data were analyzed using an inductive thematic content analysis. Within the coding protocol, the raw data were first examined line-by-line to generate initial open codes. These codes were then iteratively compared, merged according to their semantic relationships, and abstracted into broader categories. In the final stage, these categories were synthesized to construct the overarching themes reflecting the structural and pedagogical paradigms of AI in education. Additionally, the "Contextual Focus" statements presented in the findings tables are inductive summaries systematically derived from the semantic relationships of the codes within the relevant category and from the raw data.

Credibility and Confirmability: To ensure credibility, prolonged and in-depth engagement with the documents was maintained, with each document read multiple times to ensure a full understanding of the content. The findings section heavily utilizes direct quotations from the texts to demonstrate that the codes and themes are firmly grounded in the raw data. To ensure confirmability and dependability, the entire process, from code generation to theme construction, was described transparently.

Inter-Coder Reliability: To further enhance the reliability of the study, a randomly selected subset of the documents (approximately 25%, comprising 3 core documents) was independently recoded by a second faculty member experienced in qualitative research. While the initial Miles and Huberman (1994) reliability index reached a robust 83%, the remaining 17% of disagreements provided valuable analytical insights during consensus meetings (Miles and Huberman, 1994). The primary coding discrepancies occurred within the "AI Literacy" matrix, specifically regarding whether teachers' skills in "natural language interaction" should be classified under "Technical Literacy" or "Communicative Literacy (Prompt Engineering)." Through in-depth conceptual discussions, the coders agreed that prompt engineering represents a relational dialogic skill rather than pure syntax development, leading to its classification under "Communicative Literacy". Resolving these semantic boundaries through collaborative discussion ensured that the final coding framework was grounded in shared human interpretation.

Findings

Defining AI in an Educational Context

This initial thematic framework illustrates how official texts conceptualize AI as a strategic ecosystem that encompasses economic, pedagogical, and national development goals. The thematic findings are summarized in Table 3.

Table 3. Coding and Contextual Focus Distribution Related to the Theme of Defining AI

Category	Code	Contextual Focus	Source Documents
Strategic and Economic Definition *(Macro Level)*	• National technology initiative • Tool for global competition • Driving force of the data economy • Workforce transformation	AI is described as *the key component of economic development and employment policies*. It is strategically oriented.	D1, D2, D3
Pedagogical and Value-Based Definition *(Medium Scale)*	• Human-centered approach • Adaptive tool • Integration of the Maarif Model • Ontological constraints	AI has been programmed as an "ethically regulated, pedagogical co-pilot," guided by the values of the *Türkiye Century Maarif Model*.	D4, D7
Technical and Algorithmic Definition *(Micro Level)*	• Data-driven inference • Pattern recognition • Machine/deep learning • Engineering problem	In classroom applications, AI is defined, using computer science terminology, as a *programmable and trainable system*.	D8, D9, D10, D14
GAI and Risk-Based Identification *(Academic)*	• Synthetic content generation • Hallucinations • Human oversight • Bias and copyright	The concept has evolved from traditional AI to *GAI*; in an academic context, the system's "unreliability" (risks) has been placed at the center of the definition, just as much as its "generativity."	D5, D6, D12

Based on the findings presented in Table 3, documents D1, D2, and D3 define AI through a strategic and economic framework. In these documents, AI is conceptualized as a component of big data analytics, autonomous decision-making, and advanced technology aimed at enhancing global competitiveness. The texts describe AI as a fundamental element for Türkiye's digital transformation, workforce development, and the National Technology Initiative.

In documents D4 and D7, the definition of AI is linked to the human-centered approach of the "Türkiye Century Maarif Model." These texts describe AI as an individualized learning tool designed to support students' cognitive, affective, and psychomotor development. Furthermore, the documents state that AI should not compromise human ontological integrity or moral values, positioning AI as an adaptive educational tool rather than the central focus of education.

Documents D8, D9, and D10 define AI primarily through technical terminology. In these texts, AI is explained as a system in which computers mimic human intelligence to make data-driven inferences. Secondary education materials expand this definition to include Machine Learning, Deep Learning, and Neural Networks, describing AI as an algorithmic architecture capable of recognizing patterns and learning from experience. Additionally, document D14 defines AI as an engineering field that addresses problems such as object

detection and natural language processing.

Documents D5, D6, and D12 frame AI primarily in terms of GAI and its associated risks. GAI is described as a system capable of producing text, code, visuals, or data through large language models (D11). Concurrently, documents D5 and D6 incorporate risks such as hallucinations, algorithmic bias, copyright violations, and data privacy issues directly into the definition. Consequently, these academic and educational guidelines describe AI as a system that requires continuous human oversight.

AI Approaches by Educational Level

This framework outlines the hierarchical progression of AI education, ranging from early awareness to advanced engineering applications. The thematic findings are presented in Table 4.

Table 4. Distribution of Coding and Contextual Focus by Educational Level Within the Theme of AI Approaches

Category	Code	Contextual Focus	Source Documents
Primary Education: Awareness and a Block-Based Approach	• Algorithmic thinking • Block-based coding • Data literacy • Digital citizenship	The concept of AI is introduced to students not through complex coding, but through *gamification*, *drag-and-drop tools*, *and basic data logic*, with the idea of a "transition from rule-based to data-driven" approaches.	D4, D8, D10, D13
Secondary Education (High School): Text-Based Coding, Development, and Machine Learning	• Text-based programming • Machine learning/Deep learning • Dataset training • Real-world problems	The student's role is envisioned to shift from that of a consumer to that of a *model-training producer*. Advanced programming languages and statistical algorithms are at the core of the curriculum.	D9, D13
Higher Education and Academic Research: Productivity and Ethical Boundaries	• Scientific integrity • GAI assistant • Literature and data analysis • Requirement for human oversight	The focus has shifted from technical coding to the *ethical*, *transparent*, and *responsible use* of off-the-shelf GAI models (large language models) in scientific research processes.	D5, D6
Gifted Individuals: Advanced Projects and Innovation	• Autonomous systems • Object detection • Image/language processing • Advanced prototyping	Moving beyond the standard curriculum, a "project-based" and "interdisciplinary education" model has been adopted that focuses on the potential of AI in *engineering* and *innovation*.	D14

Based on the findings presented in Table 4, documents D4, D8, D10, and D13, which cover

the primary and middle school levels, focus primarily on the development of AI literacy and awareness. Specifically, the middle school documents (D8, D10) aim to enable students to develop language perception and simple image-processing projects through block-based environments rather than text-based syntax. The documents conceptualize AI at this level as representing a transition from rule-based traditional programming to data-driven systems.

At the secondary education (high school) level, documents D9 and D13 indicate a shift from block-based tools to text-based programming languages such as Python. The secondary education curriculum centers on Machine Learning, Deep Learning, and Neural Networks. The documents state that students are expected to train their own models using open-source datasets, test them, and optimize error margins. For gifted students (D14), a project- and innovation-oriented approach is discursively framed. The workshop programs outlined in this document aim to engage students in autonomous system design, real-time object detection, and advanced language processing.

In higher education and academic research contexts (D5, D6), the documents focus primarily on academic integrity and research ethics. These guidelines specifically address the concept of GAI. The documents outline that while AI is an acceptable tool for supporting literature reviews, data analysis, and manuscript editing, its use in peer-review processes is prohibited. The documents establish a framework requiring that GAI-generated outputs remain subject to human oversight and transparent reporting thereby preserving scientific integrity.

The Approach to AI Literacy

This thematic mapping illustrates the multidimensional evolution of literacy, illustrating the shift from basic computer skills to critical and communicative competencies. The thematic findings are summarized in Table 5.

Table 5. Distribution of Codes and Contextual Focuses for the AI Literacy Theme

Category	Code	Contextual Focus	Source Documents
Literacy as a Strategic and Fundamental Competency	• 21st-century skill • Digital competence • Social awareness • Workforce adaptability	AI literacy is framed as a foundational *contemporary citizenship skill* required of every citizen and student to ensure the grassroots adoption of digital transformation and the National Technology Initiative.	D1, D2, D4
Ethical and Critical Literacy *(Value-Orientation)*	• Critical analysis of outputs • Algorithmic bias • Data privacy • Digital footprint	The pedagogical focus is explicitly directed toward questioning technology rather than merely using it. Emphasis is placed on the capacity to evaluate the accuracy, objectivity, and privacy dimensions of the information generated by the system.	D4, D7, D8
Communicative Literacy: Prompt Engineering	• Establishing the appropriate context • Effective prompt writing • GAI interaction • Role assignment	Particularly for teachers and researchers, literacy is defined not as writing code, but as the skill of establishing *effective and well-defined communication*	D11, D12, D13

		with the machine using natural language (Prompt Engineering).	
Technical and Algorithmic Literacy	• Dataset logic • Awareness of limitations • Shift from rule-based to data-driven	Technical literacy has been conceptualized as individuals' ability to grasp how AI *learns* (the black box phenomenon), alongside the mathematical and data-related underpinnings of its decision-making processes.	D9, D10, D14

The findings presented in Table 5 reveal that documents D1, D2, and D4 frame AI literacy as a fundamental 21st-century competency. These documents define literacy as a foundational skill required for citizens to adapt to an evolving workforce and and to support the National Technology Initiative. The texts aim to enable all segments of society to acquire a baseline awareness regarding the potential and limitations of AI systems.

The analysis of documents D4, D7, and D8 indicates that, another prominent dimension of literacy is conceptualized as Ethical and Critical Literacy. Instructional programs and ethical frameworks outline that AI outputs should be subject to critical analysis rather than being accepted as absolute truths. Within this framework, a literate individual is defined as someone capable of questioning system-generated data, identifying algorithmic biases, and demonstrating awareness of data privacy and digital footprints.

With the proliferation of GAI systems, documents D11, D12, and D13 define literacy primarily in terms of prompt engineering. In teacher manuals and guiding documents, communicative literacy is framed as the ability to interact effectively with AI systems using natural language. The documents specify that an AI-literate educator or student should be able to establish the appropriate context, assign specific roles to the AI system, define the target audience, and write effective prompts.

In documents D9, D10, and D14, the technical dimension of literacy is conceptualized in terms of the understanding of dataset logic and algorithmic architectures. At the secondary education and gifted student levels, technical literacy is defined as the ability to comprehend how AI processes data, understand the shift from rule-based to data-driven decision-making, and understand the mathematical foundations of AI learning processes.

Approaches to Teacher Education

This matrix illustrates the expected paradigm shift in educators' pedagogical responsibilities and identifies key areas for professional development. The thematic findings are presented in Table 6.

Table 6. Distribution of Codes and Contextual Foci for the Theme of Teacher Education Approaches

Category	Code	Contextual Focus	Source Documents
The Changing Role of the Teacher *(Guide and Facilitator)*	• Transition from knowledge transmitter to mentor • Pedagogical co-pilot • Learning designer	In the policy discourse, the primary role of the teacher is outlined as guiding technology-enhanced personalized learning processes.	D4, D7
Technical and Communicative Competencies	• Effective prompt writing • Tool literacy • Context and role setting	The skill of *interacting correctly with GAI* (prompt engineering)	D11, D12, D13

(Prompt Engineering)		has been highlighted as the fundamental competency of teachers.	
Continuous Professional Development and In-Service Training	• Hands-on workshops • Need-based training • Continuous updating	It is aimed to transform teacher training into *sustainable*, *hands-on*, and *scenario-based in-service training models* that will keep pace with rapidly changing technology.	D1, D2, D4
Ethical Pedagogy and Critical Evaluation	• Hallucination detection • Data privacy awareness • Algorithmic bias auditing	Teachers are defined as *role models for students in technology ethics* by passing the accuracy and neutrality of AI outputs through a pedagogical filter.	D7, D12

Based on the findings presented in Table 6, documents D4 and D7 conceptualize "The Changing Role of the Teacher." These texts indicate a shift away from the teacher's traditional role as the primary source of knowledge. Instead, the teacher is defined as a designer and mentor who manages classroom dynamics, supports students' socio-emotional development, and uses AI as an instructional assistant in lesson planning and assessment processes.

In documents D11, D12, and D13, "Technical and Communicative Competencies" are addressed. These educational handbooks emphasize "Prompt Engineering"—the skill of communicating effectively with natural language processing systems—is emphasized as a fundamental professional competency. According to document D12, teachers' ability to write prompts by specifying the context, target audience, and format is defined as an integral part of contemporary teacher training.

The "Continuous Professional Development and In-Service Training" approach is outlined in strategic plans D1, D2, and D4. The National AI Strategy documents (D1 and D2) emphasize the need for hands-on in-service training for teachers to integrate AI tools into classroom practice. Document D4 specifies that these trainings should be provided as practical, subject-specific workshops rather than broad theoretical awareness sessions.

In the "Ethical Pedagogy and Critical Evaluation" category (D7 and D12), the teacher is positioned as an evaluator of safety and accuracy. The educational guidelines state that educators should be aware of the potential for GAI systems to produce hallucinations. Consequently, teachers are positioned as ethical guides responsible for protecting students' data privacy, recognizing algorithmic biases, and ensuring digital integrity.

Ethical Considerations, Challenges, and Limitations

These dimensions systematically map the primary systemic risks associated with the adoption of AI and the corresponding mitigation strategies outlined in the policy texts. The thematic findings are presented in Table 7.

Table 7. Distribution of Codes and Contextual Foci for the Theme of Ethical Issues, Challenges, and Limitations

Category	Code	Contextual Focus	Source Documents
Data Privacy and Cybersecurity	• Protection of personal data • Need for closed systems • Anonymization	Legal risks and digital security warnings regarding the entry of sensitive student and teacher data into AI tools used in educational processes are centralized.	D4, D5, D6, D12
Algorithmic Bias and Verification *(Hallucination)*	• Risk of hallucination • Cultural bias • Critical verification mechanism	It is stated that GAI systems do not always provide accurate information, and generated content must undergo a pedagogical and scientific filter.	D5, D6, D7, D11, D12
Transparency and Academic Integrity	• Declaration of tool usage • Plagiarism and originality • Responsible use	It is mandated that students and teachers clearly and transparently declare the extent to which they receive support from AI tools in educational processes or research.	D5, D6, D12
Pedagogical Risks and the Human Touch	• Human-in-the-loop • Danger of cognitive offloading • Weakening of socio-emotional bonds	Warnings have been issued that AI cannot replace the teacher; over-reliance on technology may lead to cognitive decline and damage human-to-human interaction in the classroom.	D4, D7, D13

Based on the findings presented in Table 7, documents D5 and D6 address "Data Privacy and Cybersecurity." In these texts, educators and administrators are warned against uploading personal data, such as student names, grades, photographs, or health information, to open-source GAI platforms, in accordance with personal data protection laws.

The category of "Algorithmic Bias and Verification" highlights the technical limitations of GAI systems, particularly in documents D7, D11, and D12. The documents state that AI models can produce hallucinations—information that is factually incorrect yet appears persuasive. Furthermore, the texts indicate that algorithms may yield biased results that favor specific cultures, genders, or ideologies based on their training datasets. Consequently, the guidelines state that teachers must serve as critical evaluators of AI-generated content.

Regarding "Transparency and Academic Integrity" (D5, D6, D12), the documents establish rules for the responsible use of AI. These documents stipulate that students and researchers must transparently declare the extent to which they utilized AI tools in their assignments, projects, and academic studies.

Finally, in the "Pedagogical Risks and the Human Touch" category, documents D4, D7, and D13 address the limitations of technology-centered approaches in education. The documents specify that tasks involving empathy, motivation, moral development, and socio-emotional bonding can only be fulfilled by human teachers. The documents position AI as a facilitating tool that must align with the values of the "Türkiye Century Maarif Model" without overshadowing human interaction. Additionally, preventing cognitive offloading—where students rely excessively on AI-generated answers—is identified as a primary pedagogical

goal.

Future Vision and Outlook

This final thematic framework outlines institutional visions and projections regarding smart school infrastructures, data management, and long-term educational planning strategies. The thematic findings are summarized in Table 8.

Table 8. Distribution of Codes and Contextual Foci for the Theme of Future Vision and Outlook

Category	Code	Contextual Focus	Source Documents
Smart Education Ecosystems and Data Management	• Cloud-based national network • Data-driven education policy • Smart school infrastructures	Schools of the future are envisioned not as isolated buildings, but as integrated "smart ecosystems" that analyze student performance instantaneously and provide data for education policies.	D1, D2, D4
Innovation and Global Competitiveness *(Technology-Producing Generation)*	• Producer generation instead of consumers • Advanced incubation centers • International leadership	The ultimate goal of education is to raise leaders who do not merely use technology, but can develop their own AI models and move the country forward in the global technology race.	D1, D4, D14
Dynamic Curriculum and Lifelong Learning	• Content updated by need • Transformation of professions • Sustainable learning companionship	It is emphasized that AI will create flexible/dynamic curricula that can rapidly adapt to future professional transformations and serve as a guide accompanying individuals throughout their lives.	D4, D7

Based on the findings presented in Table 8, the category of "Smart Education Ecosystems and Data Management" (D1, D2, D4) outlines strategic plans for digital infrastructure. In these national strategy documents, AI is defined as a system designed to integrate the digital platforms of the Ministry of National Education (such as the Student Teacher Support System [ÖDS] and Education Information Network [EBA]) into a unified cloud architecture. According to these documents, the future vision involves shaping education policies through real-time classroom data analysis and transforming schools into interconnected smart learning centers.

In the "Innovation and Global Competitiveness" category (D1, D4, D14), the documents address the goal of technological production in education. The documents state that students, particularly at the secondary level and above, are expected to transition from technology users to AI model developers. Document D14 specifies that educational workshops for gifted students are planned to function as innovation and incubation centers. Furthermore, the documents associate this goal of technological production with the "Türkiye Century Maarif Model's" objective of cultivating competent generations for global competition.

The category of "Dynamic Curriculum and Lifelong Learning" (D4, D7) includes projections regarding the transformation of future professions. The documents state that curricula should be designed as dynamic structures capable of adapting to rapid technological changes. Additionally, the texts define AI as a lifelong learning tool intended to support individuals'

continuous career development beyond formal education.

Discussion

The findings demonstrate that AI is defined within a multidimensional and comprehensive structure in educational documents. To evaluate the global alignment and theoretical depth of these policies, the findings of this study are comparatively discussed with the strategies of pioneering entities in global AI governance, such as the USA, South Korea, the EU, the UK, and international organizations like UNESCO. These specific actors and frameworks were deliberately selected because they represent the current global frontiers in either technological integration (e.g, South Korea's digital textbooks, the US AI4K12 initiative) or ethical regulation (e.g, the EU AI Act, UNESCO guidelines). Applying this comparative lens to the Turkish case is crucial; it shifts the analysis beyond a local summary, revealing how a highly centralized education system translates universal AI standards into an authentic pedagogical context aligned with its National Technology Initiative. Within this framework, the multifaceted approach reflected in the Turkish policy documents, which treats technology as a strategic ecosystem to be managed with its inherent risks and opportunities, parallels the AI vision of the U.S. Department of Education (2023). While AI is positioned as the strategic catalyst for economic development and global competitiveness in national policy documents, AI is articulated in vision documents as a pedagogical assistant that supports both students and teachers, aligned with the values of the "Türkiye Century Maarif Model." Much like South Korea's "AI-Assisted Digital Textbooks" project to be implemented incrementally as of 2025, Türkiye's effort to transform this technology from a tool of consumption into one aligned with its own cultural and pedagogical values is a significant finding reflecting the authenticity of national policies (Republic of Korea Ministry of Education, 2023). In ethical and academic guides, this technology is addressed as a tool requiring human oversight within the framework of data privacy and informational accuracy, aiming to protect the system against technological threats. The principle of human oversight emphasized throughout the documents aligns directly with both the European Union's AI Act, which categorizes education as a high-risk area, and the UK Department for Education's emphasis that teachers must remain the ultimate authority in decision-making processes (Department for Education [DfE], 2023; European Commission, 2021). Although these multifaceted definitions, shaped by the missions of various institutions, provide a comprehensive theoretical vision, it is crucial to convey this pedagogical balance through a holistic and clear approach in in-service trainings to prevent uncertainty regarding the opportunities and risks in the minds of practitioners. However, it is noteworthy that the high-expectation, optimistic rhetoric in the documents may at times overshadow existing infrastructural needs and digital inequalities in schools (Williamson and Eynon, 2020). In this context, the risk of a gap between policy goals and classroom realities must be taken into account. Accordingly, the absolute ban on AI in peer-review and jury processes in higher education and research institutions points to the potential need for re-evaluating this stance considering the current state of technology, while suggesting that responsible use standards and ethical guidelines based on data privacy and transparent disclosure principles be established. Furthermore, to prevent open-source or GAI systems used in educational processes from causing personal data protection violations, there is an apparent necessity to publish standard guidelines for the anonymization of student data prior to being entered into these platforms.

When approaches across educational levels are examined, it is evident that the integration is designed in a hierarchical top-down structure according to students' cognitive levels. Positioning students as active producers in higher education, secondary education, and the

education of gifted students through advanced engineering applications such as machine learning, dataset analysis, and autonomous systems is a strategic policy step. This strategy aligns directly with the vision of "transforming students from passive consumers of AI into active designers" adopted by the US-based K-12 AI Education Initiative (AI4K12) and demonstrates that Türkiye's policies at the high school and higher education levels are in step with global trends (Touretzky et al, 2019). At the middle school level, the official discourse frames the integration process to be carried out primarily through block-based coding and algorithmic awareness. However, when the holistic structure of the system is evaluated, it is observed that concrete application scenarios at the preschool and primary school levels are addressed in a relatively limited manner. It is considered that this perceived gap is related to the programmatic scope of the documents included in the dataset, which prioritize advanced technical skills. Directing AI education predominantly toward high school and older age groups carries the risk of overshadowing the daily interaction of early childhood individuals with smart technologies (algorithmic toys, voice assistants, etc.) and the need for AI literacy specific to this age group (Su and Yang, 2022). Extending this innovative vision from higher education to earlier educational levels through gamified activities suitable for early childhood pedagogy and designing a more flexible transition from middle school to secondary education (from block-based to text-based coding) appears necessary for the sustainability of integration. Specifically, the transition from block-based to text-based programming is defined by Weintrop and Wilensky (2017) as a challenging pedagogical threshold where students' cognitive load suddenly increases as they move from a visual and intuitive environment to an abstract structure requiring rigid syntax rules, and the resulting anxiety about making mistakes can lead to decreased motivation. Therefore, to prevent this structure in policy documents from being disrupted in the field, incorporating concrete AI literacy goals for early ages into national policies and considering pedagogical bridges in transitions between educational levels appear critical for systemic stability. At the same time, to address the lack of the innovative AI vision successfully designed for higher education levels at lower levels, it would be beneficial to integrate gamified, concrete, and age-appropriate lesson scenarios centered on algorithmic thinking, data awareness, and digital citizenship into the curriculum.

The findings regarding AI literacy reveal that, within the official discourse,, this concept is framed as having transcended mere computer usage, is conceptualized as a contemporary competency with strategic, critical, and communicative dimensions. This finding aligns with the framework that defines AI literacy as a multifaceted understanding encompassing cognitive, ethical, and socio-technical dimensions (Ng et al, 2021). Particularly in teacher handbooks and guidance documents, literacy has been redefined within the context of "prompt engineering"-the art of establishing effective communication with machines through natural language. The vision reflected in these documents centralizes individuals' ability to question the data produced by the system, recognize algorithmic biases, and possess a sense of digital citizenship. Positioning prompt engineering not merely as data entry but as a critical dialogue with the machine shows global parallelism with the strategy of "subjecting AI outputs to a pedagogical and ethical filter" advocated in UNESCO's (2023) Guidance for GAI in Education. However, reducing the matter merely to obtaining ready-made outputs by writing correct commands, without providing students with an age-appropriate intuition of the algorithmic logic behind AI, carries the risk of leading to superficial technology use. Indeed, focusing solely on output generation without understanding the algorithmic background of AI may drive students toward cognitive laziness and technological dependency by leading them to believe that outputs are absolute truths (Bender et al, 2021). Therefore, the strong vision of critical literacy in the documents must be supported by practical data literacy training that will

protect students against algorithmic echo chambers.

When teacher education and evolving teacher roles are examined, it is observed that the documents position the teacher as the most critical actor at the center of the system. Contrary to the discourse suggesting that AI will replace teachers, this finding aligns with rational approaches emphasizing that the success of technology in education directly depends on the human element. The research results reveal that within the analyzed documents, the teacher's role is discursively redefined, shifting away from the traditional role of "knowledge transmitter" toward becoming a socio-emotional mentor for the classroom, an ethical guide monitoring algorithmic biases, and a prompt engineer establishing effective communication with machines. Indeed, the literature insistently emphasizes that algorithms can never establish true empathy; therefore, the teacher's greatest pedagogical function in the future educational ecosystem will be "socio-emotional mentorship" (Selwyn, 2019). To support this new profile, the expansion of practice-oriented, subject-specific in-service training has been planned as a fundamental action step in macro-level strategy documents. However, a critical analytical distinction must be made between the idealized policy discourse and the ecological realities of the classroom. While official documents reframe the teacher as a high-level 'prompt engineer' and 'ethical guide,' expecting this multidimensional vision to seamlessly transition into practice requires addressing significant structural barriers. Imposing these advanced roles without simultaneously addressing existing high teaching loads, administrative burdens, and varying technological infrastructures across schools risks reducing these policy goals to mere bureaucratic rhetoric. If the systemic mismatch between theoretical expectations and practical constraints is not actively managed through comprehensive pedagogical support and time allocation, this ambitious integration strategy may inadvertently foster 'resistance to technology' among educators rather than innovation (Pedro et al, 2019). Ecological constraints, one of the fundamental findings of the change management literature in education, indicate that the resistance teachers develop toward technology often stems not from an anti-technology stance, but directly from a lack of time and increased workload (Zhao and Frank, 2003). Therefore, it is a vital necessity that the innovative roles in the documents are carried out simultaneously with concrete improvements to alleviate teachers' current administrative burdens. To realize the prompt engineer and ethical guide profiles expected of teachers, the inclusion of applied AI integration courses in undergraduate education programs and the simultaneous expansion of subject-based in-service training workshops emerge as important supporting strategies.

Finally, the future vision for smart education ecosystems indicates that Türkiye has established a strategic goal in global technology initiatives. The documents envision that the education system will transform from a structure that consumes data to one that generates value from data, with education policies increasingly centered on real-time data analysis through cloud-based smart school infrastructures. Particularly, the emphasis on advanced engineering skills such as object detection and autonomous systems in the education of gifted students confirms the vision of raising an innovative generation that not only uses technology but also develops its own algorithms. Indeed, this vision moves the ideal of transforming students from passive consumers of the system into active algorithm designers-the "constructive identity" paradigm advocated by Long and Magerko (2020) directly to the center of the policy framework. However, ensuring that this ambitious pedagogical vision does not remain a theoretical framework and transforms into an equitable opportunity for every student depends on addressing fundamental hardware deficiencies. Therefore, in the realization of the highly innovative data-driven smart school vision, existing technological infrastructure differences between regions and schools must be carefully managed. To prevent

the data-driven smart school vision targeted in macro documents from turning into a socio-economic digital divide, improving the hardware and internet infrastructures of schools in disadvantaged regions and expanding the AI innovation workshop model for gifted students based on the principle of equal opportunity could help mitigate this risk.

In terms of theoretical and practical implications, this study addresses an overlooked area in the literature by illustrating how a highly centralized education system adapts universal AI standards into a local, culturally authentic pedagogical framework. For academics and researchers, the thematic taxonomy developed here provides a conceptual baseline that can inform future cross-national comparative studies. For policymakers, the findings present an evidence-based framework aimed at improving the alignment between strategic visions and practical implementation capacities. In this context, addressing regional hardware disparities and extending AI literacy initiatives to early childhood are identified as fundamental components for sustainable integration. Finally, for practitioners, the study clarifies the boundaries of their evolving roles as pedagogical co-pilots and ethical guides. It highlights that AI integration extends beyond technical infrastructure enhancements, emerging as a comprehensive transformation that requires the holistic redesign of instructional processes, targeted in-service training, and the alleviation of current administrative burdens.

This study is methodologically limited to the macro-level analysis of official policy documents, strategic plans, and instructional guidelines published by state institutions. Therefore, the findings primarily reflect the intended policy discourse and theoretical frameworks rather than the actual implementation of these policies in classrooms or their direct impact on educational practice and stakeholders. This study does not provide empirical evidence regarding how teachers perceive these policies or to what extent they have been integrated into daily pedagogical practices. Consequently, the results should be interpreted as an analysis of institutional orientations and official visions, and future empirical research involving classroom observations and stakeholder interviews is necessary to evaluate the practical implementation of this vision in educational settings.

Conclusion

The findings derived from the national policy documents, curricula, and guidelines examined within the scope of this research demonstrate that Türkiye approaches AI integration in education as a multi-layered paradigm shift with pedagogical, ethical, and strategic dimensions. The findings reveal that AI is discursively framed within the education ecosystem according to the human-centered philosophy of the "Türkiye Century Maarif Model," positioning technology not as the central focus but as a pedagogical "co-pilot" that empowers the teacher and personalizes learning processes. In this transformation, where students are envisioned to evolve from passive technology consumption to algorithm production, and the teacher's role is redefined in policy texts as a learning designer and ethical guide, AI literacy is positioned as a fundamental 21st-century skill. Based on the analysis of the official documents, the findings indicate that the principle of "human-in-the-loop" is positioned as a central moral and systemic safeguard. Furthermore, the findings suggest the need to re-evaluate the absolute ban on AI in higher education peer-review processes in favor of transparency-based responsible use standards. The findings also suggest that supporting this theoretical vision with age-appropriate AI literacy curricula and addressing regional hardware disparities are critical steps toward sustainable AI integration. This research is limited to analyzing national policy documents and instructional materials.

Future research should incorporate in-depth interviews and classroom observations to examine how this vision is translated into classroom practice.

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