IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Artificial Intelligence And Classroom Curriculum

Dr. Md. Mahmood Alam
(Associate Professor & Principal)
MANUU College of Teacher Education, Asansol -713301(W.B.)
(A Constituent College of Maulana Azad National Urdu University, Hyderabad)
INDIA

ABSTRACT

Education in the 21st century is fundamentally concerned with preparing students with the knowledge and skills they need to succeed in rapidly changing world, making curricula learner-centered, socially relevant and leveraging the potential of emerging technologies to provide meaningful, real-world, problem-solving-based learning experiences (Kum Yoke et al., 2020). From personalized learning pathways to data-driven decision-making, AI is helping schools move beyond one-size-fits-all education toward more inclusive, adaptive, and future-ready learning environments. Classroom technologies powered by AI allowed educators to create adaptive and dynamic learning paths that cater to diverse student abilities, comprehension levels, and learning styles (Bean & Melzer, 2021). To adequately equip students to navigate competencies, curricula must adapt to seismic shifts that necessitate reevaluating curricular priorities. By blending technical proficiency with essential human qualities, educational systems can produce graduates capable of thriving in a rapidly evolving technological landscape. By designing and implementing such curricula, significant gaps in teaching and learning can be addressed and students will be well-equipped to navigate the complexities of future job markets, where both technical and human-centric skills are highly valued. Therefore, in light of the accelerating rate of technological change, curricula that are more student-driven, interconnected across disciplines, and connected to real-world problem-solving should be given priorities. Educators and researchers must collaboratively navigate to ensure that AI technologies are not only integrated effectively but also aligned with pedagogical principles that foster the growth of responsible and socially conscious individuals (Shepherd & Majchrzak, 2022).

Key Words: Artificial intelligence, AI ethics, Curriculum development, Personalized learning, pedagogy; Educational technology.

INTRODUCTION

Education today stands at a defining intersection between digital transformation and human-centered inclusivity. The proliferation of Artificial Intelligence (AI) in teaching and learning has redefined how knowledge is created, delivered, and experienced. This paradigm shift presents both unprecedented opportunities and complex challenges, demanding educators who can navigate these evolving landscapes with competence, creativity, and ethical awareness. Educators must determine which skills to prioritize, which to phase out, and where to place greater emphasis in an AI-influenced world. The convergence of

Artificial Intelligence (AI) and education has ushered in a transformative shift in curriculum development, reshaping how learning is designed, delivered, and assessed (Harry & Sayudin, 2023; X. Wang et al., 2023). UNESCO (2023) characterizes curriculum as the "DNA of the education system," a pivotal instruction code and instrument for educational quality. When this code is flawed, fragmented, or misaligned with other components of the system, such as teacher capacity, instructional resources or evaluation, there will be a gap between what is intended, what is implemented, and what is achieved in terms of student outcomes. Time lag in curriculum occurs when the content that children are learning in school today lags behind what they will be expected to know and do with that knowledge when they grow up. Innovative approaches to curriculum design that may minimize time lags include:

- Digital curriculum can include digital content or organizational features to implement curricular elements, online materials, tools, depositories, hardware, software and other applications.
- Personalized, individualized, differentiated or tailored curriculum is a curriculum that is tailored to students' individual needs, skills and interests. When combined with technology, students can learn anywhere, anytime.
- Cross-curricular content and competency-based curriculum are built across disciplinary or subject boundaries.
- Flexible curriculum allows schools, teachers and local bodies to adapt, implement or modify curriculum (learning content, goals, pedagogies and assessments).

As nations recognize the importance of preparing students for an AI-driven world, a key challenge is determining what and how to teach about AI. UNESCO broadly categorizes AI curriculum content into nine topic areas, including algorithms, data literacy, problem-solving, ethics, societal implications, and the application, understanding, and development of AI technologies (UNESCO, 2022). Such thematic concerns are reflected in the various approaches countries are taking to advance AI literacy. These approaches can be broadly categorized into two main themes:

1. Comprehensive, Mandated National Curricula

Some nations are pursuing a top-down, systemic approach, mandating AI education across all grade levels to ensure standardized, universal access for all students. This strategy aims to embed AI literacy as a core component of national education, signaling its importance for future economic and social development.

2. Flexible Frameworks and Programmatic Initiatives

In contrast to mandated national curricula, other countries are adopting more flexible, often bottom-up approaches. These strategies may involve developing pedagogical frameworks, launching targeted programs, or running pilot initiatives that allow for greater local adaptation and experimentation before scaling up.

These approach helps in using standard education plans more effectively and creates a better environment for teaching and learning, where everyone's differences are valued. This allow teachers to make changes to the national curriculum, such as the course structure, activities or aim of the course, based on the local context and students' needs (Davis et al., 2011; Sherin & Drake, 2009). The necessity for curriculum design and adaptation arises from the challenge of implementing a one-size-fits-all nationwide curriculum, which often fails to meet the unique needs of individual students and the specific contexts of different schools and communities (Bümen & Holmqvist, 2022). This situation calls for educators to adapt a relevant, engaging and future-oriented AI curriculum in schools to better serve their students, by modifying it to reflect local values, interests and the diverse learning styles and backgrounds of their student population (Choppin et al., 2018; Remillard, 2018). This future-oriented AI curriculum and AI-enabled tool may also help teachers with complex classroom routines. For example, a tool may help teachers with orchestrating the movement of students from a full class discussion into small groups and making sure each group has the materials needed to start their work.

Differences that Teachers and Students may Experience in Future Technologies

	Familiar Technology Capabilities	Future Technology Capabilities
Input	• Typing • Clicking and Dragging • Touching and Gesturing	• Speaking • Drawing • Analyzing Images and Video
Processing	• Displaying Information and Tasks • Sequencing Learning Activities • Checking Student Work	• Assisting Students and Teachers • Planning and Adapting Activities • Revealing Patterns in Student Work
Output	• Text • Graphics • Multimedia • Dashboards	• Conversations • Annotating and Highlighting • Suggesting and Recommending • Organizing and Guiding

Curriculum Design

The curriculum should be designed in such a way that it fit the varying learning needs and abilities of students at different academic levels. The 'Awareness', 'Knowledge', and 'Ethics' sections are designed as beginner units, suitable to lower secondary school students who are just embarking on their learning journey in this field. The 'Interaction' section is an intermediate unit, developed for students who possess a higher level of reflective thinking and learning capabilities. This unit is beneficial for those who are able to effectively interpret and gain insights from the materials presented. Lastly, the 'Empowerment' section is an advanced unit aimed at upper secondary school students. This section requires students to exhibit a higher degree of practical application skills. They will engage with computer systems through block-based visual programming, which fosters a more hands-on and immersive learning experience.

Curriculum Objectives

Sections	Units	Objectives
Awareness	Beginner	Help students understand background, development and issues of sustainability, components and relationships within a system and AI applications to solve the issues.
Knowledge		Enrich students' knowledge of key concepts in specific AI technologies to solve problems.
Ethics		Instill an understanding of how AI technologies would inhibit sustainability issues
Interaction	Intermediate	Provide interactive practices to experience essential techniques of the application
Empowerment	Advanced	Train students to design, present AI technologies to solve real-world problems.

Course Content and Activity Design

Based on the objectives design and the computational thinking competencies, this curriculum designs four sections, including awareness, knowledge, interaction and empowerment. The course content order is organized by the design of the objectives with a progressive depth of level. The teaching points and activity design is based on the computational thinking competencies to cultivate students into computational learner, leader, collaborator, designer and facilitator as shown in the following table:

Course Content Design

Sections	Teaching Points
Awareness	➢ Sustainability and the relationship between environmental, social and economic aspects ➢ Examples of AI technology in promoting sustainability in daily life
Knowledge	➢ Four steps of system thinking ➢ Analyze real-world AI-powered systems with four steps of system thinking ➢ Design an AI-powered application for sustainability
Ethics	➢ Environmental Impact of AI ➢ Sustainable AI includes AI for sustainability and sustainability of AI
Interaction	➢ Labeling land cover type from satellite images through online applications ➢ Exploring land cover change monitor ➢ Computing carbon emission of model training through online application
Empowerment	➢ Project solution on land cover change with AI, including dataset preparation, model definition, model training, model evaluation and prediction

1) Awareness: In the awareness section, students will learn the wedding cake model of sustainability to understand the interconnected sustainable development goals instead of learning them individually. It is about meeting human needs within ecological constraints. Besides, they will have a broad understanding of AI's applications in achieving these goals. Tasks are (1) recognizing AI applications from environmental, social and economic aspects in their daily life and (2) identifying what sustainability issues are solved by specific AI applications.

2) Knowledge: The knowledge part cultivates students' system thinking with a deconstruction guideline on real world applications. In the first part of knowledge section, students engage with an AI-driven application and finish 4 tasks: (1) identifying the components of technology, humans and environment and tracking the data flow between the components, (2) finding relationships, including feedback loops, (3) drawing the system map that includes their finding and (4) proposing one of the supra systems or connected systems to find how this one affects other components outside their system. The second and advanced part of the knowledge section is a simplified project-based learning activity. Students will form a group and design a new AI-driven application to solve sustainability issues they found. They can follow questions on a worksheet to design their system. Then present their project to their classmates.

3) Ethics: In the ethics part, students will learn about sustainable AI. It does not only include AI for sustainability but also the sustainability of AI. The sustainability of AI is an emerging ethical issue. Students will learn the environmental impact of developing and using AI models. How much carbon dioxide it emits? Tasks are (1) answering questions about what green AI is and how to foster green AI through instructive video and (2) drawing a flow chart to consider how to develop a sustainable AI application in the process of model training.

4) Interaction: Students experience machine learning techniques that they learn from the Knowledge part. Tasks are as follows: (1) To understand how to build a training dataset, they would participate in a

crowd-sourced project of recognizing forest areas with human impact with satellite images contributing to labeling tasks for AI model training to detect human intrusion (2) exploring land cover change monitor and (3) computing carbon emission of model training through online application.

5) Empowerment: Students learn about how to use satellite data to monitor land cover change over ten years to monitor how different land cover types change. For a simplified version, the material includes data collection, model training, testing and model application. For an advanced version, the material covers data collection, data preprocessing, model building, model training, testing, performance improvement and model application for prediction. When they get their trained model they can use it to predict, get quantity of different land cover areas and identify changes in their interested areas like their neighborhoods.

Challenges in Using AI in Classroom Curriculum

Artificial Intelligence (AI) is transforming education worldwide, and India is gradually integrating AI into its school curriculum under the guidelines of NEP 2020 and CBSE. However, challenges like lack of digital infrastructure, untrained teachers, and limited student access to technology pose significant hurdles. NEP 2020 emphasizes digital literacy, computational thinking, and AI integration into curriculum to equip students with 21st-century skills. Some of the challenges in integrating AI in classroom curriculum are:

1. Overreliance and Dependency

If learners start to depend on AI for answers, it could really hinder their ability to think critically and solve problems. It is observed that students begin to use AI to complete assignments without genuinely understanding the material. As a result, they may only gain a superficial understanding of the subject. If this problem continues unchecked, they won't be able to build on that understanding as their learning advances, which will start to really affect their academic performance.

2. Ethical Considerations

Generative AI is a recent invention and not all of our policies and legislation have caught up. That means both learners and educators may be able to use the software in ways that they shouldn't. Here are the main issues to be aware of:

- **Bias** : consuming AI content that doesn't fairly or equitably represent all groups
- **Plagiarism**: students passing off AI-generated content as their own
- **Copyright infringement**: using content that AI has copied from another source
- **Training**: requiring moderators or students to use AI without showing them how to use it
- **Unequal access:** making AI a core part of the curriculum when not all learners can benefit from it

The best way to ensure the ethical use of AI in school is to create comprehensive school policies. If necessary, arrange training sessions to ensure educators understand how to use these tools, and why the rules are in place. Revise these policies constantly as AI is still in a state of flux and we never know when a new ethical challenge will arise.

3. Data Privacy and Protection

When information with AI is shared, it's easy to forget that it stores everything. We can't be sure where this data will end up. Software companies might use it as the basis for studies or sell it to third parties for marketing purposes. If there's a leak, sensitive details could get released to the public. Experts have already discovered large numbers of hacked ChatGPT accounts on the dark web. Schools should practice standard safeguarding measures like using complex passwords and storing data securely. Personal

information about students should not and must not be used in prompts. Anonymity ensures that any sensitive details about their academic performance or personal lives remain confidential.

Strategies for Successful AI Integration in Classroom Curriculum

The effective use of AI in elementary education relies on systematically incorporated, well-balanced strategies. These strategies must integrate adaptive technology with substantial teacher support, relevant professional training, carefully considered curriculum development, and comprehensive ethical governance (Walter, 2024). This cohesive framework is vital for promoting literacy and problem-solving abilities that are critical for future preparedness (Walter, 2024). Successful AI application universally requires equitable access (Selwyn, 2019), proactive initiatives to bridge readiness disparities (Joshi & Sharma, 2024), and inspiring professional development for teachers (Almalki & Alrashed, 2025). There are various conditions necessary for translating AI-driven curriculum design into meaningful instructional and assessment practices. The successful implementation is not solely dependent on technological capability but also on pedagogical alignment, teacher readiness, ethical considerations, and institutional support structures.

1. Bridging Curriculum Design and Teaching Practice

AI-driven curriculum design must be accompanied by pedagogical strategies that support effective teaching implementation (Bora & Cansu Şahin Kölemen, 2025). Educators remain central to interpreting curriculum frameworks and contextualizing them for learners. AI should, therefore, be positioned as a decision-support tool rather than a replacement for pedagogical expertise. Successful integration means merging AI's data driven insights with teachers' deep understanding of students and context, ensuring ethical use, and addressing equity. Teacher readiness emerges as a critical factor in successful AI implementation (Dorongon & Sarmiento, 2025). Professional development programs focusing on AI literacy, digital pedagogy, and ethical awareness are essential (Ding et al., 2024). Studies indicate that educators who receive targeted training are more likely to integrate AI tools meaningfully into their teaching practices (Fitria, 2021; Akpan et al., 2025)

2. Teacher Readiness and Professional Development

Teacher readiness in adopting AI-enabled teaching and assessment is identified as another important factor. The literature highlights gaps in AI literacy, digital competence, and pedagogical confidence among educators as major barriers to implementation (Iddrisu & Iddrisu, 2025). Teachers play an important role in AIEd (Alshorman, 2024), as they plan and execute educational practices at the classroom level (Kim & Kwon, 2024) and are in the frontline of implementing these advanced technologies in classrooms, hence their readiness is crucial. Professional development initiatives should include AI literacy, pedagogical digital competency, and ethical awareness to ensure educators can apply AI tools confidently and responsibly (Ertmer & Ottenbreit-Leftwich, 2010).

3. Integrating AI in Assessment

AI-enabled assessment systems offer significant benefits, including real-time feedback and continuous evaluation (Novrianto et al., 2025). Unlike traditional teaching methods, where feedback is often given after a certain period, AI-based systems offer instant feedback, allowing students to quickly identify and correct their mistakes (Indra Saputra et al., 2024). However, a hybrid assessment model that combines AI automation with human judgment is recommended to address ethical and contextual considerations. This approach ensures fairness while leveraging AI's efficiency.

4 Institutional and Policy Implications

Institutional support is vital for sustainable AI adoption. Educational institutions must invest in infrastructure, establish data governance policies, and develop ethical guidelines for AI use (Fanar Shwedeh et al., 2024). Policymakers also play a role in creating regulatory frameworks that promote responsible and equitable AI integration in education (Oladele et al., 2025). Policymakers are essential in

shaping the integration of Artificial Intelligence (AI) in education, focusing on creating regulatory frameworks that prioritize equity, safety, and ethical use. They must balance innovation with accountability, ensuring that AI enhances learning without exacerbating existing disparities (Faisal, 2025).

Conclusions

Technology, including AI, should not be viewed as an isolated solution or a mere subject addition, but rather as one strand in the complex tapestry of curriculum development and curriculum transformation. AI use should be guided by clearly defined educational goals centred on students' wellbeing, critical thinking, creativity, ethical reasoning and responsible participation in digital environments. We must be cautious against overly narrow or unbalanced curricular strategies that may prioritize digital skills and content delivery at the expense of foundational literacies, social-emotional skills, ethics, and citizenship. Instead, curriculum must remain holistic—embracing the arts and humanities alongside science and technology, and foregrounding values of equity, empathy, critical thinking, and global citizenship. Any technology-enabled curriculum reform requires continuous adaption, review and realignment to ensure coherence between intended policies, classroom implementation, and achieved student outcomes. This underscores the importance of ongoing teacher professional development, student voice, and robust feedback systems within curriculum change initiatives, so that emerging technologies and content remain relevant and beneficial for all learners (UNESCO, 2023). Crucially, effective implementation also requires sustained support for teachers, including training and professional development that enables educators to critically integrate AI tools into pedagogically meaningful learning activities and become key actors for the design, development and implementation of AI in classrooms providing valuable feedback. Achieving these objectives will require coordinated action across governments, education systems, technology providers and the research community to ensure that AI integration strengthens learning, protects students' rights and supports the development of future learners capable of critically and responsibly engaging with AI-mediated societies.

REFERENCES

1. Akpan, I., Udofia, I., & Woke, M. (2025), "Integrating Artificial Intelligence into Teacher Education and Professional Development" International Journal of Advance Research Publication and Reviews, 2(11), pp. 793–801.
2. Almalki, A., & Alrashed, A. (2025), "Teachers and AI: Understanding the Factors Influencing AI Integration in K-12 education" Education and Information Technologies. (Not Known)
3. Alshorman, S. (2024), "The Readiness to Use AI in Teaching Science: Science Teachers' Perspective", Journal of Baltic Science Education, 23(3), pp. 432–448.
4. Bean, J. C., & Melzer, D. (2021), "Engaging Ideas: The Professor's Guide to Integrating Writing, Critical Thinking, and Active Learning in the Classroom (3rd ed.). Wiley.

5. Bora, B. Y., & Cansu Şahin Kölemen. (2025), "Integrating AI into Instructional Design: A Case Study on Digital Photography Education in Higher Education" Contemporary Educational Technology, 17(3), pp.583–1309.
6. Choppin, J., McDuffie, A. R., Drake, C., & Davis, J. (2018), "Curriculum Ergonomics: Conceptualizing the Interactions between Curriculum Design and Use" International Journal of Educational Research, Vol. 92, pp. 75–85.
7. Davis, E., Beyer, C., Forbes, C., & Stevens, S. (2011), "Understanding Pedagogical Design Capacity through Teachers' Narratives", Teaching and Teacher Education, Vol. 27, pp.797–810.
8. Ding, A.-C. E., Shi, L., Yang, H., & Choi, I. (2024), "Enhancing Teacher AI Literacy and Integration through Different Types of Cases in Teacher Professional Development", Computers and Education Open, 6, p.100178.

9. Dorongon, M., & Sarmiento, J. (2025), "Teachers' Readiness for Artificial Intelligence Integration in Teaching and Learning". (Not Known)
10. Faisal, R. (2025), "Ethical AI Integration in Education: Policies, Challenges, and Strategies for Bridging Digital Divides in Emerging Economies", Crossroads of Social Inquiry, 1(2), pp.1–18.
11. Fanar Shwedeh, Salloum, S. A., Aburayya, A., Brihan Fatin, Mohamed Ahmed Elbadawi, Zainab Al Ghurabli, & Tamadher Al Dabbagh. (2024), "AI Adoption and Educational Sustainability in Higher Education in the UAE", Studies in Big Data, pp. 201–229.
12. Fitria, T. N. (2021), "Artificial Intelligence (AI) In Education: Using AI Tools for Teaching and Learning Process", ResearchGate.
13. Harry, A., & Sayudin, S. (2023), "Role of AI in Education", Interdisciplinary Journal and Humanity (INJURITY), 2(3), pp.260–268.
14. Iddrisu, H. M., & Iddrisu, S. A. (2025). Teacher Readiness to Use AI Tools in the Classroom. International Journal of Research in Education and Science, 11(3), 494–510. https://doi.org/10.46328/ijres.1314
15. Indra Saputra, Kurniawan, A., Merita Yanita, Elviza Yeni Putri, & Mahniza, M. (2024), "The Evolution of Educational Assessment: How Artificial Intelligence is Shaping the Trends and Future of Learning Evaluation", Indonesian Journal of Computer Science, 13(6).
16. Joshi, P., & Sharma, A. (2024), "Ethical Considerations in Integrating AI into Primary Education Curricula", International Journal of Artificial Intelligence in Education and Ethics, 3(1), pp. 45-60.
17. Kim, K., & Kwon, K. (2024). "Tangible Computing Tools in AI Education: Approach to Improve Elementary Students' Knowledge, Perception, and Behavioral Intention Towards AI", Education and Information Technologies.
18. Kum Yoke, S., Ahmar Ahmad, S., Mohamed Yunos, R., Mohd Amin, J., Sulaiman, N., & Abdul Majid, F. (2020), "Educator's Readiness for 21st Century Education," Journal of Engineering and Applied Sciences, 14(9), pp. 10687–10692.
19. Novrianto, A., Gustion, D., & Rahmawati, E. (2025), "AI-Powered Performance Appraisal: Balancing Automation with Human Judgment in Performance Management Systems", Journal of Economics and Management Scienties, pp.389–396.
20. Oladele, S., Kan, K., & George, L. (2025), "Policy and Regulatory Frameworks for Responsible AI Workforce Integration", ResearchGate, unknown.
21. Remillard, J. (2018), "Mapping the Relationship between Written and Enacted Curriculum: Examining Teachers' Decision Making", Monograph, ICME-13, pp.483–500.
22. Selwyn, N. (2019), "Should We be Worried about AI in Education?" Polity Press.
23. Shepherd, D. A., & Majchrzak, A. (2022), "Machines Augmenting Entrepreneurs: Opportunities (and threats) at the Nexus of Artificial Intelligence and Entrepreneurship," Journal of Business Venturing, 37(4), p.106227.
24. Sherin, M. G., & Drake, C. (2009), "Curriculum Strategy Framework: Investigating Patterns in Teachers' Use of a Reform-based Elementary Mathematics Curriculum" Journal of Curriculum Studies, 41(4), pp.467–500.
25. UNESCO (2022), "K-12 AI Curricula: A Mapping of Government-endorsed AI Curricula".
26. UNESCO (2023), "Curriculum in Transformation Mode: Rethinking Curriculum for the Transformation of Education and Education Systems".
27. Walter, Y. (2024), "Embracing the Future of Artificial Intelligence in the Classroom: the Relevance of AI Literacy, Prompt Engineering, and Critical Thinking in Modern Education", Int J Educ Technol High Educ, Vol. 2024, pp.21-15.
28. Wang, X., Li, L., Tan, S. C., Yang, L., & Lei, J. (2023), "Preparing for AI-enhanced Education: Conceptualizing and Empirically Examining Teachers' AI Readiness", Computers in Human Behavior, p.146.