



Literature review on the role of artificial intelligence in identifying and developing the potential of secondary school students for excellent character building



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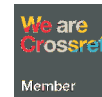
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Literature review on the role of artificial intelligence in identifying and developing the potential of secondary school students for excellent character building

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ABSTRACT

The development of artificial intelligence (AI) has changed the direction of modern education towards more adaptive, reflective, and learner-centred learning. This study aims to analyse the role of AI in identifying and developing student potential, as well as its contribution to the formation of excellent character in the digital age. This research is a narrative literature review that examines various relevant scientific publications published between 2018 and 2025, sourced from international databases such as Scopus, ERIC, and ScienceDirect, as well as SINTA-indexed national journals. The literature selection process was carried out using thematic criteria that emphasised the suitability of the context of primary, secondary, and higher education in Indonesia. Data analysis was conducted using a thematic-inductive approach to identify patterns of relationships between AI implementation, learning potential development, and moral character formation. The results showed that AI plays a role in facilitating personalised learning, increasing student engagement and motivation, and fostering empathy and responsibility through adaptive feedback and reflective interaction. On the other hand, challenges arise in terms of ethics, data privacy, and the digital divide. This study emphasises that AI implementation must be oriented towards human values so that technology functions as a pedagogical partner in shaping an intelligent and characterful generation.

Keywords:

Artificial intelligence
Student potential
Outstanding character
Digital education
Narrative literature

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Introduction

Education is the primary foundation for the development of society and the progress of the nation, especially in the 21st century, marked by the rapid advancement of digital technology. However, rapid technological changes and the complexity of global challenges require the education system to transform in order to remain relevant and capable of preparing the next generation to become individuals who are not only academically intelligent but also possess excellent character. In this context, artificial intelligence (AI) has emerged as a transformative force with the potential to change the educational landscape fundamentally. Several recent studies have shown that the application of AI can support a more adaptive, efficient, and student-oriented learning process through data-driven personalisation of learning (Bayly Castaneda, Ramirez-Montoya, & Morita-Alexander, 2024; Haetami, 2025).

Technically, AI is a subfield of computer science that focuses on developing systems capable of mimicking intelligent human behaviour including visual perception, voice recognition, decision-

making, and natural language understanding as well as the ability to "learn" and "adapt" from experience (Merino-Campos, 2025). In the context of modern education, AI is used to facilitate competency-based learning and real-time analysis of student performance, enabling teachers to design more targeted and personalised learning approaches (Sihaloho & Napitupulu, 2024; Chichekian & Benteux, 2022). AI is also a major driver in 21st-century learning models, where critical, collaborative, and empathetic thinking skills are key competencies that students must develop (Astuti, Sayuti, & Kusumastuti, 2023).

Furthermore, each student has unique characteristics, including different interests, talents, abilities, and potential. Potential here is an innate ability that emerges through encouragement, interest, and focused motivation, supported by a conducive environment. Khairani (2023) emphasises that recognising and developing individual potential from an early age is key to achieving personal and academic excellence. The formal educational environment, particularly schools and teachers, plays a strategic role in helping students recognise and develop this potential (Rif'at & Official, 2025). In line with this view, Nashori (2003) states that the development of student potential covers three main aspects: cognitive, affective, and psychomotor. With the advent of AI technology, these three aspects can now be developed simultaneously and measurably through the use of learning data and adaptive intelligence algorithms (Chaniago, Heriyanto, Alawiyah, & Khairunnisa, 2025).

In addition to developing intellectual potential, education also fosters the development of strong moral character. Character building involves the internalisation of universal moral values, such as honesty, responsibility, empathy, and hard work, which are manifested in everyday behaviour. Lickona (2004) divides character education into three interrelated dimensions, namely knowing the good, loving the good, and doing the good. In the context of technology-based learning, AI has the potential to assist in the internalisation of these values through reflective learning, digital ethics simulations, and the strengthening of social empathy through guided virtual interactions (Holmes & Tuomi, 2022; Haetami, 2025). However, the use of AI in education still requires human guidance to ensure that automation mechanisms do not compromise character values (Astuti et al., 2023).

Based on the above description, this study proposes three main questions: (1) What is the role of AI in identifying and developing students' potential to form excellent character? (2) What is the impact of AI implementation on the development of students' potential and character in the digital era? (3) What are the challenges and solutions that can be applied to ensure the ethical, effective, and inclusive use of AI in the context of education?

The purpose of this study is to systematically explore how artificial intelligence can be effectively utilised to identify and develop student potential, particularly in fostering strong character. In addition, this study aims to analyse the impact and challenges of using AI on the development of students' social and emotional skills, which form the foundation of excellent character in the digital era.

In the context of Indonesian education, the use of AI not only serves to improve academic outcomes but also strengthens the role of education in fostering moral and humanitarian values. Through data analysis and machine learning algorithms, AI can help teachers recognise students' strengths and weaknesses, provide personalised feedback, and recommend learning strategies relevant to individual learning profiles. With this holistic approach, the development of student potential not only covers cognitive aspects, but also affective and social aspects, so that education can produce individuals who are not only intellectually intelligent, but also have excellent character and are ready to face future challenges (Haetami, 2025; Sihaloho & Napitupulu, 2024).

Method

This study uses a narrative literature review approach that aims to identify, synthesise, and analyse various relevant research results regarding the role of artificial intelligence (AI) in identifying and developing student potential and shaping excellent character. This approach was chosen because the nature of the research focused more on conceptual exploration and theoretical integration than empirical testing. Thus, this method allowed researchers to highlight trends, research gaps, and directions for the development of AI-based education theory and practice.

The literature review approach used refers to the guidelines from Snyder (2019), which emphasises three main stages: (1) planning, namely the formulation of the focus and criteria for literature search; (2) conducting, namely the process of identifying, selecting, and analysing literature; and (3) reporting, namely the presentation of synthesis results in the form of themes and conceptual relationships. With this approach, the study seeks to present an integrative understanding that not only describes but also evaluates the contributions and limitations of previous studies.

Data Sources and Search Strategy

The literature was collected from various international and national academic databases recognised for their credibility, such as Scopus, Web of Science, ERIC, ScienceDirect, SpringerLink, and Google Scholar.

To enrich the local context, additional searches were conducted in SINTA indexed national journals, such as the Indonesian Journal of Educational Technology, the Journal of Educational Sciences, and Al-Madrasah: Journal of Madrasah Ibtidaiyah Education.

The publication time frame was set between 2018 and 2025 to ensure that the literature reviewed reflects the latest developments in AI implementation in education. The search was conducted using a combination of the following keywords and Boolean operators: ("artificial intelligence" OR "machine learning") AND (education OR "student learning" OR "school") AND (potential OR "student engagement" OR "learning motivation") AND (character OR "ethics" OR "moral values" OR "values education").

The search was conducted in English and Indonesian to cover relevant international and local publications. Opinion pieces, blogs, or preprints without peer review were not included in the analysis.

Literature Selection Criteria

To maintain relevance and quality, this study used the following inclusion and exclusion criteria: (1) Inclusion criteria: (a) Articles published between 2018 and 2025; (b) The research focuses on the application or impact of AI in education (primary, secondary, or higher); (c) Studies discuss the influence of AI on student potential, such as critical thinking, motivation, or character (empathy, responsibility, ethics); (c) Articles based on empirical research, education policy reports, or conceptual studies with a clear theoretical framework. (2) Exclusion criteria: (a) Articles that are not relevant to the context of human education (e.g., the application of AI in industry or economics); (b) Non-scientific publications, duplicate articles, and documents without credible academic sources.

The selection process is conducted manually and repeatedly to ensure that each article meets the criteria of topical relevance and methodological quality. Two independent reviewers read the abstract and full text in parallel to ensure objectivity, and differences of opinion are resolved through consensus discussion.

Data Analysis Procedure

Data analysis is conducted using a thematic approach (thematic content analysis) as described by Braun & Clarke (2019). The stages of analysis include: (1) Data familiarisation, through repeated reading of all selected articles; (2) Initial coding of the ideas, variables, and main findings of each study; (3) Theme identification by grouping similar codes into conceptual categories, such as cognitive potential, learning engagement, or moral character; (4) Narrative synthesis to connect cross-study findings with existing theoretical frameworks; (5) Final review to ensure consistency of interpretation and relevance to the research focus.

This approach enables in-depth exploration of the meaning of various research results, without relying on statistical quantification as in meta-analyses. The results of the analysis are presented in the form of thematic relationships and patterns of AI's influence on students' cognitive development and character.

Validity and Reliability

To ensure the quality of the analysis, this study implemented quality control measures such as: (1) Source triangulation, which is the use of various types of references (empirical, conceptual, and policy); (2) Audit trail, namely systematic documentation of the entire literature search and analysis process; (3) Peer debriefing, through the validation of preliminary results with fellow researchers in the field of educational technology; (4) Researcher reflexivity, by noting potential interpretive biases during the synthesis process.

These measures strengthen the credibility, dependability, and confirmability of the research results as recommended by Lincoln and Guba (1985).

Results and Discussion

The results of the literature review show that the use of artificial intelligence (AI) in education has a substantial impact on two main dimensions of student development, namely the development of learning potential (cognitive and motivational) and the formation of excellent character (affective and moral). 's thematic synthesis of various academic publications published between 2018 and 2025 reveals four interrelated key themes: (1) personalisation of learning and improvement of critical thinking skills; (2) increased engagement and motivation to learn; (3) internalisation of character values through AI-based reflective interaction; and (4) ethical challenges and educational readiness in the integration of innovative technology.

Personalisation of Learning and Development of Critical Thinking Skills

The literature reviewed shows that one of the most significant contributions of AI in education is its ability to create adaptive and personalised learning (Chu et al., 2023; Permana & Astawa, 2020). AI-based learning systems, such as adaptive learning systems and intelligent tutoring systems, can analyse students' learning patterns in real time, adjust the level of difficulty of the material, and provide learning recommendations tailored to individual abilities.

These results align with Vygotsky's (1978) theory of adaptive learning, specifically the Zone of Proximal Development (ZPD), where learning is most effective when the challenges presented are slightly above the student's current ability level and are facilitated through scaffolding. AI functions as digital scaffolding, providing dynamic support and instant feedback tailored to individual student needs.

Research by Damar (2021) and Susanto (2020) supports these findings, demonstrating that AI systems can enhance critical thinking skills through problem-based learning tasks and ethical decision-making simulations. In this context, AI not only acts as a learning aid but also as a cognitive agent that stimulates reflective processes and logical reasoning.

The implications for Indonesian education are enormous, as AI systems have the potential to help teachers quickly and objectively identify gaps in student understanding, enabling them to design more effective differentiated learning strategies. Thus, AI becomes a means of optimising students' intellectual potential without eliminating the pedagogical role of humans.

Increased Student Engagement and Motivation

The second theme that frequently appears in the literature is the increase in engagement and learning motivation through the application of AI. Various studies, such as those conducted by Rahma et al. (2023) and Schaufeli et al. (2019), demonstrate that integrating AI into learning activities can create an interactive, challenging, and enjoyable learning environment.

AI plays a role in providing quick personalised feedback, motivating gamification elements, and contextual learning experiences. Based on Self-Determination Theory (Deci & Ryan, 2000), this increase in motivation occurs because AI supports three basic psychological needs of students, namely autonomy (a sense of control over the learning process), competence (recognition of developing abilities), and relatedness (a sense of connection with teachers or the system).

In the context of digital learning in Indonesia, AI-based approaches also help alleviate the boredom that students often experience during and after the pandemic in online learning. Educational chatbots, material recommendation systems, and virtual assistants have been proven to increase student participation in discussions and extend the duration of active engagement (Manongga et al., 2022). Thus, AI not only enhances learning efficiency but also strengthens students' emotional engagement in the learning process.

Furthermore, AI-facilitated learning engagement also influences academic achievement. A study by Fu et al. (2025) shows a positive correlation between the level of student engagement in AI-based learning systems and improved learning outcomes. This confirms that AI is not only a technological tool but also a pedagogical mediator that can strengthen the relationship between intrinsic motivation and student academic outcomes.

Internalisation of Values and Character Building through Reflective AI Interaction

In addition to enhancing cognitive and motivational potential, the literature also suggests that AI makes a significant contribution to the development of superior character, particularly through reflective learning processes and digital social interactions. AI-based systems, such as moral simulation games and empathetic chatbot systems, are used to stimulate empathy, responsibility, and digital ethical awareness in students (Santoso, 2021; Nurdin et al., 2023).

These findings support the Social-Emotional Learning Framework (CASEL, 2020), which emphasises that moral character is formed through meaningful social experiences. AI can simulate complex and safe social situations for students to practise, such as ethical decision-making, conflict resolution, and group collaboration. In such scenarios, AI functions as a mirror of moral reflection a digital mirror that allows students to assess the impact of their actions and develop moral awareness.

Furthermore, AI also helps foster digital ethics values that are part of 21st-century excellence. With features that enable monitoring of learning activities and detection of plagiarism, AI systems play a role in instilling the values of academic integrity and personal responsibility (Rukmayuninda et al., 2020). This aligns with Thomas Lickona's (2004) theory of character education, which posits that good character is developed through a balance between knowing the good, feeling the good, and doing the good.

In the context of Indonesian education, this approach is highly relevant as it helps address the moral and social challenges arising from rapid technological penetration. AI does not replace the role of teachers in instilling values, but instead reinforces it through simulation, reflective feedback, and behaviour-based assessment.

Ethical, Inclusivity, and Educational Readiness Challenges

Although the review results show the great potential of AI in supporting the development of students' potential and character, the literature also highlights several fundamental challenges that need to be anticipated. The most dominant challenges are related to the ethics of AI use and the digital divide (UNESCO, 2023; OECD, 2023).

First, there are issues of student data privacy and security. AI systems that analyse learning data on a large scale have the potential to violate privacy if not managed with strict data governance policies. Second, there is still a technology access gap between urban and rural schools, which can widen learning opportunity inequalities. Third, low AI literacy among teachers means that many educational institutions are not yet able to utilise this technology optimally and ethically.

The literature also highlights the importance of the principle of "human-centred AI" in education (OECD, 2023), which emphasises that technology should reinforce, rather than replace, the human

dimension of the learning process. In this context, the role of teachers as facilitators of values and moral guides remains a central element that algorithms cannot replace.

Therefore, for AI to be implemented sustainably, synergy is needed between technology ethics education, inclusive digital policies, and strengthening teachers' capacity in AI literacy. These strategies will ensure that innovative technology becomes a means of empowering students and educators, rather than a source of new inequalities in the education system.

Overall, the results of this literature synthesis confirm that AI has transformative potential in education when used in a targeted and ethical manner. AI functions as a pedagogical mediator that connects cognitive (intellectual potential development) and affective (moral character formation) aspects through three main mechanisms: personalised learning, reflective feedback, and value-based social interaction. However, the successful implementation of AI depends on the readiness of the education system to maintain a balance between artificial intelligence and human wisdom. Technology will only be a meaningful tool if it is used to strengthen the human dimension of students, encouraging them to become critical, empathetic, and responsible learners.

From the literature reviewed, artificial intelligence plays a dual role: as a tool to optimise academic potential and to foster excellent character through reflective learning. AI offers new opportunities for education systems to evolve towards more adaptive, inclusive, and human-centred models. However, these opportunities can only be realised if policies, infrastructure, and educator capacity are improved in line with ethical principles and equitable access.

Conclusion

This study concludes that artificial intelligence (AI) has a strategic role in identifying and developing student potential while shaping excellent character in the era of digital education. Based on the results of the literature review, AI has been proven to facilitate personalised learning, improve critical thinking skills, and strengthen student motivation and engagement through adaptive learning systems and data-based feedback. In addition to improving cognitive aspects, AI also plays an important role in developing moral character, such as empathy, responsibility, and digital ethics, through reflective simulations and virtual social interactions designed to instil human values. Thus, AI is not merely a learning support technology, but a pedagogical instrument that brings together students' cognitive intelligence and moral sensitivity. Its application needs to be guided ethically and humanistically so that it can strengthen the role of teachers as educators and value mentors, rather than replace them. This study confirms that the successful implementation of AI in education is determined by a balance between technological innovation, pedagogical wisdom, and the human values that underlie the learning process.

This study has several limitations that need to be considered when interpreting the results. First, as a narrative literature review, this study did not conduct quantitative statistical analysis or meta-analysis; therefore, it did not provide numerical measurements of the extent of AI's influence on students' potential and character. Second, most of the literature reviewed originates from the context of Asian education, including Indonesia, which may have distinct cultural, infrastructural, and educational policy differences compared to other countries. This may affect the global generalisation of the findings. Third, methodological variations in the studies reviewed make the results of this synthesis more conceptual and exploratory than conclusive. Nevertheless, these limitations do not diminish the academic value of this research, as the results still make a significant contribution to theoretical understanding and inform policy direction in the application of AI in education. These limitations actually open up space for further research to deepen the empirical and longitudinal dimensions of the relationship between AI, cognitive potential, and character formation.

Based on the results of this synthesis and the limitations of this study, several recommendations can be proposed for future research and educational practice. First, further research is recommended to employ an empirical approach with a longitudinal or mixed-methods design to measure the long-term effects of AI implementation on the development of students' character and potential more

comprehensively. Second, it is important to explore the integration of AI in the context of learning based on local values and Indonesian culture, so that the technology is not only efficient but also morally and socially relevant. Third, future research should develop an AI implementation model grounded in educational ethics, which incorporates the principles of algorithmic transparency, digital justice, and student privacy protection.

In addition, educational institutions and policymakers are expected to strengthen teachers' capacities through AI literacy and technology ethics training programmes. Teachers must be positioned as co-designers in the AI integration process, ensuring that the application of technology aligns with human values and national educational goals. The final recommendation is the need for cross-sector collaboration between academics, technology developers, and the government to create an inclusive, adaptive, and character-oriented innovative learning ecosystem. Through such collaboration, AI can truly function as a human partner in creating fair, humanistic, and sustainable education.

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