www.ijarp.com ISSN 2456-9992 Page: 01-12

International Journal Advanced Research Publications

Research Article

Volume: 02
Issue: 07

HUMAN-CENTRED AI PEDAGOGY FOR LIFELONG LEARNING AND SOCIAL CHANGE

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Article Received: 18 June 2026, Article Revised: 08 July 2026, Published on: 28 July 2026

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Doi: https://doi-doi.org/101555/ijarp.2323

ABSTRACT

The rapid integration of Artificial Intelligence (AI) into educational contexts has created new opportunities to reimagine pedagogy through a human-centred lens. This paper explores the concept of Human-Centred AI Pedagogy as a transformative approach to lifelong learning and social change. It emphasises the need to align technological innovation with human values, ethical considerations, and inclusive practices to ensure that AI enhances, rather than replaces, meaningful learning experiences. Adopting a conceptual and analytical framework, the study examines how AI-driven tools such as adaptive learning systems, intelligent tutoring, and learning analytics can support personalised, flexible, and continuous learning across diverse contexts. A Human-centred approach prioritises learner agency, emotional well-being, and social responsibility, thereby fostering critical thinking, empathy, and collaborative problem-solving skills essential for addressing contemporary societal challenges. The paper further highlights the role of lifelong learning in empowering individuals and communities to adapt to rapid technological and socio-economic changes. By integrating AI within participatory and experiential pedagogical models, education can extend beyond formal institutions to support community engagement and social innovation. However, the study also critically addresses challenges such as digital inequality, ethical concerns, algorithmic bias, and data privacy. The findings suggest that Human-Centred AI Pedagogy has significant potential to promote inclusive and sustainable social change when guided by ethical frameworks and equity-driven policies. The paper concludes by advocating for a balanced integration of AI and pedagogy that

nurtures human capabilities while contributing to a more just, equitable, and sustainable society.

KEYWORDS: Human-centred AI; Lifelong Learning; Pedagogy; Social Change.

INTRODUCTION

The rapid advancement and integration of Artificial Intelligence (AI) into various aspects of society have intensely influenced educational landscapes, offering extraordinary opportunities to personalize learning, enhance teaching efficiency, and support continuous skill development. However, this technological flow also raises critical concerns regarding ethics, equity, and the preservation of human agency in learning processes. In response, Human-Centered AI Pedagogy has emerged as a vital framework that places human values, needs, and well-being at the core of AI integration in education (Yang et al., 2021).

Human-centered AI (HAI) in education moves beyond efficiency-driven mechanization to approaches that prioritize human conditions, contexts, emotions, and social interactions. It highlights designing AI systems that make implicit learner needs visible while nurturing explainability, agency, and meaningful human-AI collaboration (Yang et al., 2021). This pedagogical orientation leverages tools such as adaptive learning systems, intelligent tutoring systems, learning analytics, and generative AI to create personalised, flexible, and inclusive learning experiences across formal, informal, and lifelong contexts.

The requirement for such human-centered approach has become increasingly urgent amongst rapid socio-economic and technological transformations. AI holds huge potential to support lifelong learning by enabling individuals and communities to adapt continuously to changing environments, fostering critical thinking, creativity, empathy, and collaborative problem-solving skills important for addressing global challenges (Mozelius et al., 2025). International organizations like UNESCO strongly advocate for ethical, equitable, and human-centered AI integration in education to prevent the widening of digital divides and to approve technology serves inclusive and sustainable development goals (UNESCO, 2025).

However, the integration of AI in education must carefully address important ethical challenges, including algorithmic bias, data privacy, surveillance, and the risk of perpetuating systemic discrimination and inequities, mostly in diverse learner populations (Akgun & Greenhow, 2021). This paper adopts a conceptual and analytical framework to examine how Human-Centered AI Pedagogy can drive transformative lifelong learning and social change. By embedding AI within participatory, experiential, and community-oriented models,

education can spread beyond traditional institutions to promote social innovation and collective empowerment. At the same time, the study critically addresses persistent challenges such as algorithmic bias, data privacy, digital inequality, and the risk of over-reliance on technology at the expense of human connection (Cardona et al., 2023; Akgun & Greenhow, 2021).

Ultimately, Human-Centred AI Pedagogy reimagines AI not as a replacement for human educators or learners but as a helpful partner that enhances human capabilities. When guided by healthy ethical frameworks and equity-focused policies, it holds noteworthy capacity for fostering a more just, inclusive, and sustainable society through empowered lifelong learning.

Objectives of the Study

1. To examine the concept of Human-Centred AI in education.
2. To explore its role in enhancing lifelong learning.
3. To analyse its potential for promoting social change.

METHODOLOGY

This study adopts a qualitative and conceptual research design to explore the intersection of human-centred AI, pedagogy, and lifelong learning for social change. It is grounded in a comprehensive and systematic review of relevant literature drawn from diverse fields such as education, artificial intelligence, sustainability, and social sciences, enabling a broad and critical understanding of existing theories, frameworks, and practices. The study further undertakes an in-depth theoretical analysis of AI technologies such as adaptive learning systems, intelligent tutoring, and learning analytics and established pedagogical models, in order to study their potential integration in fostering meaningful and inclusive learning experiences.

In addition, an interpretative synthesis of interdisciplinary outlooks is employed to connect insights from multiple domains, permitting for the construction of a holistic and coherent conceptual framework. This process involves associating, contrasting, and critically reflecting on different viewpoints to identify patterns, relationships, and emerging themes related to AI-enabled pedagogy and social transformation. The approach also emphasizes critical inquiry into ethical considerations, equity, and human values in the use of AI within educational contexts. By avoiding empirical data collection and instead concentrating on conceptual depth, this methodology enables the generation of theoretical insights, the identification of research gaps, and the formulation of future research directions, thereby contributing to the advancement of knowledge in the field.

Research Gap

Although Artificial Intelligence (AI) is gradually being used in education, there is an imperfect integration of human-centred AI principles into pedagogical practices. Most existing AI applications prioritise technical efficiency, mechanisation, and scalability while giving insufficient attention to learner agency, emotional well-being, social interaction, and humanistic values. Additionally, there is a lack of complete frameworks that effectively connect AI, lifelong learning, and social change. Current research largely treats AI as a tool for personalised learning or skill development, with a slight focus on its potential to drive broader societal transformation through participatory and community-oriented education. Finally, ethical and inclusive dimensions of AI in education remain underexplored. Issues such as algorithmic bias, data privacy, digital inequality, and fairness are often addressed superficially, leading to implementations that risk perpetuating existing disparities rather than promoting equity. This study aims to address these gaps by developing a more integrated Human-Centred AI Pedagogy framework for lifelong learning and sustainable social change.

Human-Centred AI in Education

Human-Centred AI (HCAI) is an approach that prioritises the design and disposition of artificial intelligence systems to improve human capabilities, well-being, and agency rather than replace or diminish them (Shneiderman, 2022; Yang et al., 2021). In the educational context, HCAI shifts the focus from technology-driven automation to human-centred learning, confirming that AI serves as a supportive partner in the learning process.

Several core principles in education guide this approach:

1. Ensuring Inclusivity and Accessibility: HCAI systems are considered to accommodate diverse learners, including those from marginalised backgrounds, with disabilities, or facing language barriers. This involves creating adaptive platforms with features such as multilingual support, text-to-speech, and culturally responsive content to reduce digital divides and promote equitable access (UNESCO, 2025; Fu et al., 2024).

2. Supporting Learner Autonomy and Agency: Rather than controlling the learning process, HCAI tools permit students by providing explainable recommendations, allowing human oversight, and fostering self-directed learning. Learners retain control through “human-in-the-loop,” “human-on-the-loop,” and “human-over-the-loop” mechanisms, which increase critical thinking and decision-making (Alfredo et al., 2024; Le Dinh, 2025; Nguyen, 2022).

3. Promoting Ethical Use of Technology: Ethical considerations are fixed at every stage, addressing issues such as algorithmic bias, data privacy, transparency, accountability, and non-maleficence. HCAI frameworks emphasise fairness, trustworthiness, and responsible governance to prevent harm and build public confidence (Fu et al., 2024; Anastasiades, 2024; Li & Gu, 2023).

4. Enhancing Emotional and Social Learning: HCAI supports socio-emotional development by facilitating meaningful human interactions, empathy-building, and collaborative learning experiences. It augments rather than replaces human relationships, recognising that emotional intelligence and social connections are central to effective education (Anastasiades, 2024; Samuel et al., 2023).

By implementing these principles, Human-Centred AI ensures that technology serves as a tool for empowerment rather than control. It positions AI as an augmentative force that amplifies human creativity, critical reflection, and social responsibility while safeguarding human dignity and autonomy in educational settings (Shneiderman, 2022; UNESCO, 2025).

Lifelong Learning and AI

Artificial Intelligence (AI) has emerged as a powerful enabler of lifelong learning, transforming education from a finite, institution-bound process into a continuous, adaptive, and learner-driven journey. By leveraging intelligent technologies, individuals can engage in learning throughout their lives, adapting to evolving personal, professional, and societal demands (Bayly-Castaneda et al., 2024; Ahn, 2024).

AI facilitates lifelong learning through the following key mechanisms:

1. Providing Personalised Learning Experiences: AI systems analyse learners preferences, performance, strengths, and weaknesses in real time to address tailored content, feedback, and learning pathways. This customisation increases application, motivation, and effectiveness, making learning more responsive to individual needs across different life stages (Bayly-Castaneda et al., 2024).

2. **Enabling Flexible and Self-Paced Learning:** AI-powered platforms support asynchronous, on-demand learning that fits around work, family, and personal commitments. Learners can progress at their own speed, revisit materials, and select flexible schedules, breaking traditional time and location limits (Ahn, 2024; Gharahighehi et al., 2024).

3. Supporting Continuous Skill Development: In a rapidly changing world, AI helps individuals continuously upskill and reskill by recognising emerging competency gaps and recommending targeted learning interventions. This is mostly valuable for workforce adaptation, where AI accelerates skill acquisition and supports ongoing professional growth (UNESCO, 2025).

4. Enhancing Access to Global Knowledge Resources: AI democratizes education by providing intelligent search, translation, summarisation, and curation of vast global knowledge repositories. Learners from diverse backgrounds can access high-quality resources, courses, and expert insights regardless of geographic or economic limitations (Bayly-Castaneda et al., 2024; E.P.O, 2025).

Together, these features permit individuals to adapt effectively to changing societal, technological, and professional demands. AI-supported lifelong learning nurtures resilience, employability, and personal fulfilment in an era of constant disruption, while encouraging inclusive and equitable learning opportunities for all age groups and communities (UNESCO, 2025; Ahn, 2024).

Pedagogical Framework for Social Change

Human-Centred AI Pedagogy for social change integrates intelligent technologies with transformative educational practices to foster both individual authorisation and collective well-being. This framework moves beyond technical efficiency to position AI as a catalyst for equity, critical consciousness, and sustainable societal transformation (Anastasiades, 2024; UNESCO, 2025).

The framework is built on five interconnected pillars:

1. Personalised Learning: AI adapts content, pacing, and pathways to individual learners needs, abilities, and cultural settings. This personalisation rises application and engagement while addressing diverse learning styles and barriers, enabling more equitable educational opportunities (Bayly-Castaneda et al., 2024; Fu et al., 2024).

2. Transformative Learning: The framework boosts critical reflection, perception shifts, and the questioning of dominant assumptions. Human-Centred AI supports this by providing explainable insights and prompting learners to interrogate biases in data and algorithms, thereby developing critical AI literacy and deeper social awareness (Mezirow's transformative learning theory integrated with AI, as discussed in Samuel et al., 2023; Taylor, 2024).

3. Experiential Learning: AI facilitates engagement in real-world problem-solving through simulations, project-based scenarios, and immersive environments. Learners tackle authentic community and global challenges, bridging theory with practice and developing practical competencies for social innovation (Hmoud et al., 2025).

4. Community Engagement: The framework links individual learning with collective action by involving learners in local and global communities. AI tools support collaborative platforms, co-creation projects, and civic participation, turning education into a vehicle for social action and community-driven change (Bae-Dimitriadis, 2024).

5. Ethical Orientation: Ethical considerations are rooted throughout, promoting responsible AI use, fairness, transparency, accountability, and equity. This pillar confirms AI does not perpetuate harm or inequality but actively advances justice and human rights (Fu et al., 2024; UNESCO, 2025; Li & Gu, 2023).

By integrating these elements, the Human-Centred AI Pedagogy for Social Change nurtures individual growth such as autonomy, creativity, and critical thinking, while contributing to collective well-being through inclusive, ethical, and socially responsive education. It positions AI as a powerful assistant in building a more just, equitable, and sustainable society.

FINDINGS OF THE STUDY

1. Examination of the Concept of Human-Centred AI in Education

These findings reveal that Human-Centred AI (HCAI) in education is defined as an approach that arranges human values, agency, emotions, ethics, and well-being over purely technical efficiency. Core principles include explainability, transparency, accountability, fairness, human control (human-in-the-loop, human-on-the-loop, and human-over-the-loop), and iterative stakeholder involvement (Le Dinh, 2025; Alfredo et al., 2024; Schmager et al., 2025).

Unlike traditional AI systems focused on automation and scalability, HCAI treats AI as a collaborative partner that augments human capabilities. It emphasises co-design with educators and learners, trustworthiness, and alignment with pedagogical goals. Empirical reviews show that effective HCAI frameworks integrate human reflection before and after AI interactions, confirming technology serves rather than replaces human judgment (Yang et al., 2021).

2. Role of Human-Centred AI in Enhancing Lifelong Learning

Human-Centred AI significantly enhances lifelong learning by allowing personalized, adaptive, and flexible learning pathways across formal, informal, and workplace contexts. Studies demonstrate that HCAI systems support adaptive content delivery, real-time

scaffolding, personalized recommendations, and metacognitive skill development while preserving learner autonomy and motivation (Gharahighehi et al., 2024; Bayly-Castaneda et al., 2024).

In professional and adult learning environments, AI-powered tools have revealed enhancements in engagement (up to 43% higher voluntary participation), problem-solving capabilities, and continuous skill development. HCAI approaches excel in creating inclusive ecosystems that accommodate diverse learner needs throughout life, particularly through explainable and controllable systems that foster self-directed learning (Alfredo et al., 2024; Ramachandran et al., 2024).

3. Potential of Human-Centred AI for Promoting Social Change

Human-Centred AI holds solid potential to drive equitable and inclusive social change by reducing educational inequalities, empowering marginalized communities, and encouraging critical consciousness. When designed ethically, it enhances accessibility for learners with disabilities, supports personalized pathways for underrepresented groups, and mitigates systemic biases (Melo-López et al., 2025; UNESCO, 2025).

However, findings also highlight that without thoughtful human-centred governance, AI risks exacerbating digital divides and biases. Successful implementations emphasise stakeholder co-creation, ethical oversight, and alignment with social justice goals, leading to greater inclusion, community empowerment, and sustainable development outcomes (Anastasiades, 2024).

Challenges and Ethical Considerations

While Human-Centred AI Pedagogy offers significant potential, its implementation faces several critical challenges and ethical concerns that must be carefully addressed.

1. Digital Divide and Unequal Access to AI Tools: Many learners, especially in developing regions and marginalised communities, lack access to reliable internet, devices, or high-quality AI systems. These risks widen existing educational inequalities rather than dropping them (UNESCO, 2025).

2. Data Privacy and Security Concerns: AI systems collect huge amounts of sensitive student data, raising serious risks of breaches, misuse, and surveillance. Protecting learner privacy remains a major ethical challenge (Akgun & Greenhow, 2021; Fu et al., 2024).

3. Algorithmic Bias and Fairness Issues: AI algorithms can spread and even amplify societal biases related to race, gender, socioeconomic status, and culture, leading to unfair learning outcomes and discriminatory practices (Anastasiades, 2024; Li & Gu, 2023).

4. Overdependence on Technology: Excessive reliance on AI may reduce critical thinking, creativity, and human interaction, potentially weakening essential human skills and emotional development (Shneiderman, 2022; Samuel et al., 2023).

5. Need for Policy and Ethical Guidelines: There is currently a lack of comprehensive, enforceable policies and ethical frameworks to guide the responsible integration of AI in education across different contexts (UNESCO, 2025).

Addressing these challenges is essential for ensuring equitable, ethical, and responsible implementation of Human-Centred AI Pedagogy.

CONCLUSION

Human-Centered AI Pedagogy signifies a transformative and ethically grounded approach to education that effectively integrates advanced artificial intelligence with core human values, learner agency, and broader social objectives. By placing humans at the centre of AI design and implementation, this pedagogical framework has significant potential to reshape lifelong learning, making it more personalized, inclusive, flexible, and meaningful while simultaneously driving sustainable social change through empowered individuals and communities. This study concludes that Artificial Intelligence should not replace human educators or learners but must function as a supportive tool that enhances human capabilities, fosters critical thinking, emotional intelligence, and ethical awareness. When guided by human-centred principles, AI can bond educational inequalities, promote continuous skill development, and empower learners to become active agents of positive social transformation rather than passive recipients of technology.

The successful realization of this revelation depends on addressing critical challenges such as the digital divide, algorithmic bias, data privacy, and overdependence on technology through robust ethical frameworks and inclusive policies. Ultimately, Human-Centered AI Pedagogy offers a promising pathway toward a more equitable, empathetic, and sustainable educational forthcoming. Future research should concentration on the empirical validation of this framework, its practical implementation across diverse cultural and socio-economic contexts, and the development of scalable models that can effectively support both individual growth and collective well-being.

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