

ARTIFICIAL INTELLIGENCE: A PARADIGM SHIFT TOWARDS TEACHING–LEARNING PROCESS AT THE HIGHER SECONDARY LEVEL

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Abstract

This study aims at how teaching and learning at the upper secondary level are changing as a result of artificial intelligence (AI). It examines how AI affects educators, learners, and curriculum design by synthesizing current research and theory. For the responsible and successful integration of AI in higher secondary education, the essay highlights potential, obstacles, and useful suggestions. According to key findings, AI can enable data-driven education, customize learning, lessen administrative burden, and spur curriculum renewal. However, it also raises questions around equality, the responsibility of teachers, data privacy, and the necessity of strong professional development.

Keywords: Artificial Intelligence, Adaptive Systems, Personalize Learning Paths, Data Privacy

Introduction:

The way teachers and students learn is changing significantly as a result of artificial intelligence (AI) in higher secondary education. These developments are being accelerated by AI tools like intelligent tutoring and adaptive learning, which make education more efficient and individualized. AI is significantly influencing the learning experiences of students between the ages of 15 and 18 as they prepare for postsecondary education and professions (Crompton & Burke, 2023). Since AI changes where, how, and what students learn, this stage is crucial for instructional innovation. Teachers' and curriculum designers' roles are redefined, with a greater emphasis on leading pupils than merely imparting knowledge. Students can learn at their own pace with the help of adaptive platforms, which customize learning courses. Real-time feedback from intelligent technology helps pupils identify their areas of strength and weakness. Teachers can concentrate on more important facets of teaching because automated evaluation saves them time (Zhang et al., 2022). By producing original educational content, generative AI enhances the interactivity and engagement of learning. AI improves results and engagement, which boosts academic achievement. The delivery of education is undergoing a paradigm shift, and integrating AI is crucial at the upper secondary level.

AI is helping students acquire the skills they need to succeed in a world driven by AI. AI is having a significant and diverse impact on education, altering how we approach both teaching and learning. AI is helping to make education more student-centered, which is a good thing. AI is a force for change in education, not merely a tool (Zabala, 2020). We must be ready for the way artificial intelligence is changing the educational landscape. In order to successfully include AI tools, teachers must receive training, and students must understand the potential of AI. The future lies in AI, and education must change to keep up. We can increase the effectiveness and accessibility of education by adopting AI. AI is here to stay, and it's time to take use of its capabilities.

We're only beginning to explore the many advantages of AI in education. We will witness even more inventive uses of AI in education as it develops further. It's wonderful to be a part of the AI-driven educational future.

Scope and Methodology

This document summarizes recognized theoretical frameworks on learning and technology adoption as well as peer-reviewed studies, policy documents, and practitioner reports released in the past ten years. The study focuses on the practical consequences for higher secondary education in the United States, however many of the conclusions are applicable to other countries. The influence on teachers, the impact on pupils, and the impact on curriculum are the three key areas of analysis. Best practices for implementation and empirical results are used to inform the recommendations.

Conceptualizing AI in Higher Secondary Education:

AI in education refers to systems that can generate content, interpret data, forecast outcomes, or adjust to learners (Baker & Smith, 2019). Automated grading algorithms, natural language processing models, and recommender engines are a few examples (Luckin et al., 2016).

Methods of application of AI include formative evaluation, content production, administrative automation, additional tutoring, and analytics to enhance instruction. (Shute, 2008; Khan, 2012)

Theoretical framing in which AI facilitates blended and flipped instructional designs (Garrison & Kanuka, 2004), allows for more frequent, focused feedback, and supports mastery learning models (Bloom, 1984).

Developing AI Concept in Higher Secondary Education:

AI in education refers to systems that can generate content, interpret data, forecast outcomes, or adjust to learners (Baker & Smith, 2019). Automated grading algorithms, natural language processing models, and recommender engines are a few examples (Luckin et al., 2016). Methods of application include formative evaluation, content production, administrative automation, additional tutoring, and analytics to enhance instruction. (Shute, 2008; Khan, 2012) In Theoretical framing AI facilitates blended and flipped instructional designs (Garrison & Kanuka, 2004), allows for more frequent, focused feedback, and supports mastery learning models (Bloom, 1984).

Impact on Teachers:

Professional Roles and Practices: According to Zawacki-Richter et al. (2019), AI changes the job of instructors from content providers to learning designers, facilitators, and evaluators. In order to give socio-emotional and higher-order cognitive assistance, teachers now plan learning routes and analyze analytics produced by AI (Baker & Smith, 2019 & Holmes et al., 2019). Teachers are essential for complicated student demands because AI cannot completely mimic these elements. AI frees up teachers' time by automating repetitive chores like practice item creation, attendance tracking, and grading (Khan, 2012). This change makes it possible to concentrate more on mentoring, focused interventions, and lesson planning. Teachers help kids develop critical thinking and problem-solving skills, which AI can supplement but cannot take the place of human understanding. Teachers can provide preemptive support by identifying pupils who require further assistance thanks to AI's analytics. In general, when educators utilize AI's advantages, it improves the efficacy of instruction.

Needs for Professional Development:

Teachers require ongoing professional development (PD) in several crucial areas:

Interpreting learning analytics: To guide instruction, teachers need to comprehend insights produced by AI (Siemens & Long, 2011). **Combining AI tools with pedagogy:** Professional development assists educators in combining AI tools with successful teaching methods (Zawacki-Richter et al., 2019).

Curating AI-generated content: Teachers must be able to assess and modify content produced by AI (Holmes et al., 2019).

Protecting data privacy and equity: Professional development guarantees that educators address ethical AI use and data issues (Bharati et al., 2023).

Risks & Concerns:

• **Deskilling risk:** If critical thinking about AI outputs is not cultivated, an over dependence on AI may diminish instructors' diagnostic and evaluation skills.

- **Legal and ethical obligations:** Teachers need to be aware of consent, data governance, and bias in AI forecasts.
- **Workload paradox:** Setting up tools, screening content, and matching outputs to learning objectives take time, which might lead to an increase in workload during early adoption phases.

Recommendations for Supporting Teachers

To successfully integrate AI, teachers require assistance. It is essential to offer time, mentoring, and incentives for professional growth related to AI (Darling-Hammond et al., 2017). In order to provide them agency in integration, teachers should be included in the selection and assessment of AI technologies (Zawacki-Richter et al., 2019). Schools and districts must have explicit rules on the use of AI, data privacy, and equity (Bharati et al., 2023). With this assistance, educators may take use of AI's advantages. Teachers can tackle AI-related issues with the use of coaching. Teachers are encouraged to use AI tools through incentives. Involving teachers in the tool selection process guarantees the usability of AI. Trust is increased and safe AI use is ensured by clear policies. AI-related assistance for teachers should be given top priority in schools. Teacher support is necessary for AI integration to be successful. Problems with data security should be covered by policies. All pupils gain from AI thanks to equity considerations. When integrating AI, teacher agency is crucial. Student outcomes are improved when teachers have AI support.

Impact on Students:

Personalization and Differentiation:

AI-driven personalization improves engagement and results by customizing learning routes to each student's demands (Luckin et al., 2016). Based on student performance, adaptive systems modify the scaffolding, complexity, and pace of the content (Baker & Smith, 2019). For advanced learners, this lessens boredom and promotes mastery learning (Bloom, 1984). According to Vygotsky (1978), scaffolding makes difficult topics easier for struggling pupils to understand. When personalization is in line with learning objectives and student interests, it increases engagement (Khan, 2012). AI tools that are culturally sensitive increase their influence and relevance (Ladson-Billings, 1995). The versatility of AI satisfies a range of learning requirements and increases motivation (Holmes et al., 2019). Student agency is increased by customized feedback and routes (Siemens & Long, 2011). AI has enormous personalization potential, but it must be carefully designed (Zawacki-Richter et al., 2019). Effective personalization takes the culture and context of the student into account. With customized assistance, AI technologies can advance equity. Student voice and ownership are increased through personalized learning. The use of AI in differentiation is expanding quickly. Platforms for adaptive learning are essential for individualized instruction.

Developing Skills and Higher Order Learning:

AI facilitates practice and formative feedback. AI facilitates the practice of procedural and factual knowledge (Luckin et al., 2016). AI frees up class time for higher-order activities like creativity, problem-solving, critical thinking, and teamwork (Holmes et al., 2019). Students may swiftly prototype ideas, iterate drafts, and receive constructive feedback thanks to generative AI (Bharati et al., 2023). If teachers do not provide scaffolding, students run the risk of enticing shortcuts (Vygotsky, 1978).

AI can help multilingual learners by providing translation and language support, as well as providing high-quality tutoring resources to underprivileged kids. But models based on non-representative data, algorithmic bias, and unequal access to dependable devices and broadband may disfavor some populations. In Digital literacy students must be taught how to assess AI results, check the reliability of sources, and utilize them ethically (academic integrity, attribution).

Student Wellbeing, Motivation, and Agency:

Rapid feedback and mastery are the two goals through which well-designed AI technologies can improve motivation; nevertheless, an excessive focus on metrics might compromise intrinsic motivation. Keeping in mind of the social and emotional effects teachers need to focus on identity, belonging, and digital welfare because AI cannot take the place of human connections.

Impact on Curriculum:

Impact on Curriculum: AI literacy must be incorporated into curriculum to cover topics such as bias, data ethics, AI systems, and socioeconomic effects (Bharati et al., 2023; Holmes et al., 2019). Understanding the effects of AI on society and exercising critical thought when using AI are components of AI literacy (Zawacki-Richter et al., 2019). Human-centric abilities like creativity and empathy should be combined with technical AI capabilities in curricula

(Holmes et al., 2019). Emphasize the following abilities for a society driven by AI: flexibility, problem-solving, and teamwork (Fadel et al., 2015). Multidisciplinary learning strategies are required by AI (Siemens & Long, 2011). Curriculum updates ensure that students are prepared for AI and ethically aware (Bharati et al., 2023). AI integration requires curriculum conformity with future labor demands (Zawacki-Richter et al., 2019). For an AI-driven future, lifelong learning skills should be prioritized (Luckin et al., 2016). The effects of AI on society and employment should be covered in curricula (Holmes et al., 2019). In the digital age, AI literacy is essential for informed citizenship (Bharati et al., 2023). Updates to curricula aid students in navigating changes brought about by AI. Put an emphasis on human-AI cooperation (Siemens & Long, 2011). The use of AI in courses improves students' preparedness for the future. Curriculum needs to stress transferable abilities like as data literacy and problem-solving (Fadel et al., 2015). Students are prepared for an AI-centric world through AI education.

Pedagogical Shifts

Competency-based and mastery models backed by AI analytics should be adopted instead of universal pacing. The ability of AI to manage regular scaffolding and provide just-in-time support makes project-based and inquiry-based approaches more practical.

Assessment and Standards Alignment

Frequent formative assessments and thorough diagnostics are made possible by AI, but summative evaluations must guarantee validity and fairness, especially if AI is utilized in test administration or scoring. Curriculum requirements should incorporate AI-related outcomes (e.g., identifying algorithmic bias, using data to support assertions).

Recommendations for Curriculum Design

AI literacy across disciplines by teaching data and AI concepts in domain contexts like as science, English, and social studies is integrated. (Bharati et al., 2023). This helps students understand the influence of AI in a variety of professions and makes AI learning relevant and applicable to a wide range of subjects.

Evaluations that foster critical thinking, creativity, and teamwork must be created. Pay particular attention to areas that are less amenable to automation (Holmes et al., 2019). This assesses the abilities required in a future powered by AI (Fadel et al., 2015). Promotes abilities like creativity and problem-solving. Make sure to use culturally appropriate examples and various datasets which reduces prejudice in learning and AI technologies (Zawacki-Richter et al., 2019) and it increases accessibility and promotes equity and diversity in AI education.

Systemic and Policy Considerations

- **Infrastructure:** For AI adoption to be equitable, dependable devices, connectivity, and technical support are necessary.
- **Governance:** Data governance, algorithmic accountability, student privacy (FERPA compliance), and vendor transparency must all be covered by district and school rules.
- **Equity measures** include localized content, offline-capable platforms, reimbursed gadgets, and human assistance for students with specific needs.
- **Research-practice partnerships:** To assess effectiveness, unintended consequences, and equality outcomes, districts should collaborate with researchers.

Case Examples

- **Adaptive Math Platforms:** Research indicates that combining adaptive practice with teacher-led instruction and focused intervention results in modest improvements on standardized measures.
- **Intelligent tutoring systems:** Provide customized support for overcoming challenging problems; work well when incorporated into lesson plans.
- **Automated Writing Feedback Tools:** Quick formative feedback on conventions and structure might speed up revision cycles; however, teacher evaluation is still necessary for insightful feedback.

Challenges and Open Questions

- Validity and Reliability: When applied to a range of student groups, how accurate are AI diagnostic claims?
- Interaction between Teachers and AI: Which forms of collaborative decision-making between AI and teachers result in the best learning outcomes?
- Longitudinal Effects: How do students' autonomous problem-solving and metacognitive skills change when they depend on AI for an extended period of time?
- Ethics and Policy: How can innovation be balanced with safeguards for equity, privacy, and academic integrity?

Recommendations for Practice:

For district and school administrators, start with experimental programs that are linked to specific learning objectives; assess results before expanding. Invest in technical assistance, infrastructure, and continuing professional development. Demand openness from vendors regarding known biases, model training data, and data use.

For educators, acquire the ability to critically assess analytics and use AI outputs as one of many inputs when making decisions about instruction. Instruct students on how to assess, challenge, and utilize AI tools. Keep your attention on human abilities like empathy, judgment, and facilitation.

In the case of curriculum designers they have to integrate data ethics and AI literacy into all topic areas, create tests that gauge cooperative problem-solving and higher order thinking, incorporate culturally appropriate contexts and a variety of datasets.

And the policymakers must establish rules and standards for AI in education that take privacy, equity, and transparency into account. Funding for large-scale studies on equity and efficacy must be impacted.

Conclusion:

AI is a paradigm change that impacts curriculum priorities, pedagogical practices, and the roles of both instructors and students at the higher secondary level. It is not just a collection of tools. AI may improve personalization, free up teacher time for higher-value activities, and assist curriculum modernization when carefully integrated with professional development, a strong infrastructure, open governance, and fair access. Risks to privacy, equity, and educational quality, however, necessitate careful consideration. To ensure that all students benefit, the future of secondary education should combine AI's affordances with human judgment, moral guidance, and systemic supports.

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