A review of the evolution of educational frameworks: pedagogy 1.0 to 7.0

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Abstract

This review systematically analyses the evolutionary trajectory of educational frameworks from Pedagogy 1.0 to the envisioned Education 7.0. It traces the paradigm shifts from traditional, teacher-centred instruction, characterised by passive knowledge transmission, towards increasingly learner-directed, collaborative, and technology-integrated models. The progression aligns with the development of the World Wide Web, moving from the static consumption of Web 1.0 (Education 1.0) to the interactive and collaborative nature of Web 2.0 (Education 2.0), and further to the networked, connective knowledge of Web 3.0 (Education 3.0). The analysis extends to emerging AI-integrated ecosystems, where Education 5.0 emphasises human-machine collaboration and design thinking, while Education 6.0 and 7.0 envision immersive, globally connected learning environments powered by artificial intelligence, virtual reality, and advanced interfaces.

The review highlights corresponding shifts in pedagogical theory, from pedagogy to andragogy, heutagogy, and paragogy- and examines the evolving roles of educators and learners, alongside changes in technology use and assessment methods. Key findings confirm a fundamental reorientation from standardised, instructor-led delivery to personalised, adaptive, and self-determined learning. The paper concludes by identifying critical ethical considerations and future challenges, such as data privacy, algorithmic bias, and digital equity,

emphasising the necessity for policies that ensure technological advancements foster inclusive, human-centred education focused on creativity, ethics, and socio-emotional skills. This overview serves as a map for educators and policymakers to navigate and prepare for the demands of a digitised future.

Keywords: Pedagogy, Andragogy, Heutagogy, Pedagogy, Education 1.0-7.0, AI integrated ecosystem, Paradigm shift.
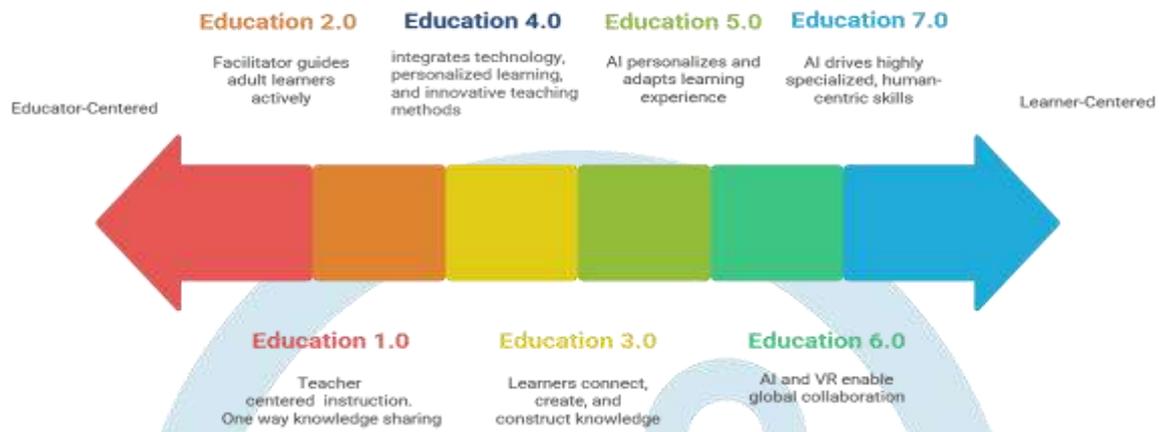
Introduction

The modern world is undergoing rapid digital transformation, motivated by extensive changes in Artificial Intelligence (AI) and robotics. This technological evolution demands a corresponding fundamental transformation of education (Zawacki-Richter et al., 2019). Educational structures have traditionally been viewed through the lens of pedagogy (Gupta, S., 2023), yet the impact of technology, particularly the World Wide Web, has accelerated the adoption of advanced learning paradigms (Anderson & Dron, 2011).

The transformation of the web, from Web 1.0 to Web 3.0, works as a powerful metaphor for the advancement of modern education, moving from Education 1.0, characterised by passive consumption, toward Education 3.0, emphasising self-determined content creation (Keats & Schmidt, 2007; Siemens, 2005). This conceptual change involves a gradual shift from pedagogy towards andragogy, heutagogy, and paragogy, aligning with the emergence of more learner-centred and networked approaches (Blaschke & Hase, 2019).

The importance of analysing these frameworks is to highlight the urgent need for educational institutions to reconsider their contributions and infrastructures to align with present-day learning demands (Gupta, S. & Singh, V., 2024). As the world transitions toward Society 5.0—a cohesive civilisation that integrates the digital and physical worlds while prioritising human needs, educational policy must be reshaped to prepare learners for an automated workforce where creativity, adaptability, and complex social skills are most valued (UNESCO, 2021; Tlili et al., 2022).

The scope of this review covers the historical and philosophical fundamentals of pre-digital and Web 1.0–3.0 connected learning models (Pedagogy 1.0 to 3.0). It also inspects the foreseen characteristics and pedagogical shifts within emerging technology-driven frameworks such as Education 5.0, 6.0, and 7.0, which emphasise the integration of AI, robotics, and design thinking as core components of next-generation learning (Luckin et al., 2016; Popenici & Kerr, 2017). This paper is structured into sections addressing the underlying frameworks of Education 1.0–3.0, followed by an in-depth discussion of AI-centric master plans for Education 5.0–7.0, and concludes with key findings and directions for future research.

Figure 1: Evolution of Education from educator-led to AI-driven Learning

Research Aim:

To systematically analyse the evolution of educational methodologies from traditional, teacher-centred approaches (Pedagogy 1.0) to advanced, AI-integrated learning ecosystems (Education 5.0–7.0), and to identify the paradigm shifts in pedagogical theories, roles of educators and learners, and technological integration.

Research Objectives:

1. To trace the history of educational frameworks from Education 1.0 to 7.0.

2. To analyse the evolution of pedagogical models (Education 1.0-7.0) by comparing their core characteristics and examining their synergy with technological and societal paradigms (Web, Industry, Society 5.0).

3. To identify ethical considerations and future challenges associated with AI and advanced technologies in education.

Research Design

This study employed a Systematic Literature Review (SLR) methodology to analyse the evolution of educational frameworks from Pedagogy 1.0 to Education 7.0. A rigorous, multi-stage protocol was followed to ensure a comprehensive and unbiased synthesis of existing research (Rastogi, S., et. al., 2025). The process began with the systematic identification of relevant literature from major academic databases (e.g., Scopus, Web of Science) using targeted keywords related to pedagogical models and technological integration. A strict screening process was applied based on predefined inclusion criteria, focusing on peer-reviewed articles published between 2000 and 2024. This process resulted in a final corpus of 20 key research papers that formed the basis of the analysis. Thematic analysis was then used to synthesise the findings, identifying core

themes such as paradigm shifts in learning philosophies, the evolving roles of educators and learners, and the ethical implications of AI integration. This structured approach ensured a reliable and reproducible review, providing a solid evidence base for the paper's conclusions and future research directions.
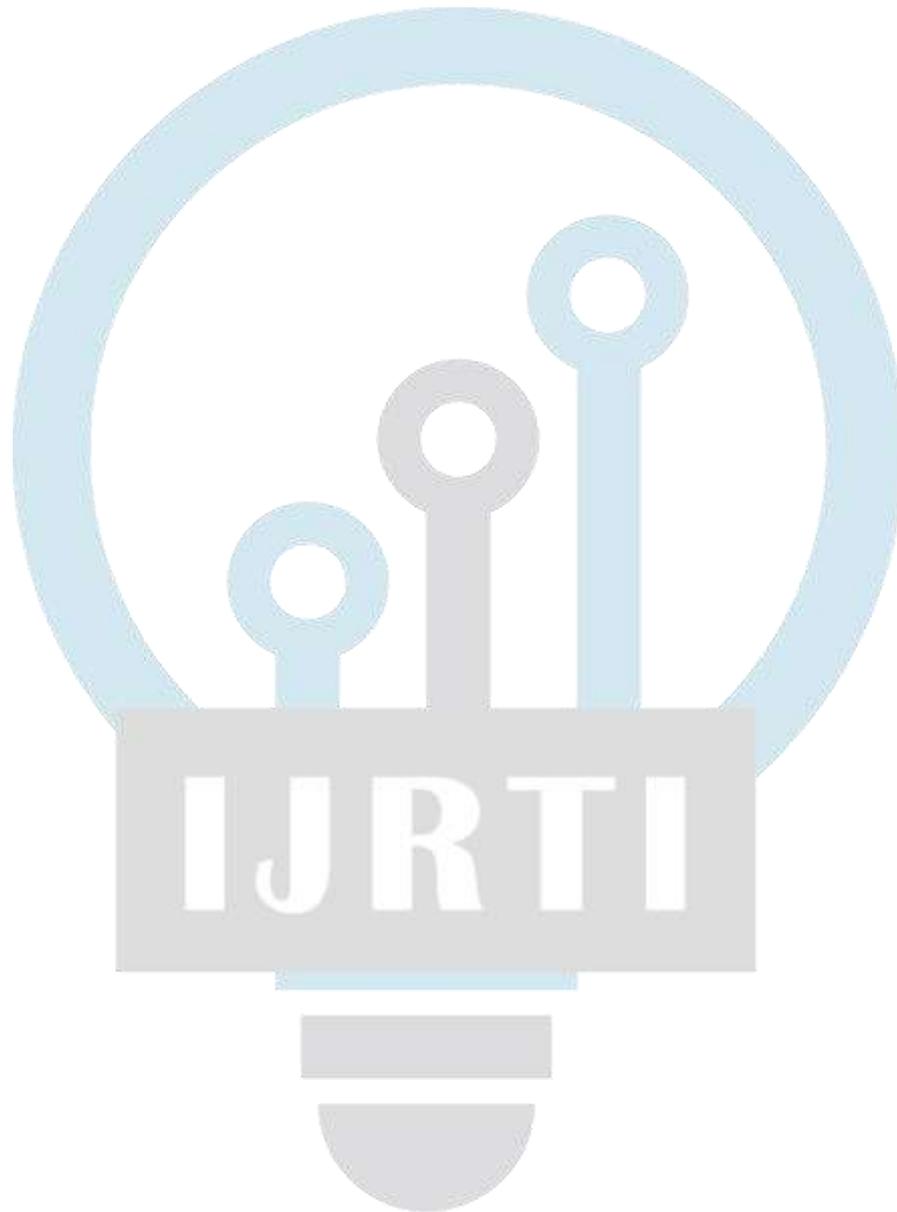
Table 1: Potential Studies for Systematic Literature Review on Pedagogical Evolution (1.0 to 7.0)

No.	Author(s) & Year	Title	Focus Area (Pedagogy Version)	Key Contribution
1.	Anderson & Dron (2011)	Three Generations of Distance Education Pedagogy	1.0, 2.0, 3.0	Contrasts behaviourist/cognitive (1.0), social constructivist (2.0), and connectivist (3.0) models.
2.	Bonk & Graham (2006)	The Handbook of Blended Learning	2.0	Comprehensive review of blended learning, a key feature of the Education 2.0 era.
3.	Keats & Schmidt (2007)	The Genesis and Emergence of Education 3.0 in Higher Education	3.0	Early conceptualisation of Education 3.0, emphasising collaboration and open content.
4.	Blaschke & Hase (2019)	Heutagogy and Digital Media Networks	2.0, 3.0	Explores the link between heutagogy (self-determined learning) and Web 2.0/3.0 technologies.
5.	Downes (2010)	Learning Networks and Connective Knowledge	3.0	Further develops the theory of connectivism and its application in online learning networks.
6.	Siemens (2005)	Connectivism: A Learning Theory for the Digital Age	3.0	Foundational paper proposing connectivism as a learning theory for the network era.
7.	Hase & Kenyon (2000)	From Andragogy to Heutagogy	2.0, 3.0	Seminal paper introducing the concept of heutagogy as an evolution beyond andragogy.
8.	Ito et al. (2013)	Connected Learning: An Agenda for Research and Design	3.0	Explores learning that is socially connected, interest-driven, and oriented towards educational opportunity.

No.	Author(s) & Year	Title	Focus Area (Pedagogy Version)	Key Contribution
9.	Facer (2011)	Learning Futures: Education, Technology and Social Change	3.0, 5.0	Discusses the long-term future of education in a technologically advanced society.
10.	Tlili et al. (2022)	Is Education 4.0 a Sufficient Innovative and Disruptive Educational Trend?	4.0/5.0	Critically examines the concept of Education 4.0 and its alignment with Industry 4.0.
11.	Zawacki-Richter et al. (2019)	Systematic Review of Research on Artificial Intelligence in Education	5.0	Provides a broad overview of AI applications in education, relevant to Education 5.0.
12.	Popenici & Kerr (2017)	Exploring the Impact of Artificial Intelligence on Teaching and Learning in Higher Education	5.0	Early analysis of AI's potential to transform teaching roles and learning processes.
13.	Luckin et al. (2016)	Intelligence Unleashed: An argument for AI in Education	5.0	Proposes a framework for using AI to support "learning how to learn" and metacognition.
14.	Selwyn (2019)	Should Robots Replace Teachers?	5.0, 7.0	A critical examination of the role of AI and robotics, emphasising the importance of human teachers.
15.	UNESCO (2021)	AI and Education: Guidance for Policy-makers	5.0, 6.0, 7.0	Provides a global policy framework focusing on inclusion, equity, and ethical AI use.

| No.	Author(s) & Year	Title	Focus Area (Pedagogy Version)	Key Contribution
16.	Holmes et al. (2021)	Ethics of AI in Education: Towards a Community-Wide Framework	5.0-7.0	Addresses critical ethical concerns like data privacy, algorithmic bias, and digital humanism.
17.	Zhang & Aslan (2021)	AI Technologies for Education: Recent Research & Future Directions	5.0	Reviews recent advancements in AIEd technologies and their pedagogical implications.
18.	Hwang et al. (2020)	Vision, Challenges, Roles and Research Issues of AI in Education	5.0, 6.0	Discusses the future vision and challenges of AI in education, including personalised tutoring.
19.	Mystakidis (2022)	Metaverse and Education: A Systematic Review	6.0	Explores the potential of immersive technologies (VR/AR) for education, aligning with Education 6.0.
20.	Kaplinsky (2020)	How will AI and Automation Affect Education? The Need for a New Model	7.0	Argues for a fundamental shift in education towards uniquely human skills in the age of AI automation.

Critical Discussion of Evolving Pedagogical Frameworks

Education 1.0 is defined by a conventional philosophical approach firmly established in essentialism and behaviourism, reflecting the unidirectional information transmission of Web 1.0. This model is traditionally teacher-centred and unidirected (Gupta, S., & Singh, V., 2025). The pedagogy of Education 1.0 originated in monastic schools, where instruction was designed to produce loyal, reliable, and devoted servants. In this model, the instructor is the primary gatekeeper of information and holds full accountability for deciding what, how, and when learning occurs, as well as assessing progress. This aligns with instructivist theory, where knowledge is external and transmitted passively to the student, often through lecture methods (Anderson & Dron, 2011). Learners are viewed as repositories of knowledge with standardised characteristics, engaging in the traditional "three Rs": receiving, responding, and regurgitating. Technology use is minimal, limited to drill-and-practice tools or basic edutainment.

Education 2.0 marks a transformation toward progressive and humanistic foundations, paralleling the development of Web 2.0, which allowed interactivity among users and content. This stage highlights andragogy and heutagogy. Andragogy emphasises intrinsic motivation and problem-centred learning, while heutagogy extends toward self-directed learning, supported by Web 2.0 technologies that enable learner-generated content (Hase & Kenyon, 2000; Blaschke & Hase, 2019). Learners focus on communication, contribution, and collaboration, while teachers act as facilitators or consultants. Examples include project-based and team-based learning.

Education 3.0 harmonises with Web 3.0 and integrates heutagogy and connectivism. Connectivism emphasises that knowledge resides in networks of people and digital nodes, with learners acting as connectors, creators, and constructivists (Siemens, 2005; Downes, 2010). Students take control of their educational journeys, becoming "free-agent learners" who leverage tools and expertise beyond classrooms (Keats & Schmidt, 2007). Paragogy further emphasises peer-to-peer learning, making educators guides, coaches, and resource-suggesters rather than authorities.

As society transitions toward Society 5.0, educational frameworks must incorporate big data, AI, and robotics (UNESCO, 2021). Education 5.0 aligns with Industry 5.0, where human–machine collaboration supports individualised, adaptive learning. AI tutors, intelligent robotics, and design thinking approaches enable human-centred, personalised experiences (Luckin et al., 2016; Popenici & Kerr, 2017).
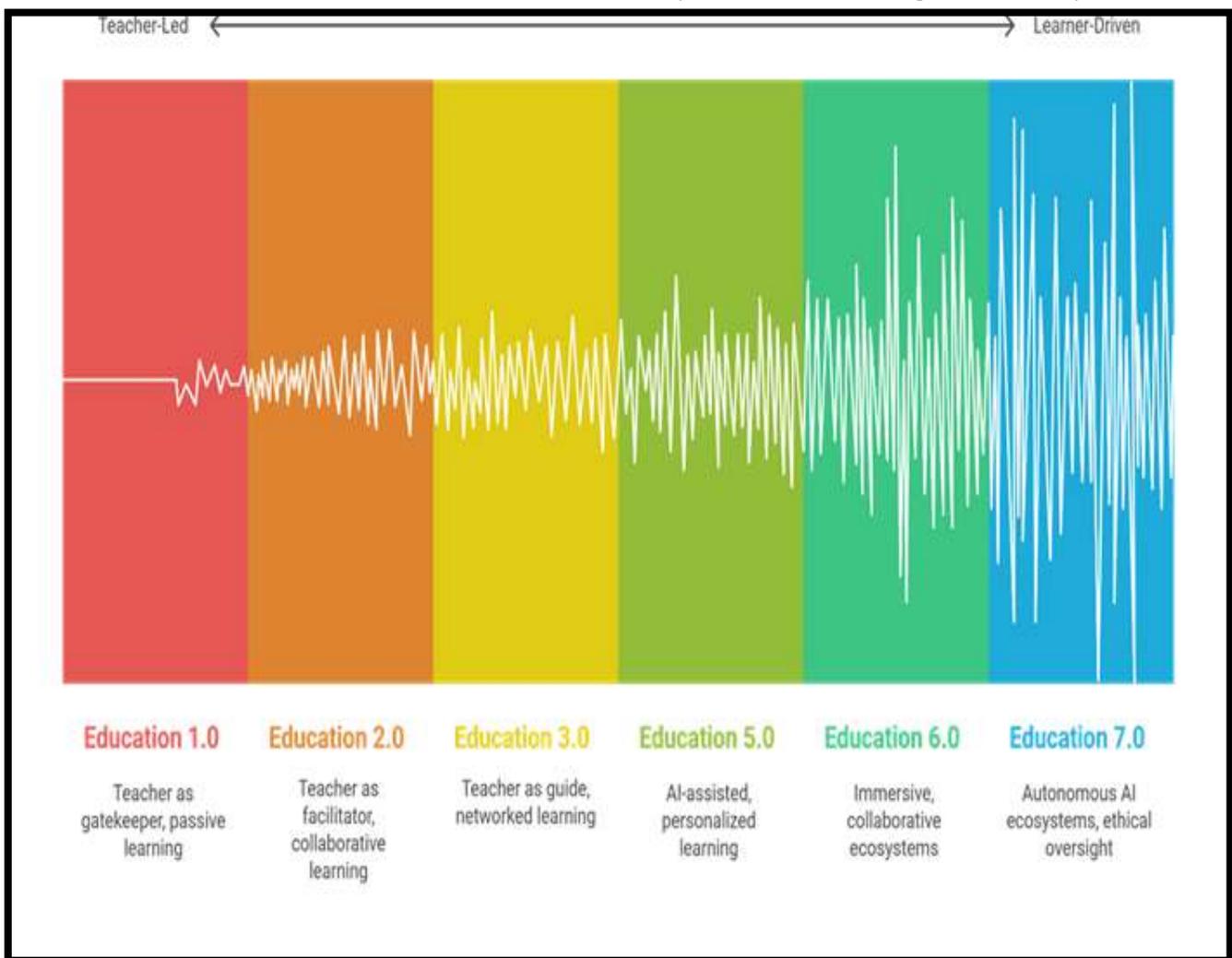
Figure 2: Education evolves from teacher-led to learner-driven autonomy

Education 6.0 envisions immersive ecosystems using AI, AR, VR, and adaptive learning systems for global collaboration (Mystakidis, 2022; Hwang et al., 2020). Finally, Education 7.0 foresees highly autonomous AI ecosystems, holographic displays, brain–computer interfaces, and blockchain-based credentialing, emphasising creativity and ethics as core human capacities (Kaplinsky, 2020; Selwyn, 2019). These advances demand rigorous ethical oversight to address data privacy, algorithmic bias, and digital humanism (Holmes et al., 2021). UNESCO advocates for inclusive, human-centred policies to ensure equity and sustainability in AI-driven education (UNESCO, 2021).

Objective 2: To analyse the evolution of pedagogical models (Education 1.0-7.0) by comparing their core characteristics and examining their synergy with technological and societal paradigms (Web, Industry, Society 5.0).

| Aspect	Education 1.0 (Uni-Directed)	Education 2.0 (Constructivist & Multi-Directed)	Education 3.0 (Network & Self-Directed)	Education 5.0 (AI & Design Thinking)	Education 6.0 (Global Tech Collaboration)	Education 7.0 (Human-Centric AI Future)
Timeline / Context	Pre-Web Era (Monastic/Traditional Schools)	Web 1.0 & 2.0 (1990s–2000s)	Web 3.0 (2010s–2020s)	Society 5.0 / Industry 5.0 (2020s)	Future Vision ~2035	Future Vision ~2050
Learning Philosophy	Essentialism, Behaviorism, Instructivism	Constructivism, Andragogy, Heutagogy	Heutagogy, Connectivism, Paragogy	AI Pedagogy, Design Thinking	Techno-Globalism, AR/VR Learning	Human-Centric AI, NOAI Systems
Direction of Learning	Teacher → Student (one-way)	Teacher ↔ Learner (multi-way)	Learner ↔ Network ↔ Peer (multi-nodal)	AI ↔ Human (co-adaptive)	Global Learners ↔ Virtual Networks	Human ↔ Super-Intelligent AI Ecosystems
Role of Educator	Knowledge-giver, Authority, Assessor	Facilitator, Consultant, Co-planner	Guide-on-the-side, Coach, Peer Mentor	AI-assisted Teacher, Designer of human-centered learning	Global Connector, VR/AR Immersive Guide	Ethical Custodian, Human-Skills Developer

Aspect	Education 1.0 (Uni-Directed)	Education 2.0 (Constructivist & Multi-Directed)	Education 3.0 (Network & Self-Directed)	Education 5.0 (AI & Design Thinking)	Education 6.0 (Global Tech Collaboration)	Education 7.0 (Human-Centric AI Future)
Role of Learner	Passive Recipient ("3 Rs": Receive, Respond, Regurgitate)	Active Participant ("3 Cs": Communicate, Contribute, Collaborate)	Autonomous Creator ("3 Cs": Connectors, Creators, Constructivists)	Adaptive Learner, Emotional-Skills Developer	Global Citizen, Cross-Cultural Collaborator	Specialist in Creativity, Ethics, Empathy, Imagination
Technology Use	Minimal (lectures, drill-and-practice apps, worksheets)	Interactive Web 2.0 tools (blogs, wikis, project-based platforms)	Web 3.0, Social Media, MOOCs, Peer-to-Peer Platforms	AI Tutors, Robotics, Adaptive Learning Apps, Design Thinking Frameworks	AR/VR Classrooms, AI-driven Language Tools, Global Learning Hubs	Holograms, Brain-Computer Interfaces, NOAI Systems, Blockchain Credentials
Knowledge Creation	Teacher-owned, Standardised	Co-created, Collaborative	Networked, Learner-generated	AI-supported, Personalised	Globally Co-created, Cross-disciplinary	AI-Human Co-evolution, Specialisation in creativity

Aspect	Education 1.0 (Uni-Directed)	Education 2.0 (Constructivist & Multi-Directed)	Education 3.0 (Network & Self-Directed)	Education 5.0 (AI & Design Thinking)	Education 6.0 (Global Tech Collaboration)	Education 7.0 (Human-Centric AI Future)
Assessment	Exams, Standardised Testing	Collaborative projects, Reflective journals	Peer-assessment, Self-assessment, E-portfolios	AI Analytics, Continuous Adaptive Assessment	Global AI Credentialing, Performance-based	Blockchain-based Micro-Credentials, Human-skill evaluation
Skills Emphasized	Memorisation, Obedience, Repetition	Problem-solving, Teamwork, Experiential Learning	Networking, Creativity, Critical Thinking	Emotional Intelligence, Collaboration with AI	Multilingualism, Cultural Intelligence, Tech Skills	Imagination, Ethics, Empathy, Creative Leadership
Pedagogical Identity	Pedagogy (Teacher-centred)	Andragogy & Heutagogy (Learner-centred)	Heutagogy + Paragogy (Self & Peer-driven)	AI Pedagogy + Design Thinking	Techno-Global Pedagogy	Humanistic-AI Pedagogy
Potential Risks	Passive learners, lack of creativity	Over-dependence on the facilitator	Over-reliance on digital networks, lack of structure	AI bias, ethical concerns, and human detachment	Digital divide, cultural imbalance	Loss of human autonomy, over-automation

3. To identify ethical considerations and future challenges associated with AI and advanced technologies in education.

Ethical considerations are foremost, especially given that the worldwide and speedy adoption of AI poses a threat to human rights, and can both increase existing prejudice and bring up new bias and exclusion. AI technologies typically study user data, recognise repeating patterns and evaluate user approaches, often without the user's complete awareness or true informed consent. Policymakers require an in-depth understanding of the distinct ethical problems arising from the use of AI, including applicable advice on how to manage the use of student data. The use of AI may result in the non-observance of common people's human rights, and the government may fail to advocate for their constituents in the face of worldwide data analysis (Gupta, S., et al., 2024). UNESCO stands with legislation focusing on the equilibration of the governance system for AI and robotic technology incorporation in education, using the recommendations on the ethics of AI.

The accelerated digital transformation of society mandates a reconsideration of what it means to be human and the outcomes for learning. Challenges emerge across governance, skills enhancement and labour market adaptation. Educational systems must persistently revise curricula to inculcate new knowledge, skills, and techniques relevant to the transforming industrial landscape (Gupta, S., & Mishra, U., 2024). There is a significant requirement to promote human resources with outstanding AI skills, which should be blended into national curricula for K–12 schools and higher education institutions. On the far side of technical skills, there is an accelerating demand for soft skills such as interdisciplinary work, critical thinking, problem-solving, and adaptability. Digital literacy is becoming a core skill essentially required for both learners and educators as digital technologies become more widespread (Gupta, S., et al., 2025). A major challenge is ensuring balanced access to quality education and training for each and every individual, including marginalised groups, to prevent increasing socio-economic inequalities. Around the globe, a major issue is the demand for comprehensive infrastructure advancement, especially in nations that have numerous schools situated in isolated rural areas. Uniform teacher training and support are required to effectively blend evolving technologies, such as design thinking and AI, into teaching practices.
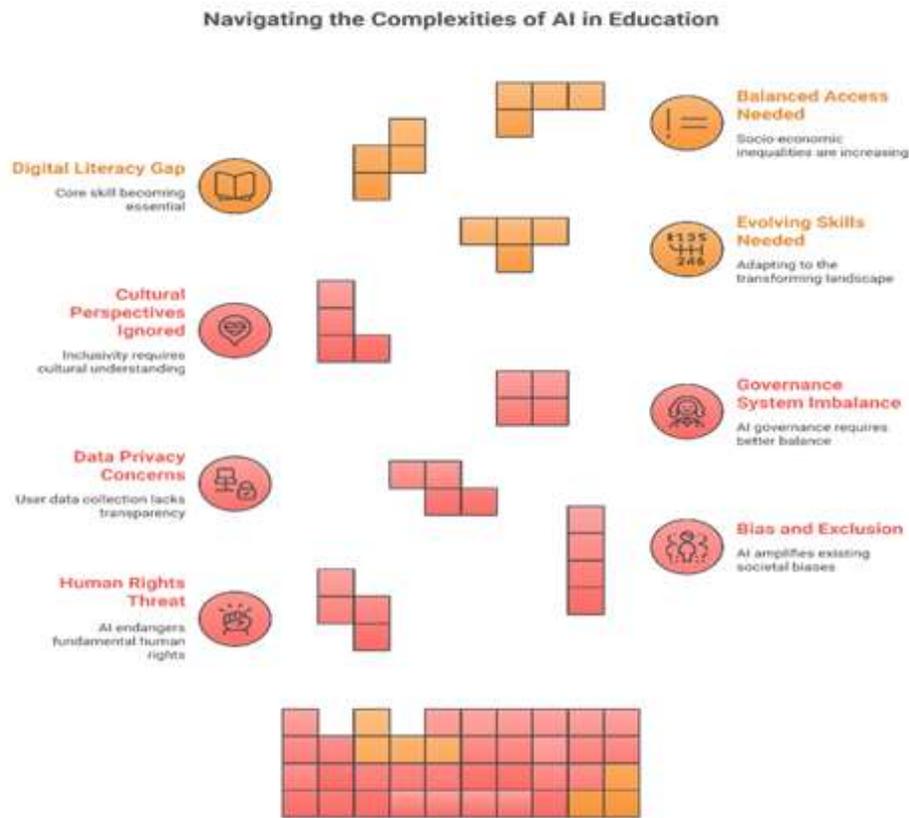
Figure 3: Navigating the complexities of AI in Education

Faculty members must reconceptualise their conventional roles, shifting from content-based instruction (pedagogy or andragogy) towards self-determined and network-directed learning structures (heutagogy or paragogy). Future educational structure should study the constant evolution of immersive technologies, including the use of **cutting-edge AI, Augmented Reality (AR), Virtual Reality (VR), and holographic projection or brain-machine interfaces** to enhance learning experiences (Education 6.0 and 7.0 approaches). Education in future will need to handle dynamic curriculum development, which emphasises creativity and critical thinking. It is currently difficult to predict what will come further as a result of fast-paced technological progress, apart from the asynchronous framework of widespread Web 3.0 learning. Organisational concerns emerging from **human-robot collaboration** in education and research must be discussed in future challenges.

Discussion

The evolution from Pedagogy 1.0 to Education 7.0 demonstrates a continuous paradigm shift shaped by technological, philosophical, and societal transformations. Education 1.0, rooted in essentialism and behaviourism, emphasised the teacher as the central authority and the learner as a passive recipient of knowledge (Anderson & Dron, 2011). The arrival of Education 2.0 and 3.0 introduced constructivist, heutagogical, and connectivist perspectives, which emphasised collaboration, learner autonomy, and networked knowledge creation (Siemens, 2005; Blaschke & Hase, 2019). These frameworks reflected the affordances of Web 2.0 and Web 3.0 technologies, illustrating that pedagogical change is both a response to and a driver of wider socio-technological contexts (Keats & Schmidt, 2007; Ito et al., 2013). Thus, the

trajectory from Education 1.0 to 3.0 reflects a fundamental reorientation in the philosophy of learning, from unidirectional knowledge transfer to multi-directional and self-directed participation.

The progression toward Education 5.0 and beyond represents the integration of advanced technologies such as artificial intelligence, robotics, and adaptive learning systems into mainstream education. Scholars argue that AI-supported ecosystems foster personalised and data-driven learning pathways while design thinking ensures that such innovations remain human-centered (Luckin et al., 2016; Popenici & Kerr, 2017). In this phase, educators shift from knowledge transmitters to facilitators, designers, and ethical custodians, while learners assume greater responsibility as adaptive and self-determined participants (Zawacki-Richter et al., 2019). Frameworks like Education 6.0 and 7.0 envision immersive learning environments shaped by augmented and virtual reality, holographic interfaces, and even brain–computer technologies, reflecting a co-evolution between human and machine intelligence (Mystakidis, 2022). The central theme here is not the replacement of teachers by machines but the emergence of a symbiotic partnership where technology augments human creativity, empathy, and critical thinking (Selwyn, 2019).

Despite these advances, ethical and practical challenges remain pressing. Issues such as data privacy, algorithmic bias, and digital inequality require careful governance (Holmes et al., 2021). While technologically advanced nations may approach the ideals of Education 6.0 and 7.0, many developing contexts remain constrained within Education 2.0 or 3.0 models, risking further marginalisation (UNESCO, 2021) (Singh, V., et. al., 2025). To ensure inclusivity, policymakers must prioritise equitable access, infrastructure development, and digital literacy. Furthermore, curricular reform must balance technical fluency with socio-emotional and creative skills, aligning with the demands of Industry 5.0 and Society 5.0 (Tlili et al., 2022). Ultimately, the review suggests that the sustainability of future education lies not in technological sophistication alone but in fostering digital humanism, ensuring that innovations serve to advance equity, human dignity, and imagination (Kaplinsky, 2020)

Conclusion

The evolution from Education 1.0 to Education 7.0 reflects a fundamental paradigm shift in teaching and learning, moving from teacher-centred, instructivist traditions to highly adaptive, technology-driven ecosystems. Education 1.0 emphasised essentialism and behaviourism, with learners positioned as passive recipients of knowledge (Anderson & Dron, 2011). The introduction of Education 2.0 and 3.0 brought constructivist and connectivist perspectives that highlighted learner autonomy, collaboration, and peer-to-peer learning, supported by Web 2.0 and Web 3.0 technologies (Siemens, 2005; Blaschke & Hase, 2019). These frameworks reshaped the role of educators from knowledge transmitters to facilitators and mentors, while learners became active contributors and creators of knowledge (Keats & Schmidt, 2007).

The transition to Education 5.0 and beyond represents a new era shaped by artificial intelligence, robotics, immersive technologies, and design thinking. Education 5.0 aligns with Industry 5.0 and Society 5.0, emphasizing human–machine collaboration and fostering creativity, adaptability, and emotional intelligence (Luckin et al., 2016; Popenici & Kerr, 2017). Subsequent stages—Education 6.0 and 7.0—extend this trajectory toward immersive global learning through AI, AR, VR, holographic systems, and

blockchain-based credentialing (Mystakidis, 2022; Kaplinsky, 2020). These frameworks prioritize human capacities such as empathy, imagination, and ethical reasoning, while positioning technology as a supportive partner rather than a replacement for teachers (Selwyn, 2019).

Despite these advances, challenges remain. The integration of AI and robotics in education raises ethical concerns related to privacy, algorithmic bias, and digital inequality (Holmes et al., 2021). Global disparities in technological readiness further complicate the adoption of advanced frameworks, as many developing contexts continue to operate within Education 2.0 or 3.0 paradigms (UNESCO, 2021). Therefore, the future of education must be guided by principles of inclusivity, equity, and digital humanism, ensuring that technological progress enhances rather than undermines human dignity and social justice (Tlili et al., 2022).

In conclusion, the trajectory from Education 1.0 to Education 7.0 underscores that sustainable educational transformation depends not only on technological innovation but also on fostering creativity, ethics, and socio-emotional skills. The path forward requires context-sensitive policies, curriculum innovation, and global collaboration to balance human-centred pedagogy with advanced digital ecosystems.

Future Research Directions

Based on this review, future studies should focus on:

1. **Dynamic Curriculum Development:** Examining methodologies that effectively incorporate design thinking and AI into curricula to foster creativity, reflective thought, and social skills development.

2. **Ethical Frameworks:** Establishing comprehensive ethical frameworks for AI use in education to address challenges about data privacy, algorithmic bias, and linguistic diversity, ensuring AI serves as a collective good.

3. **Technological Integration:** Exploring the cutting-edge immersive technologies (AR, VR, holographic displays, brain-computer interfaces) to further enhance personalized and international learning opportunities.

This review advances the subject by offering a systematic conceptualisation of pedagogical change across these defined eras, emphasising that educational sustainability in the digital age demands a shift in mindset and holistic institutional investment to digital humanism and advanced technological integration.

Author Contributions (CRediT Taxonomy)

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1.	Priyanka Shukla	Conceptualisation, Methodology, Supervision, Writing – Review & Editing, Project Administration
2.	Dr. Vikas Singh	Data Curation, Investigation, Formal Analysis, Writing – Original Draft, Visualisation
3.	Shalini Sonwani	Validation, Literature Review, Writing – Review & Editing
4.	Meenakshi Dixit	Software, Data Entry Support, Statistical Assistance
5.	Suraj Gupta	Resources, Proofreading, References Management

References

1. Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. *The International Review of Research in Open and Distributed Learning, 12*(3), 80–97. https://doi.org/10.19173/irrodl.v12i3.890
2. Blaschke, L. M., & Hase, S. (2019). Heutagogy and digital media networks: Setting students on the path to lifelong learning. In *Dominant discourses in higher education* (pp. 85–102). Brill. https://doi.org/10.1163/9789004393073_005

3. Blaschke, L. M., & Hase, S. (2019). Heutagogy and digital media networks: Setting students on the path to lifelong learning. In *Dominant discourses in higher education* (pp. 85–102). Brill. https://doi.org/10.1163/9789004393073_005

4. Bonk, C. J., & Graham, C. R. (Eds.). (2006). *The handbook of blended learning: Global perspectives, local designs*. Pfeiffer.

5. Downes, S. (2010). Learning networks and connective knowledge. In H. H. Yang & S. C.-Y. Yuen (Eds.), *Collective intelligence and e-learning 2.0: Implications of web-based communities and networking* (pp. 1–26). IGI Global.

6. Facer, K. (2011). *Learning futures: Education, technology and social change*. Routledge.

7. Gupta, S. (2023). Choice-based credit system in India. *International Journal of Research and Analytical Review*, *7*(4), 262–268.

8. Gupta, S., & Mishra, U. (2024). Economic value impact analysis of Hindi vs. English medium schools of Kanpur Nagar: A comparative study. *Educational Metamorphosis*, *3*(1).

9. Gupta, S., & Singh, V. (2024). Examine the **NEP's initiatives** for improving the quality of education in India. *Navigating NEP 2020 Strategic Implementation and Future Challenges* (pp. 153–162). Luit and Pine. ISBN: 978-81-9740-99-8.

10. Gupta, S., & Singh, V. (2024). Trajectories of collective intelligence. *Collective Intelligence* (Vol. 1, pp. 97- 107)**.** BlueRose Publication. ISBN: 978-93-6452-971-6.

11. Gupta, S., & Singh, V. (2025). CBCS in higher education: An impact analysis. Omniscient: An International Multidisciplinary Peer-Reviewed Journal, 3(1), 43–53. https://www.omniscientmjprujournal.com

12. Gupta, S., Deepak, D., Gore, R., Mishra, B. N., & Singh, V. (2024). Tracing challenges in the pathway of CBCS: A status study. *Library Progress International*, *44*(3), 10300–10309.

13. Gupta, S., Shukla, P., Shukla, S., Deepak, D., Gore, R., & Singh, V. (2025). Environmental concerns in the present scenario and future works of education. *International Journal of Environmental Sciences*, *11*(7s), 697–709. https://theaspd.com/index.php/ijes/article/view/1274

14. Hase, S., & Kenyon, C. (2000). From andragogy to heutagogy. *UltiBASE, 5*(3), 1-10.

15. Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Shum, S. B., & Koedinger, K. R. (2021). Ethics of AI in education: Towards a community-wide framework. *International Journal of Artificial Intelligence in Education, 32*(3), 504–526. https://doi.org/10.1007/s40593-021-00239-0

16. Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of artificial intelligence in education. *Computers and Education: Artificial Intelligence, 1*, 100001. https://doi.org/10.1016/j.caeai.2020.100001

17. Ito, M., Gutiérrez, K., Livingstone, S., Penuel, B., Rhodes, J., Salen, K., ... & Watkins, S. C. (2013). *Connected learning: An agenda for research and design*. Digital Media and Learning Research Hub.

18. Kaplinsky, R. (2020). How will AI and automation affect education? The need for a new model. *Journal of Research in Innovative Teaching & Learning, 13*(1), 5-14.

19. Kaplinsky, R. (2020). How will AI and automation affect education? The need for a new model. *Journal of Research in Innovative Teaching & Learning, 13*(1), 5–14. https://doi.org/10.1108/JRIT-05-2019-0061

20. Keats, D., & Schmidt, J. P. (2007). The genesis and emergence of Education 3.0 in higher education and its potential for Africa. *First Monday, 12*(3). https://doi.org/10.5210/fm.v12i3.1625

21. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.

22. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed:* Mystakidis, S. (2022). Metaverse and education: A systematic review. *Education Sciences, 12*(10), 687. https://doi.org/10.3390/educsci12100687

23. Popenici, S. A., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning, 12*(1), 1–13. https://doi.org/10.1186/s41039-017-0062-8

24. Rastogi, S., Gupta, S., Deepak, D., & Singh, V. (2025). *Humanities*, Spiritual Intelligence: A Systematic Review. *International Journal of Arts and 3*(1), 35–52. https://doi.org/10.61424/ijah.v3i1.297

25. Rastogi, S., Gupta, S., Deepak, D., Mishra, B. N., Gore, R., & Singh, V. (2025). A systematic literature review on anxiety among undergraduate students: Causes and coping strategies. *Annals of Neurosciences, 1–16.* https://doi.org/10.1177/09727531251366078

26. Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education*. Polity Press.

27. Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1), 3-10.

28. Tlili, A., Huang, R., Shehata, B., Liu, D., Zhao, J., Metwally, A. H. S., ... & Burgos, D. (2022). Is Education 4.0 a sufficient innovative, and disruptive educational trend to promote sustainable development? A critical review. *Sustainability, 14*(11), 6680.

29. Tlili, A., Huang, R., Shehata, B., Liu, D., Zhao, J., Metwally, A. H. S., & Burgos, D. (2022). Is Education 4.0 a sufficient innovative, and disruptive educational trend to promote sustainable development? A critical review. *Sustainability, 14*(11), 6680. https://doi.org/10.3390/su14116680

30. UNESCO. (2021). *AI and education: Guidance for policy-makers*. United Nations Educational, Scientific and Cultural Organization.

31. Vimal Singh, V., Om Shankar Gupta, O. S., Kumar, B., Gupta, S., Priya, P., & Shukla, S. (2025). News framing and student perceptions: A bibliometric analysis of global research trends. *International Journal of Interdisciplinary Cultural Studies, 20*(2), 66–88. https://doi.org/10.18848/p2qy7b42

32. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—Where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 1–27. https://doi.org/10.1186/s41239-019-0171-0

33. Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. *Computers and Education: Artificial Intelligence, 2*, 100025.