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Building a Literature Synthesis on Artificial Intelligence in Education: A Library Research and Content Analysis Approach

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Abstract

The rapid development of Artificial Intelligence (AI) has increasingly influenced educational practices, particularly teaching, learning, assessment, and the role of teachers. Existing discussions on AI in education, however, cover diverse issues and are often presented as separate findings across books, journal articles, and other academic sources. This study aims to construct a literature synthesis of Artificial Intelligence in education by re-analyzing the body of literature presented in a previous library research study. Rather than treating the reviewed literature merely as a collection of summaries, this study organizes the reported findings into analytical units, develops initial codes, groups related codes into thematic categories, and synthesizes the relationships among the emerging themes. The study employs library research using documentation as the data collection technique and content analysis as the principal analytical approach. The corpus consists of the books and journal articles cited and discussed in the selected source article concerning Artificial Intelligence and education. The analysis is organized into four stages: data extraction, initial coding, thematic categorization, and cross-theme synthesis. The proposed analytical framework identifies several interconnected dimensions of AI in education, including the educational functions of AI, transformation of teaching and learning, changing teacher roles, educational benefits, and ethical and pedagogical challenges. The study demonstrates how a conventional library research approach can be developed into a more explicit analytical procedure for producing a conceptual synthesis from existing literature.

Keywords

Artificial Intelligence, Education, Library Research, Content Analysis, Literature Synthesis, Teacher Role, Educational Technology

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1. Introduction

Artificial Intelligence (AI) has become increasingly influential in contemporary education. The development of AI-based technologies has introduced new possibilities for teaching and learning, including automated assessment, personalized learning, virtual mentoring, smart content, voice assistants, and other forms of educational support. Fitria's discussion of AI in education identifies several applications that can assist teachers and students and emphasizes the potential of AI to improve the effectiveness and efficiency of educational activities (Fitria, 2023).

The increasing presence of AI in education is closely related to the broader development of digital technologies. AI is commonly associated with systems capable of performing functions that traditionally require human intelligence, including learning, decision-making, adaptation, and problem-solving. In the educational context, such capabilities create opportunities for technology to support various instructional activities and reduce the amount of routine work performed by educators. The literature discussed by Fitria also associates AI with efficiency and the reduction of direct human intervention in certain tasks (Manongga et al., 2022; Li & Zhang, 2022).

The application of AI, however, does not simply represent the introduction of another instructional technology. It potentially changes the relationship between teachers, students, learning materials, assessment, and educational processes. AI can provide feedback and recommendations, support personalized learning, automate routine activities, monitor student progress, and adapt learning activities to students' needs. Consequently, the role of teachers may also change from performing certain routine instructional tasks toward facilitating, supervising, evaluating, and maintaining the human dimension of education (Fitria, 2023).

At the same time, the development of AI generates an important question concerning the position of human educators. Technological advancement has frequently generated concerns regarding the replacement of human labor by machines. In education, this concern becomes particularly significant because teaching involves not only the transmission of knowledge but also guidance, character development, moral formation, interpersonal relationships, and human interaction. The literature reviewed by Fitria therefore emphasizes that although AI can support teachers and enhance learning, it does not eliminate the significance of the teacher's knowledge, experience, expertise, and human responsibilities (Fitria, 2023).

These observations indicate that the literature on AI in education contains several interconnected dimensions. Some sources emphasize technological capabilities and educational benefits, while others highlight changes in teacher roles, pedagogical implications, and potential limitations. A simple descriptive

review may identify these findings individually, but it does not necessarily explain how they are related to one another.

Therefore, the present study does not attempt to introduce a new empirical dataset. Instead, it uses the existing literature presented in the selected source article as a corpus for a second-order analysis. The purpose is to demonstrate how literature that was previously presented descriptively can be reorganized, coded, categorized, and synthesized into a more explicit conceptual structure.

Based on this purpose, the study focuses on identifying the major themes concerning Artificial Intelligence in education that emerge from the selected body of literature and examining how the findings reported across the literature can be organized into meaningful thematic dimensions. The study further explores the relationships among the emerging themes in order to understand how different aspects of AI in education are interconnected. Through this process, the study seeks to synthesize these relationships into a coherent conceptual understanding of the role and implications of Artificial Intelligence in education.

Accordingly, the objective of this study is not merely to reproduce or summarize the findings reported in previous studies, but to demonstrate how dispersed findings from the existing literature can be systematically analyzed, categorized, and synthesized into a coherent body of knowledge. By applying library research and content analysis, the study seeks to move from individual findings reported in different sources toward broader thematic patterns and conceptual relationships that can provide a more integrated understanding of Artificial Intelligence in education.

2. Research Methods

2.1. Research Design

This study employs a qualitative library research design combined with content analysis. Library research is appropriate because the data analyzed in this study are not obtained from respondents, experiments, observations, or questionnaires, but from existing written sources. The source study on which the present analysis is based similarly employed library research and collected information through documentation of books and journal articles related to AI in education (Fitria, 2023).

The present study extends this approach by making the analytical procedure more explicit. Instead of treating the literature as a collection of descriptive references, the study treats the reported findings and arguments contained in the literature as analytical data. The procedure consists of four principal stages: (1) data extraction, (2) initial coding, (3) thematic categorization, and (4) synthesis of relationships among themes.

2.2. Data Source

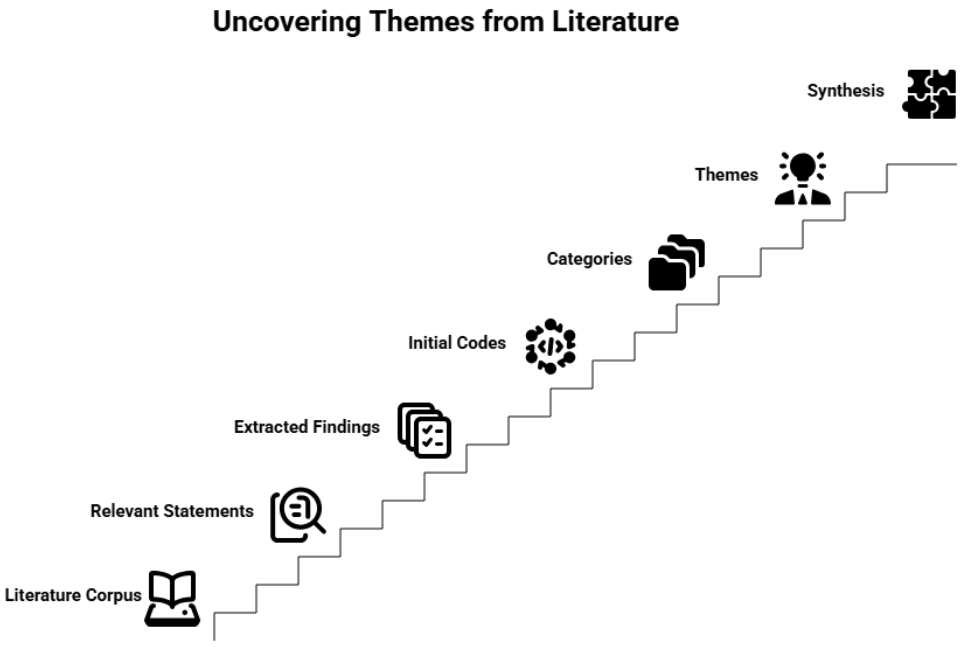
The data corpus consists of the literature cited, discussed, and utilized in the selected source article, The Use of Artificial Intelligence in Education (AIED): Can AI Replace the Teacher's Role? by Fitria (2023). The original study explicitly states that its library research uses documentation from books and journal articles related to the topic. Its sources include national and international journal articles and books relevant to Artificial Intelligence in education (Fitria, 2023).

Accordingly, this study does not introduce an independently searched literature database as its primary corpus. Instead, it deliberately uses the existing literature corpus of the selected article in order to examine how the same body of literature can be transformed into a more structured analytical synthesis.

This methodological decision is important because the purpose of the study is methodological demonstration rather than the production of a comprehensive systematic review of all literature on AI in education.

2.3. Data Collection

Data were collected through documentation. The documented materials were examined to identify statements, arguments, findings, and descriptions concerning the application and implications of Artificial Intelligence in education. The data extraction process focused on information relevant to the research questions. Each relevant statement was recorded according to its source and substantive meaning. The extracted information was subsequently treated as an analytical unit rather than merely as supporting quotations. The procedure can be represented as follows:



2.4. Unit of Analysis

The unit of analysis in this study is the substantive finding or argument concerning AI and education contained within each selected source. For example, a single article may contain more than one relevant finding. A source may discuss AI as a tool for personalized learning while also describing its capacity to automate routine tasks and its implications for the teacher's role. These different findings are therefore treated as separate analytical units before being grouped into broader categories. This approach allows the analysis to move beyond a source-by-source summary and instead focus on patterns that occur across the literature.

2.5. Data Analysis

Content analysis was used to analyze the extracted literature. The source article describes content analysis as a method for deriving valid conclusions from documents, articles, and books by examining written or printed material and identifying its central ideas and information (Fitria, 2023). In the present study, content analysis was developed into four analytical stages. The first stage is Data Extraction. In this phase, we will filter relevant statements and findings regarding artificial intelligence (AI) in education extracted from the corpus. The second stage is Preliminary Coding. Each extracted finding is assigned a preliminary descriptive code that represents its substantive meaning. Examples of possible preliminary codes include personalization, efficiency, automation, feedback, adaptive learning, teacher facilitation, teacher adaptation, human interaction, ethical concern, routine tasks. The third stage is Thematic Categorization Codes with similar meanings are grouped into broader categories. For example, the codes personalization, feedback, and adaptive learning can be grouped under the broader category of AI-supported learning, while AUTOMATION and EFFICIENCY can be grouped under AI-supported educational processes. The final stage is Synthesis. At this stage, the categories are compared to identify relationships, complementarities, and tensions among them. The ultimate analytical goal is to develop a conceptual synthesis, not merely to count the frequency of occurrence of certain concepts.

3. Results And Discussion

3.1. Artificial Intelligence as an Educational Support System

The literature analyzed in this study indicates that Artificial Intelligence (AI) has increasingly developed as a supporting system within educational processes rather than as a single-purpose technological instrument. The reviewed literature identifies several forms of AI applications in education, including virtual mentors,

voice assistants, smart content, presentation translators, global courses, automatic assessment, and personalized learning. These applications perform different functions, ranging from providing learning materials and feedback to supporting assessment, information retrieval, and individualized learning. The literature therefore suggests that the contribution of AI to education is multidimensional, with its primary function being to assist teachers and students in carrying out learning activities more effectively and efficiently (Fitria, 2023).

A closer analysis of these applications reveals that the different AI tools can be organized into several functional categories. Virtual mentors, for example, facilitate the distribution of learning materials, assignments, and feedback and can assist teachers in monitoring students' understanding. Voice assistants provide students with rapid access to information through voice-based interaction, while smart content helps organize and retrieve relevant learning resources. Presentation translators facilitate access to information across languages, whereas automatic assessment supports teachers by processing students' answers and providing assessment information. Personalized learning systems, meanwhile, analyze students' learning activities and preferences in order to provide individualized learning support.

From a content-analysis perspective, these findings can be interpreted as representing four closely related functions of AI in education: information support, learning assistance, process automation, and personalization. Information support concerns the ability of AI to search, organize, translate, and present learning resources. Learning assistance involves feedback, recommendations, and interaction with learners. Process automation refers to the performance of routine activities such as assessment and information processing, while personalization concerns the adaptation of learning materials and strategies to individual student needs. This categorization is important because it demonstrates that the literature does not merely describe different AI tools; rather, the tools collectively represent different ways in which AI can intervene in educational processes.

This pattern is consistent with the broader conceptualization of Artificial Intelligence in Education (AIEd). Zawacki-Richter et al. (2019), as cited in the source article, identify four major application areas of AIEd: profiling and prediction, assessment and evaluation, adaptive systems and personalization, and intelligent tutoring systems. These areas correspond closely with the functional categories identified in the present analysis. The literature therefore provides an indication that AI in education is not primarily defined by the particular technological brand or application being used, but by the educational function that the technology performs.

From a pedagogical perspective, this distinction is significant. AI-supported education can shift some learning activities from a uniform model toward a more adaptive model. The reviewed literature indicates that AI can collect data concerning student performance, adjust learning content and difficulty, provide real-time feedback, and offer learning materials according to individual needs. Such capabilities potentially enable students to receive support that is more closely aligned with their learning conditions. Fitria (2023), drawing on previous literature, describes adaptive learning as one of the ways in which AI can improve learning effectiveness by tailoring materials, difficulty levels, teaching strategies, and feedback to individual student performance.

However, the presence of these capabilities should not automatically be interpreted as evidence that AI can perform the entire educational function of a teacher. The literature itself makes an important distinction between performing educational tasks and performing the broader function of educating. AI may provide information, feedback, recommendations, and automated assessment, but the teacher remains responsible for interpreting information within the educational context and guiding students in using that information appropriately. The source literature explicitly positions AI as an auxiliary technology that can increase human intelligence and support effective and efficient learning activities rather than necessarily replacing human educators.

This distinction becomes particularly important when AI is viewed from the perspective of educational thought. The teacher is not simply a transmitter of information. In the literature reviewed by Fitria, the teacher is described as a facilitator, motivator, inspirer, mentor, and developer of students' imagination, creativity, character, teamwork, and social empathy. These roles require more than the capacity to process information or generate responses. They require educational judgment and sustained interaction with students.

In our interpretation, therefore, the emergence of AI should be understood not as the arrival of a new "teacher," but as the emergence of a new layer of educational support. This distinction allows us to avoid an overly technological interpretation of AI adoption. When AI performs routine or information-intensive activities, the technology may create additional space for teachers to concentrate on activities that require pedagogical judgment, interpersonal interaction, motivation, guidance, and character development. In this sense, the value of AI is not necessarily determined by how much of the teacher's work it can replace, but by how effectively it can support the work that teachers need to perform.

The same interpretation is supported by the literature concerning the changing professional role of teachers. Liu and Wang (2020), as cited by Fitria, argue that intelligent educational platforms, tools, and services introduce

challenges and dilemmas to teachers' professional roles. At the same time, AI can function as an auxiliary teacher and classroom analyst, increasing the effectiveness, precision, and variety of classroom teaching. This implies that technological development may transform the distribution of educational tasks without eliminating the professional identity of the teacher. Teachers remain responsible for designing learning, making educational decisions, and guiding students' overall development.

The findings can therefore be synthesized into a simple analytical proposition: AI primarily expands the technological capacity of the educational system, while teachers remain central to the human and pedagogical dimensions of education. AI can search, process, classify, recommend, personalize, and automate; teachers interpret, contextualize, motivate, guide, evaluate, and educate. The distinction does not mean that these functions are completely separate. Rather, they can operate in a complementary relationship in which AI supports particular tasks while teachers retain responsibility for the broader educational process.

This interpretation also provides an important foundation for understanding the subsequent themes identified in the literature. If AI functions primarily as an educational support system, its adoption inevitably affects the organization of teaching and learning, the distribution of teachers' tasks, the potential benefits of educational technology, and the ethical and human dimensions of education. Thus, the first theme establishes the technological-functional foundation for understanding the subsequent transformation of education: AI does not simply enter education as a replacement for an existing actor; it enters as a technological system that changes how educational work can be performed.

3.2. AI-Supported Teaching and Learning

The second theme emerging from the literature concerns the ways in which Artificial Intelligence can support and transform teaching and learning processes. While the first theme emphasizes the functional capabilities of AI as an educational support system, the present theme focuses more specifically on what happens when those capabilities are incorporated into actual learning activities. The literature reviewed in the source article indicates that AI can support teachers and students through personalized learning, adaptive learning, automated feedback, assessment, and the provision of learning resources. These functions suggest that AI is not merely an additional source of information but can become an active component of the teaching and learning environment (Fitria, 2023).

One of the most prominent findings concerns the capacity of AI to facilitate personalized learning. The literature describes personalized learning as an approach in which learning materials, difficulty levels, teaching strategies, and feedback can be adjusted according to individual students' needs and performance.

AI can analyze information concerning students' learning activities and use such information to provide learning experiences that are more closely aligned with individual characteristics. In this context, AI-supported learning differs from a uniform instructional model because the system can respond to variations in students' abilities, learning progress, and preferences.

The literature also associates AI with adaptive learning. Adaptive learning systems are described as technologies capable of modifying learning content and instructional strategies based on students' performance. Rather than providing exactly the same learning pathway to every student, an AI-supported system can potentially adjust the level of difficulty, provide additional material when students experience difficulties, and offer different forms of feedback. This capability positions AI as a mechanism for responding to learner diversity. The finding is particularly relevant because differences in students' abilities and learning needs are among the challenges that teachers must address in classroom environments.

Another important dimension is the use of AI to provide feedback and recommendations. The literature discussed by Fitria indicates that AI can assist students by providing feedback and recommendations during the learning process. Virtual mentors, for example, can support the distribution of learning materials, assignments, and feedback, while AI-based systems can help monitor students' learning progress. Such functions can make feedback more immediate and allow students to receive assistance without always having to wait for direct intervention from the teacher.

From the perspective of educational technology, these findings indicate a movement from AI as a passive repository of information toward AI as an interactive learning support system. Students can interact with AI-based technologies, receive information, obtain feedback, and in some cases experience learning materials adapted to their performance. The literature therefore suggests that the contribution of AI is not restricted to increasing access to information. Its more significant educational potential lies in its ability to process information about learning activities and use that information to support subsequent learning decisions.

This development can also be connected with the application areas of Artificial Intelligence in Education identified by Zawacki-Richter et al. (2019), particularly adaptive systems and personalization, assessment and evaluation, profiling and prediction, and intelligent tutoring systems. These areas demonstrate that AI can intervene at several points in the learning process, from understanding learner characteristics to evaluating performance and providing individualized support. The convergence between these application areas and the findings identified in the present analysis strengthens the interpretation that AI-supported

teaching and learning involve a combination of learner analysis, instructional adaptation, feedback, and assessment rather than a single technological function.

However, the ability of AI to personalize and adapt learning should not be interpreted as meaning that learning automatically becomes better merely because technology is involved. Personalization provided by a technological system remains dependent on the quality of the data, the appropriateness of the learning materials, and the educational decisions surrounding its use. The literature itself emphasizes that AI can improve the effectiveness and efficiency of learning, but it also maintains that AI functions as a supporting technology within the broader educational process.

From a pedagogical perspective, this distinction is important. Learning is not simply a process of receiving appropriately selected information. Students also need explanation, encouragement, motivation, social interaction, contextual understanding, and guidance when they experience difficulties. The literature reviewed in the source article describes teachers as facilitators, motivators, inspirers, mentors, and figures involved in developing students' imagination, creativity, character, teamwork, and social empathy. Consequently, the capacity of AI to adapt content or provide feedback addresses only some dimensions of learning.

The findings therefore suggest that AI-supported teaching and learning should be understood through the principle of augmentation rather than substitution. AI can extend the capacity of teachers and students by processing information rapidly, providing feedback, supporting personalization, and assisting with routine learning activities. The teacher, however, remains responsible for interpreting students' conditions, selecting appropriate pedagogical responses, and providing forms of guidance that depend on human interaction. In this sense, AI may increase the range of resources available to teachers without necessarily assuming the complete instructional responsibility of the teacher.

This interpretation becomes particularly important when considering the relationship between AI-supported learning and teacher workload. If AI can assist with routine activities such as providing assignments, correcting answers, monitoring progress, and generating feedback, teachers may have more opportunities to concentrate on activities that require direct interaction with students. The source literature explicitly notes that AI can take over certain routine tasks, while teachers continue to be required to guide students, explain concepts, develop social skills, motivate learners, and provide academic support.

From the author's perspective, this pattern represents a potential redistribution of instructional attention. When repetitive or information-intensive activities are supported by AI, the teacher's value may increasingly be located in

activities that cannot be adequately reduced to automated processing. This does not mean that routine instructional work is unimportant. Rather, it means that technology may create a possibility for teachers to devote more attention to the interpretive and relational dimensions of education. The educational value of AI, therefore, should be assessed not only by asking how much work it can perform, but also by asking what kinds of educational work it enables teachers to perform more effectively.

This point also helps clarify the meaning of "AI-supported learning." The term should not be understood as learning that is controlled entirely by AI. Instead, it can be interpreted as a learning arrangement in which AI provides technological support while teachers retain pedagogical responsibility. AI may contribute speed, data processing, personalization, and automated feedback; teachers contribute contextual judgment, motivation, social interaction, and educational guidance. The two therefore occupy different but potentially complementary positions within the same learning process.

The literature consequently reveals a dual movement. On one side, AI increases the capacity of educational systems to provide individualized, responsive, and efficient learning support. On the other side, the increasing technological capacity of AI makes the human contribution of teachers more visible rather than necessarily less important. As AI becomes more capable of performing informational and routine instructional functions, the distinctive value of teachers increasingly lies in their ability to understand students as whole persons and to respond to educational situations that cannot be fully represented through data.

Taken together, the findings of this theme indicate that AI-supported teaching and learning involve a transformation of the process of learning support, rather than the disappearance of human teaching. AI can contribute to personalization, adaptation, feedback, assessment, and access to learning resources, while teachers continue to provide pedagogical interpretation, motivation, guidance, and human interaction. This synthesis provides a bridge to the next theme, namely the transformation of teachers' roles. If AI increasingly performs some instructional and routine functions, the central question is no longer simply whether teachers will remain present, but how their roles and professional responsibilities will change in an AI-supported educational environment.

3.3. Transformation of Teachers' Roles in the Age of Artificial Intelligence

The integration of Artificial Intelligence into education does not merely introduce new technological tools into teaching and learning; it also changes the way the role of teachers is understood. The literature analyzed in the present study consistently

indicates that the increasing capability of AI to provide information, support learning, automate routine activities, and generate feedback reduces the necessity for teachers to function primarily as transmitters of knowledge. At the same time, this technological development does not eliminate the teacher's role. Instead, it encourages a redistribution of educational responsibilities in which some instructional tasks can be supported by AI, while teachers are expected to assume broader roles that require human judgment, interaction, guidance, and educational responsibility.

This transformation is explicitly reflected in the literature presented by Fitria (2023). Halimatussa'diyah (2019), for example, argues that teachers' roles have shifted from transmitting knowledge toward becoming facilitators, motivators, inspirers, mentors, and developers of students' imagination, creativity, character values, teamwork, and social empathy. Similarly, Wang et al. (2022) argue that although machine learning will not completely replace teachers, the traditional function of teachers may no longer be sufficient to respond to the demands of an increasingly intelligent technological environment. Teachers therefore need to improve their professional literacy and reposition their roles. In this sense, technological development should not be interpreted simply as a threat to the teaching profession, but as a force that changes the competencies and functions expected from teachers.

The distinction between *teaching* and *educating* provides an important conceptual explanation for this transformation. The literature reviewed in the source article differentiates the transmission of knowledge from the broader process of educating individuals. Machines and AI may increasingly perform functions associated with delivering information, explaining concepts, assigning learning activities, or providing feedback. However, educating students involves a wider set of responsibilities, including guiding, motivating, developing character, and establishing meaningful relationships with learners (Wang et al., 2022; Solihati & Rachmawati, 2020). Consequently, the emergence of AI may make the informational dimension of teaching less exclusive to teachers, while simultaneously making the educational and relational dimensions of the profession more important.

This distinction is also consistent with the description of teachers' responsibilities in Indonesian educational policy cited in the source literature. Law No. 14 of 2005 defines teachers as professional educators whose principal responsibilities include educating, teaching, guiding, directing, training, assessing, and evaluating students. The law also identifies pedagogical, personal, social, and professional competencies as important dimensions of teacher competence. Fitria's discussion connects these responsibilities with the limitations of AI, particularly in

areas involving human interaction, character development, social competence, and emotional understanding.

From the perspective of the present synthesis, this distinction suggests that the transformation of the teacher's role should not be understood as a movement from *teacher* to *non-teacher*, but from one form of teaching work to another. When AI becomes increasingly capable of performing information-processing and routine instructional activities, the relative importance of those activities in defining the teacher's professional identity decreases. Conversely, activities that require contextual judgment, interpersonal understanding, motivation, ethical consideration, and the development of students as persons become increasingly central. Thus, the development of AI may actually make the broader educational meaning of the teaching profession more visible.

One of the clearest dimensions of this transformation is the movement from knowledge transmitter to learning facilitator. AI can provide students with rapid access to information and can assist in explaining concepts or improving difficult areas of learning. Krishnan et al. (2023), as cited by Fitria (2023), acknowledge that AI can teach certain skills and help students understand difficult concepts, but cannot replace human teachers. Similarly, Kanagachidambaresan et al. (2023) describe AI as an intermediary system that can provide timely feedback to students and teachers. These capabilities mean that teachers do not necessarily need to spend all of their instructional time performing activities that technology can increasingly support. Instead, teachers can use AI-generated information and feedback as resources for designing learning experiences and responding to students' needs.

The teacher's role as a facilitator therefore represents an important redistribution of instructional work. AI can contribute to the provision of information and immediate learning support, while the teacher determines how that information should be used within a particular educational context. The teacher remains responsible for interpreting students' conditions, selecting appropriate learning strategies, adjusting instruction, and determining when technological recommendations are appropriate or inappropriate. In this configuration, AI becomes part of the instructional infrastructure, whereas the teacher remains responsible for the pedagogical direction of the learning process.

A second dimension concerns the transformation of the teacher into a mentor, motivator, and source of inspiration. The literature emphasizes that students do not learn only through the acquisition of information. They also require encouragement, guidance, emotional support, and assistance in dealing with learning difficulties. Fitria (2023) notes that teachers can help students overcome learning difficulties, motivate them to learn, provide academic guidance, and

support the development of cognitive abilities, social skills, and critical thinking. These functions involve an understanding of the learner that extends beyond observable academic performance.

This aspect becomes particularly important because the literature identifies human interaction as one of the strongest boundaries between AI-supported instruction and human teaching. Teachers can interact naturally with students, develop relationships of trust, create enjoyable learning situations, respond to unexpected classroom situations, and help students learn social values such as empathy and trust. In contrast, AI-based interaction remains dependent on the capabilities and programming of the system (Fitria, 2023).

The significance of this finding is not that AI is incapable of producing convincing interaction. Rather, the literature suggests that educational relationships involve dimensions that cannot be reduced to information exchange. A student's hesitation, frustration, motivation, confidence, or social difficulty may require a contextual response rather than simply an informational answer. Teachers can interpret these situations through accumulated experience and interpersonal knowledge. The present analysis therefore suggests that as AI becomes more capable of providing instructional responses, the teacher's capacity to interpret the *meaning behind students' responses* becomes an increasingly important professional function.

A third dimension of transformation is the teacher's role as a developer of character, values, and social competence. Several sources discussed in the article strongly emphasize that education involves more than intellectual development. Priyanta (2021), for instance, argues that teachers are responsible not only for conveying learning materials but also for developing kindness, virtue, tolerance, and empathy among students. Tri et al. (2021) similarly emphasize the teacher's role in educating character and morals and serving as an example for students. Solihati and Rachmawati (2020) distinguish between the teaching function, which may be technologically supported, and the broader educational process involving exemplary behavior, values, and morality.

This finding provides an important qualification to the claim that AI will replace teachers. If the teacher is conceptualized only as a person who transfers academic knowledge, then technological substitution appears increasingly plausible. However, if the teacher is conceptualized as an educator responsible for the intellectual, social, emotional, and moral development of students, the substitution argument becomes considerably more limited. Education is therefore not equivalent to information delivery. It is also a process through which learners develop ways of thinking, behaving, relating to others, and understanding values.

The literature further associates these educational responsibilities with specifically human qualities, including sympathy, empathy, compassion, tolerance, and intuition. Fitria (2023) reports that teachers can use these qualities to understand students' complex needs and respond to particular classroom situations. The literature also argues that AI continues to face limitations in understanding students holistically and interpreting the richness and complexity of classroom situations.

From the perspective of this synthesis, these findings point toward a distinction between computational responsiveness and educational responsiveness. AI may respond rapidly to a question, identify patterns in student performance, or provide feedback based on available data. Educational responsiveness, however, may require a teacher to determine *why* a student is struggling, whether the difficulty is academic or emotional, what kind of intervention is appropriate, and how that intervention should be communicated. The difference is therefore not simply between machine intelligence and human intelligence, but between different forms of decision-making within education.

This does not mean that teachers are unaffected by technological development. On the contrary, the literature emphasizes that teachers themselves must adapt. Wang et al. (2022), as cited in the source article, argue that teachers need to increase their professional literacy and reposition themselves in response to the demands of the intelligent age. Fitria (2023) similarly emphasizes that teachers should develop themselves in accordance with technological developments and continuously improve their skills.

The implication is significant. If AI changes what students can obtain directly from technology, teachers must provide value that cannot be reduced to simply possessing information. Professional competence therefore becomes increasingly associated with the ability to design learning, evaluate information, interpret AI outputs, make pedagogical decisions, build relationships, motivate students, and integrate technological resources appropriately. In this configuration, teacher professionalism is not weakened by AI; rather, the basis of professionalism changes.

The literature consequently reveals a paradox in the relationship between AI and teachers. AI can potentially reduce the burden of repetitive instructional tasks, yet this does not necessarily reduce the importance of teachers. Instead, it may create greater space for teachers to perform functions that are difficult to automate. Sun et al. (2022), as cited by Fitria (2023), argue that AI can replace or reduce some daily teaching roles and thereby reduce routine burdens, but it cannot accomplish the broader goal of educating people. This argument is consistent with the broader literature in which AI is positioned as a support system rather than a complete substitute for educators.

Taken together, the findings indicate that the most meaningful transformation is therefore not teacher replacement, but teacher-role redistribution. Tasks that are highly repetitive, information-intensive, or computationally manageable are increasingly open to technological assistance. Meanwhile, tasks involving mentoring, motivation, ethical judgment, character formation, interpersonal relationships, contextual interpretation, and educational leadership remain strongly associated with human teachers. This redistribution changes the question from "Can AI replace teachers?" to "Which educational tasks can AI perform, and which responsibilities require human educational judgment?"

This shift in perspective is important because it prevents the analysis from treating AI and teachers as competing entities occupying the same functional space. The literature instead suggests a complementary relationship. AI can increase the efficiency and responsiveness of instructional processes, while teachers provide the human direction necessary to transform technological capability into meaningful educational experience. As Fitria (2023) summarizes, AI may assist teachers and facilitate their work, but it does not necessarily replace their role as educators, guides, and developers of student character.

The present analysis therefore argues that the emergence of AI should be understood as a process of professional repositioning. Teachers are increasingly expected to move beyond the traditional role of knowledge transmitter and become facilitators, mentors, motivators, evaluators, designers of learning experiences, and developers of students' character and social capacities. AI contributes computational and informational capabilities to this process, but the teacher remains responsible for determining how those capabilities should serve educational purposes. The future of teaching suggested by the literature is consequently not a simple choice between humans and machines, but a reorganization of educational work in which technological capability and human educational judgment operate in complementary ways.

3.4. Educational Benefits and Opportunities of Artificial Intelligence

The integration of Artificial Intelligence into education creates a range of opportunities for improving both teaching and learning processes. The literature analyzed in this study indicates that the value of AI does not lie only in its ability to perform tasks that traditionally required human effort, but also in its capacity to make educational processes more adaptive, responsive, efficient, and data-informed. Across the literature presented by Fitria (2023), several interconnected benefits emerge, including personalization of learning, faster feedback, more efficient assessment, support for teachers, improved use of student data, and greater flexibility in learning. These benefits indicate that AI has the potential to

expand the capacity of educational systems rather than merely automate existing practices.

One of the most prominent opportunities is the personalization of learning. Traditional classroom instruction often requires teachers to work with groups of students who differ in their abilities, learning speeds, interests, and learning difficulties. The literature suggests that AI can help address this variation by collecting information about students' learning performance and using that information to adjust learning materials, difficulty levels, and instructional strategies. Fitria (2023), drawing on Fitria (2021b), explains that adaptive learning systems can tailor learning content to individual student needs and provide real-time feedback based on students' abilities.

This capability is particularly important because personalization changes the relationship between the learner and educational content. Rather than requiring all students to move through exactly the same material at the same pace, AI-supported systems can provide alternative learning pathways based on individual performance. The source article describes personalized learning systems as capable of analyzing students' learning styles, accumulating data from learning activities, providing alternative learning solutions, recommending content, and supporting students in managing their learning activities. Examples discussed include Khan Academy, Duolingo, and Ruanguru (Fitria, 2023).

From the perspective of the present synthesis, personalization represents more than a technical improvement. It potentially addresses one of the persistent challenges of classroom education: the difficulty of providing sufficient individual attention to every learner. As class sizes increase, teachers may have less time to provide one-to-one assistance. AI-supported learning environments can therefore function as an additional layer of individualized support, particularly for students who require additional explanation or practice. This does not remove the teacher from the learning process; rather, it can extend the teacher's capacity to respond to learner diversity.

A second major opportunity is the acceleration of feedback and assessment. Assessment is traditionally one of the most time-consuming components of teaching because teachers must review student work, identify errors, provide feedback, and determine whether students have achieved particular learning objectives. The literature reviewed in the source article indicates that AI can automate parts of this process. AI systems can evaluate multiple-choice and short-answer questions and can potentially be extended to more complex forms of assessment. Automated evaluation can reduce teachers' workload and allow students to receive feedback more rapidly (Fitria, 2023).

The significance of automated feedback is not limited to saving teachers' time. Faster feedback can also shorten the distance between students' performance and their opportunity to correct misunderstandings. In conventional learning, feedback may arrive after a considerable delay because teachers must first collect and assess student work. AI-supported systems can potentially provide immediate responses, enabling students to identify mistakes while the learning activity is still cognitively active. The source literature describes AI as capable of providing real-time feedback and recommendations tailored to student needs (Fitria, 2021b).

The third opportunity concerns data-informed teaching. AI can collect and analyze information about students' learning performance, identify patterns, and provide recommendations that may assist teachers in understanding student strengths and weaknesses. According to the literature summarized by Fitria (2023), AI can facilitate the collection of student performance data, analyze patterns, and support teachers in adjusting teaching methods to individual needs.

This represents an important shift in the informational basis of pedagogical decision-making. Teachers have always observed students and evaluated their progress, but AI potentially increases the volume and speed with which learning information can be processed. Instead of relying exclusively on occasional assessments or general classroom observations, teachers can potentially use continuously generated learning data to identify patterns in student performance. From the perspective of this synthesis, however, data should be understood as a resource for pedagogical judgment rather than as a substitute for it. AI may identify patterns, but teachers remain responsible for interpreting what those patterns mean within the broader context of students' learning.

A fourth opportunity is increased teacher efficiency. The literature identifies several routine activities that can be supported by AI, including automatic assessment, administrative tasks, preparation of teaching materials, feedback generation, and data processing. Such applications can reduce the amount of time teachers spend on repetitive activities and potentially allow them to devote greater attention to instructional interaction and student development. Fitria (2023) specifically notes that AI can increase efficiency by automating evaluation, administrative activities, and parts of teaching-material preparation.

This finding connects directly with the transformation of teacher roles discussed in Section 3.3. If AI reduces the amount of routine work performed by teachers, the benefit should not be measured simply by how much work has been removed. The more important question is what teachers can do with the time and attention that have been released. If the saved time is redirected toward mentoring, discussion, feedback that requires human judgment, classroom interaction, and

character development, AI may contribute to educational quality rather than merely institutional efficiency.

A fifth opportunity is the expansion of flexible and continuous learning. The source literature describes virtual assistants and virtual mentors as AI-based tools that can support students beyond conventional classroom hours. These systems can help students understand course materials, answer questions, provide feedback, and recommend learning materials. Because such systems can be accessed at different times and locations, they may contribute to more flexible learning experiences.

The literature on virtual mentors provides a concrete illustration of this possibility. AI-based virtual mentors can help distribute learning materials, practice questions, assignments, and feedback while enabling students to interact with learning resources outside direct teacher contact. Such systems can also provide teachers with information about student understanding, which may then be used to improve subsequent instruction.

From the present analytical perspective, this creates a form of extended educational availability. The classroom is no longer necessarily the only location where students can obtain instructional assistance. AI can provide supplementary support before, during, and after classroom learning. However, this opportunity should be interpreted as an extension of educational support rather than the replacement of educational relationships. The teacher remains important in contextualizing information, guiding discussion, and educating students, even when learning increasingly takes place through digital environments.

Another important opportunity concerns the development of more interactive and diverse learning environments. The source article identifies several AI applications, including virtual mentors, voice assistants, smart content, presentation translators, global courses, automatic assessment, and personalized learning. These applications demonstrate that AI can enter education through multiple points rather than through a single technological function.

This diversity suggests that the educational contribution of AI should not be reduced to generative systems or automated grading alone. AI can support communication, content access, learning recommendations, assessment, translation, and interaction. Zawacki-Richter et al. (2019), as cited in the source article, categorize AIEd applications into areas including profiling and prediction, assessment and evaluation, adaptive systems and personalization, and intelligent tutoring systems. These categories demonstrate that AI can operate at several levels of educational activity, from individual learning support to broader institutional and academic services.

The literature also suggests that AI may contribute to improving the quality and effectiveness of education. Fitria (2023) identifies several benefits, including the ability to develop smarter learning patterns, identify factors that make concepts difficult for students, adjust learning strategies, and facilitate assessment. These functions indicate that AI can contribute not only to efficiency but also to the responsiveness of educational processes.

Nevertheless, the present synthesis suggests that the concept of "improved quality" needs to be interpreted carefully. Efficiency and personalization are important dimensions of educational quality, but they do not represent quality in its entirety. A learning system may become faster, more adaptive, and more data-driven without necessarily becoming more meaningful, humane, or educationally valuable. Therefore, the benefits identified in the literature should be understood as capacities that can contribute to educational quality when they are integrated with appropriate pedagogical judgment.

An additional opportunity emerges at the level of teacher productivity and professional capacity. The literature presents AI as a technology that can augment human intelligence rather than merely imitate it. Zawacki-Richter et al. (2019), as presented in Fitria's discussion, identify two broad approaches: transferring certain teacher tasks to AI systems that act as tutors, and using AI to augment human intelligence and support more effective and efficient educational activities.

The second approach is particularly important for the conceptual development of this study. If AI is understood primarily as an augmentation technology, then its success should not be measured by how many teachers it can replace. Instead, its value should be evaluated according to how effectively it enables teachers and students to accomplish educational objectives. This reframes AI from a substitute for human capability into an instrument for expanding human capability.

The opportunities identified across the literature can therefore be organized into four broader dimensions. First, AI expands learning responsiveness through personalization, adaptive content, and immediate feedback. Second, AI expands teacher capacity by reducing repetitive and administrative workloads. Third, AI expands educational availability through virtual assistants, digital learning environments, and flexible access to learning support. Fourth, AI expands informational capacity by collecting, processing, and analyzing learning data that can inform pedagogical decisions.

Taken together, these dimensions indicate that the principal educational opportunity of AI is not simply automation. It is the possibility of creating an educational environment in which teachers and students have access to greater informational resources, more individualized learning support, faster feedback, and

more flexible learning processes. The source article itself concludes that AI can improve learning effectiveness, provide recommendations, increase efficiency, personalize learning, monitor student progress, minimize errors, save time, automate routine tasks, and modify the teacher's role toward facilitation (Fitria, 2023).

From the perspective of the present synthesis, however, these opportunities should be understood as enabling conditions rather than guaranteed outcomes. AI does not automatically produce better education merely because it is technologically sophisticated. Its educational value depends on how its capabilities are incorporated into pedagogical processes and how teachers use the information and functions provided by the system. The literature therefore supports a view of AI as an educational capacity multiplier: it can increase what teachers and students are able to do, but the educational direction of that increased capacity still requires human decision-making.

This interpretation also provides an important transition to the next theme. The more AI becomes capable of personalization, automation, prediction, assessment, and continuous learning support, the more important it becomes to examine the limitations and risks accompanying those capabilities. Increased technological capacity does not eliminate questions concerning human relationships, ethical responsibility, data, privacy, dependence on technology, and the boundaries of automation. Thus, the opportunities identified in this section should not be considered independently from the risks and human dimensions that accompany them.

Accordingly, the literature does not support an understanding of AI in education as either an inherently beneficial or inherently threatening development. Rather, AI represents a set of capabilities whose educational consequences depend on how those capabilities are positioned within the broader educational system. The strongest opportunity identified through this synthesis is therefore the possibility of combining machine-enabled efficiency, personalization, and analytical capacity with human-centered pedagogy, judgment, and educational relationships. This complementary configuration provides the foundation for examining the limitations and risks of AI in the following section.

3.5. Risks, Limitations, and the Human-Centered Complementary Model

The preceding analysis demonstrates that Artificial Intelligence offers substantial opportunities for improving educational processes through personalization, adaptive learning, automated assessment, feedback, data analysis, and the automation of routine tasks. However, the increasing capabilities of AI should not be interpreted as evidence that all educational functions can or should be

transferred to machines. The literature examined in this study simultaneously reveals a set of limitations and concerns that place important boundaries on the educational use of AI. These limitations are particularly significant because education is not solely a process of transmitting information or optimizing learning outcomes; it also involves human interaction, guidance, emotional support, ethical judgment, and the development of character.

One of the principal concerns identified in the literature is related to data security and privacy. The growing use of AI in education depends heavily on the collection and analysis of learner data, including information concerning students' learning performance, progress, preferences, and patterns of interaction. While such data can support personalized learning and enable teachers to obtain more useful information about students, the extensive collection and processing of educational data also creates ethical responsibilities concerning how such information is stored, processed, and used. Zawacki-Richter et al. (2019) therefore emphasize the importance of critical reflection on the ethical implications of AI in education. From the perspective of the present synthesis, the educational value of data-driven technologies cannot be separated from the responsibility to ensure that technological efficiency does not undermine the rights and interests of learners.

Another limitation concerns the difference between computational capability and human educational capacity. AI can process information rapidly, identify patterns, generate feedback, and perform repetitive tasks with considerable efficiency. Nevertheless, the literature reviewed by Fitria (2023) emphasizes that AI does not possess the human qualities associated with empathy, sympathy, compassion, and emotional understanding. These qualities are particularly important in educational situations in which students require more than informational assistance. A learner may need encouragement, motivation, personal guidance, or an understanding of circumstances that cannot be adequately represented through measurable data. Consequently, the ability of AI to respond to learning information should not be equated with the ability to understand the learner as a whole person.

This distinction becomes particularly important when considering the broader meaning of the teacher's role. Several studies discussed in the literature distinguish between teaching and educating. Teaching may involve the transmission of knowledge, explanation of concepts, assessment, and provision of feedback, whereas educating involves broader processes of guiding, motivating, developing character, and forming social and moral capacities (Solihati & Rachmawati, 2020; Tri et al., 2021). Some of the former functions can increasingly be supported or partially automated through AI. The latter, however, remain strongly dependent on human relationships and professional judgment. Thus, the expansion of AI capabilities does not necessarily diminish the importance of

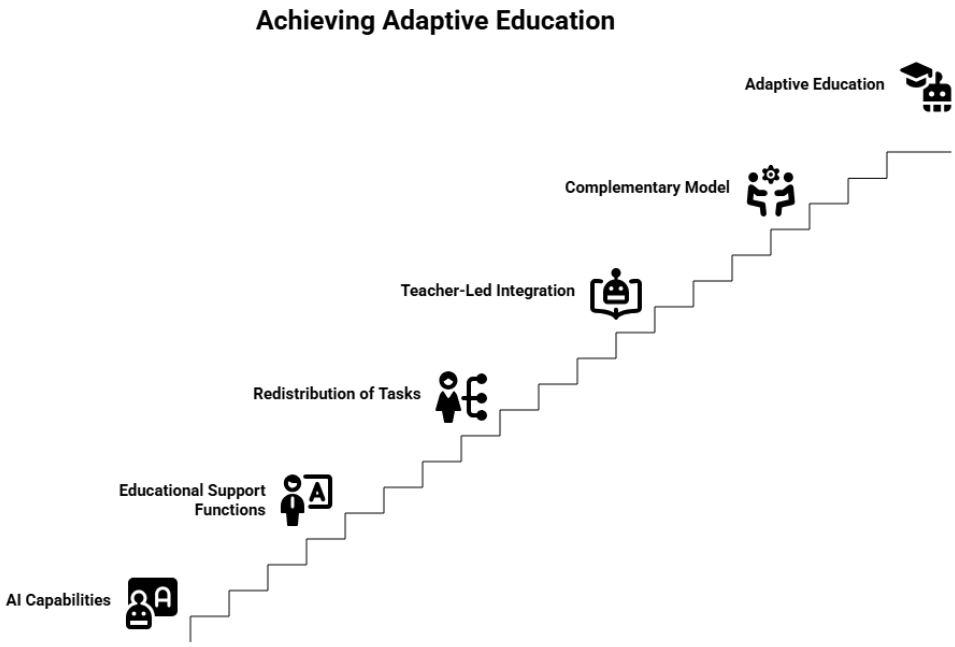
teachers. Instead, it makes the distinction between technological assistance and human educational responsibility increasingly visible.

The literature also suggests that excessive reliance on technology may create another important limitation. When educational processes become increasingly dependent on automated systems, there is a possibility that teachers or learners may treat technological outputs as inherently authoritative. Yet AI-generated recommendations and assessments remain technological outputs that require interpretation and professional judgment. The role of the teacher therefore remains important not only because teachers perform functions that AI cannot easily reproduce, but also because teachers provide the contextual judgment necessary to determine whether a technological recommendation is educationally appropriate. In this sense, teachers do not merely operate AI systems; they mediate between technological capabilities and the actual educational needs of learners.

Taken together, these limitations lead to a broader interpretation of the relationship between AI and teachers. The central issue is not whether AI will replace teachers, but how educational work should be redistributed between technological systems and human professionals. AI is particularly valuable in activities involving data processing, pattern recognition, personalization, automated feedback, assessment support, and repetitive administrative or instructional tasks. Teachers, meanwhile, remain central to activities requiring contextual interpretation, interpersonal relationships, motivation, mentoring, ethical judgment, and character development. This distribution should not be understood as a rigid separation because many educational activities involve interaction between both dimensions. Rather, it represents a complementary relationship in which the strengths of AI can support, rather than eliminate, the professional functions of teachers.

The present analysis therefore proposes a human-centered complementary model of AI in education. The model can be understood through four interconnected elements. First, AI provides technological capabilities such as data analysis, personalization, automation, prediction, and feedback. Second, these capabilities are translated into educational functions that can improve learning support and teacher efficiency. Third, teachers remain responsible for interpreting technological outputs, contextualizing learning experiences, and maintaining the human dimensions of education. Fourth, the interaction between AI capabilities and teacher expertise is expected to produce an educational environment that combines technological efficiency with human-centered pedagogy.

This synthesis can be represented conceptually as follows:



The significance of this model lies in its rejection of two opposing assumptions. The first is the assumption that AI can simply replace teachers because machines are increasingly capable of performing instructional tasks. The second is the assumption that AI has little educational value because education is fundamentally human. The findings synthesized in this study suggest a position between these extremes. AI has the capacity to transform substantial parts of educational work, but its greatest educational value emerges when technological capabilities are integrated with, rather than separated from, human educational expertise.

From the perspective of the present synthesis, therefore, the future of AI in education should be understood primarily as a process of role transformation and task redistribution rather than teacher replacement. The more effectively AI performs computational and routine functions, the more important it becomes for teachers to focus on functions that require professional judgment, meaningful interaction, mentorship, and human understanding. The central challenge is consequently not to determine whether AI or teachers should dominate education, but to establish how technological capabilities can be governed and integrated so that they strengthen the educational purposes that technology alone cannot fully accomplish.

Overall, the analysis of the literature demonstrates that the educational significance of AI lies neither in technological automation alone nor in the preservation of existing teaching practices unchanged. Rather, AI introduces new possibilities for organizing educational work. When these possibilities are

accompanied by ethical awareness, responsible data practices, critical evaluation, and strong teacher involvement, AI can function as a powerful educational support system while preserving the human-centered character of education. This complementary relationship provides the principal conceptual synthesis emerging from the present analysis and serves as the basis for understanding AI not as a substitute for the teacher, but as a technological partner within a broader human-centered educational system.

4. Conclusions And Suggestions

This study examined how the existing literature on Artificial Intelligence in education can be organized and synthesized into broader thematic patterns using a library research and content analysis approach. Rather than treating the reviewed literature as a collection of isolated findings, the analysis identified interconnected themes concerning the capabilities of AI, its application in teaching and learning, the transformation of teachers' roles, the educational opportunities it provides, and the limitations that shape its responsible use.

The findings demonstrate that Artificial Intelligence has become an important educational support system with capabilities that include personalization, adaptive learning, automated assessment, feedback provision, data analysis, and the automation of routine educational tasks. These capabilities can increase the efficiency and responsiveness of educational processes while providing teachers and learners with additional forms of learning support. However, the presence of these technological capabilities does not automatically produce better educational outcomes. Their educational value depends on how effectively they are integrated into pedagogical processes and how appropriately their outputs are interpreted and used.

The synthesis further indicates that the growing use of AI does not necessarily lead to the disappearance of the teacher's role. Instead, AI contributes to a redistribution and transformation of educational tasks. Tasks that are computational, repetitive, data-intensive, or highly standardized can increasingly be supported by AI, while teachers remain particularly important in areas requiring contextual judgment, interpersonal interaction, motivation, mentoring, ethical responsibility, and character development. Thus, the transformation brought by AI should be understood as a shift in the configuration of educational work rather than a simple transition from human teachers to technological systems.

At the same time, the analysis identifies important limitations and risks associated with the use of AI in education, particularly concerning data privacy, ethical responsibility, technological dependence, and the limitations of AI in reproducing human qualities such as empathy, compassion, and contextual understanding. These limitations demonstrate that educational processes cannot

be reduced to the efficient processing of information or the optimization of measurable learning outcomes. Education also involves human relationships and the development of learners as individuals. Consequently, technological advancement needs to remain connected to the broader human purposes of education.

Based on the overall synthesis, this study proposes that the relationship between AI and teachers is best understood through a human-centered complementary model. Within this model, AI contributes computational, analytical, adaptive, and automation capabilities, while teachers provide professional judgment, contextual interpretation, interpersonal support, ethical guidance, and human-centered educational leadership. The effectiveness of AI in education therefore depends not on replacing one with the other, but on establishing an appropriate relationship between technological capabilities and human educational expertise.

Overall, the central conclusion of this study is that AI should not primarily be understood as a replacement for teachers, but as a technology that redistributes educational tasks and creates new possibilities for collaboration between AI systems and human educators. The future development of AI in education should consequently focus not only on what AI is capable of doing, but also on what educational responsibilities should remain under human judgment. Such an approach allows technological innovation to contribute to more adaptive, efficient, and responsive education while preserving the human-centered purposes that constitute the broader meaning of education.

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