The Academic
International Journal of Multidisciplinary Research

An Online Peer Reviewed / Refereed Journal
Volume 3 | Issue 4 | April 2025
ISSN: 2583-973X (Online)
Website: www.theacademic.in

Artificial Intelligence in Teacher Education: Unlocking Potential, Navigating Challenges and Shaping the Future

Anshu Chandra
Research Scholar, Department of Teacher Education,
Nagaland University, 797004, Kohima, Nagaland, India, 797004
EX- Guest Faculty, Nalanda Mahila Shikshak Prashikshan Mahavidyalaya,
Patliputra University, Patna, India, 803111
Email: anshuchandra19@gmail.com

ARTICLE DETAILS

Research Paper

Accepted: 15-04-2025

Published: 10-05-2025

Keywords:

AI in education, teacher training, adaptive learning, digital pedagogy, NEP 2020.

ABSTRACT

This paper explores the opportunities, challenges and future directions of AI integrated innovations in teacher education and training along with how AI-powered tools, adaptive learning platforms, virtual simulations (VR/AR) and intelligent tutoring systems (ITS) enhance customized learning and automate administrative tasks for educators. Under the **thematic analysis approach** recent literature, policy documents and case studies reviewed to understand AI's role in teacher education and training program as well as professional development. **Key findings** indicate that AI offers transformative potential as well as challenges (such as algorithmic bias, data privacy concerns, digital divide and ethical dilemmas) must be addressed to ensure inclusive and responsible AI adoption specially in teacher education and training domain. It also highlights practical **recommendations** for AI stakeholders.

DOI : https://doi.org/10.5281/zenodo.15390385

INTRODUCTION

Artificial Intelligence (AI) refers to computer systems that simulate human intelligence including problem-solving skills, decision-making skills and learning from data (Russell & Norvig, 2021). Study have shown that AI-driven tools are progressively being used to enhance teacher training programs,

improve administrative tasks and support inclusive education through assistive technologies (Selwyn, 2020) and AI also helps in automated grading, adaptive learning and virtual instruction assistants for teacher education and training. Indeed, the incorporation of AI in education is transforming traditional teaching and learning approaches and offering new opportunities for custom-made learning as well as automated assessment and intelligent tutoring systems (Luckin, 2018). Although, The National Education Policy (NEP) 2020 recognizes the importance of AI in teacher preparation and advocating for AI-based learning platforms and digital pedagogies to advance teaching competencies and student outcomes. AI includes machine learning (ML), automation in education and training and Intelligent Tutoring Systems (ITS). Machine learning is nothing but a subset of AI which enables computer systems to learn from data and improve performance without unambiguous programming (Goodfellow et al., 2016). Chatbots, recommendation systems and predictive analytics in education run on ML techniques. Automation in education encompasses using AI-powered tools to handle repetitive tasks such as gradings, attendance tracking and customized content delivery (Holmes et al., 2021). ITS refers to AI-powered platforms that provide real-time feedback and customized learning experiences (Goodyear & Retalis, 2019). The NEP 2020 highlights AI and digital learning as significant components of teacher training and encouraging for AI-based professional development, online learning platforms and ICT incorporation. Similarly, the UNESCO Report on AI in Education (2021) highlights the potential of AI to advance teacher training, assessment methods and inclusive education worldwide.

Relevance of AI to Teacher education and Training: Like various sectors, AI started to transform teacher training practices through providing customized, data-driven and technology-enhanced learning experiences? (1) AI enables adaptive learning platforms that personalize teacher training based on individual progress and learning needs (Holmes et al., 2021). In short, AI-Powered Personalized Learning platforms such as Coursera, edX and Google's AI for Education offer customized courses, assessments approaches and feedback which ensure targeted skill development for educators. (2) AI-powered tools assist teachers in curriculum planning, content generation and instructional design. Applications like ChatGPT, Microsoft Education AI and Jasper AI help in generating lesson plans, quizzes and teaching resources which reduce workload and improving efficiency (Luckin, 2018). In short, AI-Based Lesson Planning and Content Creation. (3) AI-integrated VR and AR provide immersive teacher training simulations. Platforms like Mursion and TeachLivE allow educators to practice classroom management, student engagement and instructional delivery in realistic virtual classrooms (Zawacki-Richter et al., 2019). In short, Virtual and Augmented Reality in Teacher Training. (4) AI tools

analyse teaching performance data to provide feedback and recommendations for further improvements. AI-based platforms such as GoReact and Edthena use machine learning algorithms to assess teaching behaviours, communication skills, and instructional techniques as well as fostering continuous professional growth (Williamson & Eynon, 2020). In short, AI-Driven Professional Development and Performance Analytics. (5) AI-driven Intelligent Tutoring Systems (ITS) like IBM Watson Tutor and Carnegie Learning offer real-time feedback, guidance and automated assessments which help teachers to develop subject expertise and improve their teaching methodologies (Selwyn, 2020). In short, Intelligent Tutoring Systems (ITS) for Teacher Training. AI in teacher training enhances personalization, efficiency and skill development allowing educators to adapt to modern teaching environments.

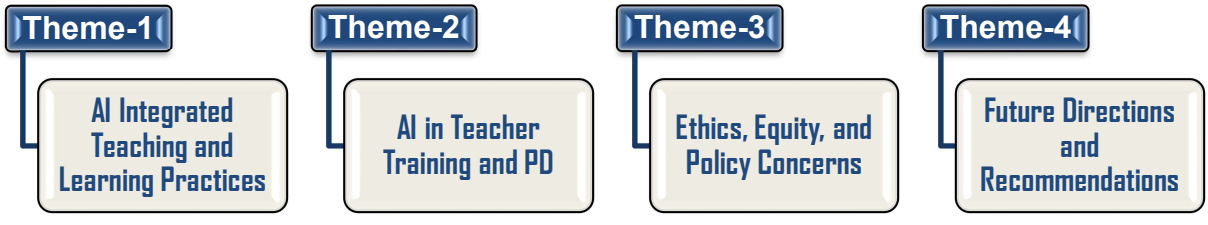
RESEARCH QUESTIONS

1. What are the opportunities of AI for teacher training and professional development?
2. How does NEP 2020 promote AI adoption in teacher preparation?
3. What challenges hinder the effective implementation of AI in teacher training?
4. What strategies can be adopted to maximize AI's benefits in teacher training?

METHODOLOGY

A **qualitative content analysis** method was used to examine trends in **AI integrated teacher education and training, digital pedagogy and ethical AI governance. Thematic analysis approach** synthesized **recent literature, policy documents and case studies** to explore AI and emerging technologies in teacher education and training. Data sources include **peer-reviewed journal articles, UNESCO and India's NEP 2020 policy framework.** Additionally, case studies of **AI-driven educational tools** such as intelligent tutoring systems, VR-based teacher simulations etc. were analysed to assess their impact on **teacher preparation and professional development of prospective teachers.**

THEMATIC DISCUSSION



THEME 1: AI INTEGRATED TEACHING AND LEARNING PRACTICES

A. AI integrated Custom-made Learning: For instance, Duolingo uses machine learning algorithms to customized language lessons, predicting learners weak or struggling areas of learning (Settles & Meeder, 2016), and Knewton and Smart Sparrow adjust instructional material based on students' immediate responses and offering individualized feedback to enhance comprehension (Holmes et al., 2021). Indeed, AI integrated adaptive learning platforms facilitate customized learning by modifying instructional content according to different learner's progress, strengths, and shortcomings. Platforms such as Coursera, Duolingo, and Khan Academy use AI to adjust learning pathways and ensuring that students receive customized support (Zawacki-Richter et al., 2019). Therefore, Adaptive learning platforms enhance engagement, retention, and self-paced learning along with benefiting both students and educators (Luckin, 2018). AI-driven solutions are revolutionizing the conventional teacher-student relationship by improving adaptability, efficiency, and accessibility in education.

B. ITS and their Impact on Teacher-Student Interactions: For instance, Carnegie Learning's Cognitive Tutor adapts to student responses in real time along with offering step-by-step feedback in subjects like math (Koedinger et al., 2013) and ALEKS (Assessment and Learning in Knowledge Spaces) offers personalized tutoring by assessing students' knowledge gaps and adjusting teaching accordingly (Falmagne et al., 2013). Indeed, ITS force AI to provide real-time based automated guidance to learners, and simulating the role of a human tutor. Hence, ITS can analyse students' responses, identify misconceptions, and offer targeted remedial support to the different learners (VanLehn, 2011). It also enables one-on-one tutoring while allowing teachers to focus on higher-order instruction and mentoring style (Selwyn, 2020). ITS can plays a significant role in teacher training and education for assisting both pre-service and in-service teachers in enhancing pedagogical strategies along with identifying areas where students require additional guidance and support.

C. AI-Based Assessment Tools for Instant Feedback: For instance, Grammarly and Turnitin like software use AI to assess the student's writing, for identifying the grammatical errors, and plagiarism areas along with writing style improvements ideas (Liang et al., 2022) and EdTech platforms like Grade scope and Coursera employ AI for automated grading of multiple-choice questions, short-answer

questions, and coding assignments also (Bali, 2019). Indeed, AI-powered automated assessment tools modernize the evaluation process and providing immediate feedback to students as well as educators also. Actually, these types of tools utilize natural language processing (NLP), data analytics and deep learning to analyse student responses and suggest improvements (Holmes et al., 2021). since, AI-based grading systems may reduce teacher workload and allowing them to focus on interactive and creative pedagogical activities therefore, it can be added to teacher training program to strengthen training practices as well as NEP 2020 policy implementation.

THEME 2: AI IN TEACHER TRAINING AND PROFESSIONAL DEVELOPMENT

A. AI-Powered Lesson Planning Tools for Pre-Service Teachers: For instance, IBM Watson Education provides AI-driven insights to help teachers develop personalized lesson plans based on students' strengths and weaknesses (Luckin, 2018) and Teach FX uses AI to analyse teachers' instructional time and suggest improvements for engaging students in classroom discussions (Zawacki-Richter et al., 2019). Study shown that Google's Socratic AI assists teachers in designing interactive learning activities by offering real-time content recommendations (Selwyn, 2020). Since, Lesson planning demand a balanced approach for curriculum alignment, instructional strategies, and assessment methods which actually make it skill wise significant for prospective teachers. therefore, AI-powered tools assist in creating customized and adaptive lesson plans that cater to diverse student learning needs (Holmes et al., 2021). Indeed, these tools not only reduce lesson planning workload but also help prospective teachers experiment with different pedagogical approaches before implementing them in real classrooms settings so, it should be added to teacher training program to strengthen training practices as well as NEP 2020 policy execution part.

B. VR and AR for Teacher Simulations: For instance, Mursion is an AI-driven VR platform that simulates real-life classroom challenges and allowing teachers to practice their responses to different student behaviours (Dieker et al., 2014) and ImmerseMe and ClassVR use VR-based interactive learning environments where teachers can experiment with different teaching techniques and receive feedback (Ferdig, 2020). Study shown that Google Expeditions AR enables teachers to visualize complex

concepts in subjects like science and history and enhancing student engagement (Lindgren & Johnson-Glenberg, 2013). Indeed, VR and AR are transforming teacher training by providing simulations that allow prospective teachers to practice teaching in realistic environments. AI integrated VR/AR platforms help educators to experience classroom situations for practice classroom management and refine their instructional strategies (Bailenson, 2018). Hence, these simulations provide a risk-free environment for teachers to develop their classroom skills, particularly in handling diverse student behaviours and implementing innovative teaching strategies also.

C. AI-Driven Analytics for Tracking Teacher Performance: For instance, Edthena AI Coach provides automated feedback on teaching videos, analysing aspects like teacher talk time and student engagement along with instructional clarity (Holmes et al., 2021) and GoReact uses AI to track teacher-student interactions and suggest ways to improve classroom communication and instructional strategies (Ferdig, 2020). Study shown that Microsoft Insights in teams for Education offers AI integrated reports on teacher workload, student engagement, and learning patterns which helping educators refine their teaching practices (Selwyn, 2020). Indeed, AI integrated analytics are transforming teacher PD by offering real-time insights into teaching effectiveness and student engagement along with classroom interactions. Therefore, these tools help educators to identify areas for improvement and track progress over time along with personalize their professional development plans accordingly (Zawacki-Richter et al., 2019). Hence, teacher educators can provide targeted mentorship and design personalized professional development programs by leveraging AI-driven analytics that enhance teacher effectiveness. So, it should be added to teacher training program to strengthen training practices as well as NEP 2020 policy execution part.

THEME 3: ETHICS, EQUITY, AND POLICY CONCERNS

A. Bias in AI Algorithms: How AI Might Reinforce Existing Educational Inequalities? For instance, Studies have shown that AI-powered grading systems, such as those used in standardized testing may unintentionally favour students from privileged backgrounds due to biased training datasets (Holmes et al., 2021) and facial recognition systems in AI-based classroom monitoring have been found

to be less accurate for students of darker skin tones, leading to misidentifications and unfair disciplinary actions (Buolamwini & Gebru, 2018). Indeed, AI algorithms are trained on historical data which may contain inherent biases related to gender, ethnicity, socioeconomic status, and geography. Therefore, if not properly addressed these biases can lead to discriminatory outcomes and reinforcing existing educational disparities (West et al., 2019). In addition to Language-processing AI tools, such as Grammarly and AI-driven essay evaluators may disadvantage students from non-English-speaking backgrounds due to training biases (Zawacki-Richter et al., 2019). Hence, in order to mitigate AI biasness special along with developers and policymakers must ensure that AI systems are trained on diverse datasets and undergo bias audits as well as incorporate fairness algorithms (Selwyn, 2020). This same fact is applicable for teacher training and education program also.

B. Data Privacy and Security: For instance, concerns were raised over EdTech platforms such as Proctorio and ExamSoft which use AI integrated facial recognition and keystroke analysis for online proctoring in 2021. These tools have been criticized for excessive surveillance and data security risks (Roberts et al., 2022) and also, AI integrated student monitoring tools like Go-Guardian have been criticized for potentially violating students' digital rights by tracking their online activities beyond school hours (Selwyn, 2020). Indeed, Concerns Over Student Data and Surveillance the extensive use of AI in education and training raises concerns over student data privacy-security and surveillance. Since, AI integrated learning management systems, several chatbots and analytics platforms collect vast amounts of student data which if misused; can lead to privacy breaches and data exploitation along with ethical dilemmas (Williamson & Eynon, 2020). Moreover, Big Tech companies such as Google and Microsoft have been collecting vast quantities of student data through AI-driven educational platforms actually raising concerns about data ownership and consent (Zuboff, 2019). Hence, to address privacy concerns and regulatory frameworks such as the General Data Protection Regulation (GDPR) and Children's Online Privacy Protection Act (COPPA) must be enforced to ensure ethical data collection, student consent and secure AI deployment in education (Holmes et al., 2021). This should incorporate in teacher training and education program also.

C. AI and the Digital Divide: For instance, AI-driven personalized learning platforms like Knewton and DreamBox are inaccessible due to poor internet connectivity and lack of digital devices specially in India like developing countries (Williamson & Eynon, 2020) and Studies have shown that AI-powered language learning applications such as Duolingo are more widely used in urban areas than in rural

communities due to differences in smartphone and internet penetration (West et al., 2019). Therefore, ensuring fair access to AI-Based Educational Tool (The digital divide refers to the gap between those who have access to AI-powered educational resources and those who do not) and disparities in internet connectivity, available infrastructure and digital literacy status pose significant barriers to equitable AI adoption in training and education; particularly in rural and economically disadvantaged communities (Van Dijk, 2020). Moreover, AI-driven adaptive assessments may disadvantage students from low-income families who lack high-speed internet and advanced digital tools for leading to unfair learning outcomes (Holmes et al., 2021). To bridge the digital divide governments and educational institutions must invest in affordable digital infrastructure, and teacher training as well as AI literacy programs to ensure equal access to AI-driven education (Selwyn, 2020).

THEME 4: FUTURE DIRECTIONS AND RECOMMENDATIONS

A. Integrating AI Literacy into Teacher Education Curricula: Several studies have given indication that AI literacy is vital for preparing future educators if we want to effectively integrate AI tools into teaching and learning. We need to also be clear that, AI literacy includes understanding how AI works and recognizing its limitations along with applying it ethically in education (Holmes et al., 2021). It is only possible with effective strategies integration into teacher training curricula? Strategies for AI Literacy Integration: - (1) Pre-service teacher programs should introduce AI-driven lesson planning, adaptive learning and assessment tools in short, AI-Inclusive Teacher Training (Zawacki-Richter et al., 2019). (2) In-service teachers need ongoing training on AI applications in education for professional development supported by EdTech partnerships workshops (Williamson & Eynon, 2020). (3) Teacher training curricula must emphasize data privacy, algorithmic bias and responsible AI usage to ensure equity in AI-powered education in short AI Ethics and Digital Citizenship training (West et al., 2019). (4) Teachers can make informed decisions about AI applications and critically assess AI-based tools along with create inclusive learning environments after fostering AI literacy (Selwyn, 2020).

B. The Role of Policymakers in AI Governance in Education: AI policies must address student data privacy, algorithmic fairness, and access to AI integrated tools for underserved communities (Van Dijk,

2020). Indeed, Governments and policymakers play a vital role in regulating AI integration in education and training by ensuring equity and transparency along with ethical AI deployment. These are following key Policy Considerations should be taken place: (1) Indian NEP-2020 should provide clear frameworks for AI integration in teaching-training and assessment. In short, Developing AI Guidelines for Education and teacher training program. (2) AI regulations should align with international privacy laws like GDPR and COPPA to protect student data. In short, Ensuring Data Privacy and Security (Holmes et al., 2021). (3) Governments must invest in AI infrastructure and provide access to AI tools along with promote digital literacy in rural and low-income areas also. In short, addressing the Digital Divide challenge (Williamson & Eynon, 2020). In fact, Governments can promote ethical AI usage and minimize risks for ensure equitable AI integrated teacher education and training by implementing robust policies actually.

C. AI and Human Collaboration: AI should be viewed as a collaborative tool that enhances (rather than replaces) human educators (Luckin, 2018) and Keeping the Teacher in centre at an AI integrated Classroom actually. The role of the teacher remains irreplaceable in fostering critical thinking, creativity and emotional intelligence in students despite AI's advancements even in last 50 to 70 years of AI history actually. Indeed, AI is as an Assistant but not a Replacement for AI-powered tutoring and assessment tools. Balancing AI and Human Teaching should actually, support teachers in personalizing learning experiences rather than automating the teaching profession (Selwyn, 2020). While AI can assist with content delivery and teachers must continue to nurture students' social-emotional skills and ethical reasoning as well as interpersonal relationships. In short, Maintaining Emotional and Social Learning (West et al., 2019). Blended learning approaches combining human-led instruction with AI-driven insights can create more effective and inclusive learning experiences. In short, Hybrid AI-Classroom Models (Holmes et al., 2021).

CONCLUSION AND PRACTICAL RECOMMENDATIONS

In order to completely leverage AI and maximize the benefits and mitigate the risks of AI in teacher education and training stakeholders must adopt a balanced, ethical and inclusive approaches. (A) For Policymakers: Develop AI governance frameworks that ensure transparency, data security, and ethical AI use in education (Van Dijk, 2020), and invest in AI accessibility initiatives to bridge the digital divide in rural and underserved areas (West et al., 2019). Moreover, Align AI integrated teacher training programs with NEP 2020 and incorporating AI literacy into teacher preparation curricula. (B) For Educators and Teacher Training Institutions: Incorporate AI literacy and digital pedagogy courses into

teacher education and training programs (Selwyn, 2020) and encourage blended AI-human teaching models where AI supports teachers in curriculum planning, assessment, and personalized instruction (Holmes et al., 2021) and promote professional development opportunities for prospective teachers on AI applications in education (Williamson & Eynon, 2020). (C) For AI Developers and EdTech Innovators: Design AI tools that prioritize ethical considerations, transparency, and teacher agency (Luckin, 2018) and develop AI-driven learning platforms with localized, culturally responsive content for diverse educational contexts (West et al., 2019) as well as work collaboratively with educators to ensure that AI solutions develop pedagogy without replacing human interaction (Zawacki-Richter et al., 2019).

Key Insights from the Discussion

1. AI can personalize and optimize learning experiences through adaptive learning platforms, intelligent tutoring systems (ITS) and AI-based assessment tools (Holmes et al., 2021).
2. AI integrated teacher education and training and professional development leverage AI-based lesson planning, VR/AR simulations, and performance analytics to enhance pre-service and in-service teacher preparation (Zawacki-Richter et al., 2019).
3. Ethical concerns such as bias in AI algorithms, data privacy issues and the need for equitable access must be addressed to ensure fair and responsible AI adoption in education (Williamson & Eynon, 2020).
4. Future AI integration must prioritize human-AI collaboration, ensuring that teachers remain central to the learning process while leveraging AI to enhance (not replace) teaching (Luckin, 2018).

Future Research Directions: To ensure the sustainable and effective use of AI in teacher education and training, future research may explore longitudinal studies on AI integrated teacher education and training to assess long-term impacts on teacher effectiveness and student learning outcomes (Holmes et al., 2021). Ethical AI frameworks for education that address algorithmic bias, data security and student privacy (Williamson & Eynon, 2020). Scalability and contextual adaptation of AI in diverse educational settings, especially in low-resource environments (Van Dijk, 2020). AI's role in fostering 21st-century teaching competencies such as critical thinking, creativity, and digital fluency in pre-service and in-service teacher education (Selwyn, 2020).

REFERENCES

- Bailenson, J. (2018). *Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do*. W. W. Norton & Company.
- Bali, M. (2019). "Automated Assessment in Higher Education: The Role of AI in Grading." *Educational Technology Research & Development, 67*(2), 89-104.
- Buolamwini, J., & Gebru, T. (2018). "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification." *Proceedings of Machine Learning Research, 81*, 1–15.
- Dieker, L. A., Rodriguez, J. A., Lignugaris/Kraft, B., Hynes, M. C., & Hughes, C. E. (2014). "The Potential of Simulated Environments in Teacher Education: Current and Future Possibilities." *Teacher Education and Special Education, 37*(1), 21-33.
- Falmagne, J.-C., Albert, D., Doble, C., Eppstein, D., & Hu, X. (2013). *Knowledge Spaces: Applications in Education*. Springer.
- Ferdig, R. E. (2020). "Immersive Learning: How VR and AR Are Transforming Teacher Preparation." *Journal of Educational Technology & Society, 23*(2), 47-59.
- Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press.
- Goodyear, P., & Retalis, S. (2019). *AI for Teacher Training: Enhancing Professional Development through Data-Driven Insights.* Educational Technology Research and Development, 67(4), 733-752.
- Government of India. (2020). *National Education Policy 2020*. Ministry of Education.
- Holmes, W., Bialik, M., & Fadel, C. (2021). *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Routledge.
- Jordan, M. I., & Mitchell, T. M. (2015). *Machine Learning: Trends, Perspectives, and Prospects.* Science, 349(6245), 255-260.
- Koedinger, K. R., Anderson, J. R., Hadley, W. H., & Mark, M. A. (2013). "Intelligent Tutoring Goes to School in the Big City." *Artificial Intelligence in Education, 25*(4), 531-554.

- Liang, J., Wang, S., & Yang, Y. (2022). "AI-Driven Writing Assistance: Analyzing the Impact of NLP in Education." *Computers & Education, 180*, 104472.
- Lindgren, R., & Johnson-Glenberg, M. (2013). "Emboldened by Embodiment: Six Precepts for Research on Embodied Learning and Mixed Reality." *Educational Researcher, 42*(8), 445-452.
- Luckin, R. (2018). "Machine Learning and AI in Education: The Teacher's Role in an AI-Driven Classroom." *International Journal of AI in Education, 28*(1), 1-14.
- Luckin, R. (2018). "The Role of AI in Education: Challenges and Opportunities." *International Journal of AI in Education, 28*(1), 1-14.
- MHRD (Ministry of Human Resource Development). (2020). *National Education Policy 2020.* Government of India.
- MHRD. (2021). *DIKSHA and AI in Teacher Training: Enhancing Digital Pedagogy*. Government of India.
- Roberts, L. D., Murphy, J., & Kozar, M. (2022). "Surveillance in Online Assessments: Ethical and Equity Considerations." *Journal of Learning Analytics, 9*(1), 23–40.
- Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.
- Selwyn, N. (2020). "AI and the Future of Education: Critical Perspectives." *Learning, Media, and Technology, 45*(2), 179-192.
- Settles, B., & Meeder, B. (2016). "A Trainable Spaced Repetition Model for Language Learning." *Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics, 5*(2), 1142-1152.
- UNESCO. (2021). *AI and Education: Guidance for Policy-Makers*. UNESCO Publishing.
- Van Dijk, J. (2020). *The Digital Divide*. Polity Press.
- VanLehn, K. (2011). "The Relative Effectiveness of Human Tutoring, Intelligent Tutoring Systems, and Other Tutoring Systems." *Educational Psychologist, 46*(4), 197-221.
- West, D. M., Bock, J., & Lieberman, M. (2019). "AI and Bias in Education: Addressing Discriminatory Algorithms." *Brookings Institution Report*.

- Williamson, B., & Eynon, R. (2020). "Algorithmic Education: Data Ethics and the Future of AI in Schools." *AI & Society, 35*(3), 615–625.
- Zawacki-Richter, O., et al. (2019). "The AI Horizon: Emerging Trends in AI Applications for Teacher Training." *Computers & Education, 140*, 103587.
- 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), 39.
- Zuboff, S. (2019). *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. PublicAffairs.