


Chapter 3


AI-Enhanced Network Learning Theory Transforming Education Through Personalized, Inclusive, and Ethical Artificial Intelligence

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ABSTRACT

Artificial Intelligence (AI) is profoundly transforming education by enabling personalised learning and fostering inclusive access to knowledge. We have introduced AI-Enhanced Network Learning Theory (AI-NLT) that reconceptualises learning as the product of hybrid intelligence, emerging from the dynamic interaction between human cognition, artificial intelligence systems, and distributed digital networks. It emphasises six interrelated components: personalised and adaptive learning,

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collaborative connectivity, inclusive intelligence, emotional-cognitive support, feedback and co-creation, and ethical AI. Together, these dimensions illustrate how AI can tailor learning pathways, facilitate global collaboration, dismantle barriers to participation, support learner well-being, enable co-creation of knowledge, and uphold transparency and accountability. A case study on Collaborative Learning with AI Speakers (CLAIS) exemplifies human-AI co-construction of knowledge, highlighting both potential and limitations.

1. INTRODUCTION

In the field of education, Artificial Intelligence (AI) is playing an increasingly significant role. AI not only helps personalize learning but also makes administrative tasks more efficient. It also helps provide access to quality education to a large number of people (Hwang et al., 2020; Rane, 2024). As these exchanges between humans and AI grow, human-centered machine learning (HCML) has evolved. AI is based on algorithms, a set of rules and instructions that computers follow to solve complex problems (Tammets et al., 2023).

Algorithms give AI and Machine Learning systems step-by-step instructions. Machine Learning (ML) uses statistical methods and data to solve complex problems. AI and ML analyze data to find patterns, build models, and then predict values based on those models (Akgun & Greenhow, 2022). AI is increasingly used to automate assessment and feedback processes (Kumar, 2024). AI assists educators in grading multiple-choice questions, math problems, and essays (Farhood et al., 2024). As a result, AI enables educators to focus on essential tasks, such as mentoring and student support. AI can also provide real-time feedback, helping students understand and learn from their mistakes (Kolluru et al., 2018).

These days, AI is used to analyze students' learning patterns, identify their strengths, areas for improvement, and learning preferences. This helps personalize learning instead of following a fixed curriculum (Karroum et al., 2024). Such flexibility is expected to lead to higher engagement and better academic results (Wu, 2023; Saputra et al., 2023). With AI, educational content and pacing are increasingly tailored to individual needs (Tulasi & Rao, 2023). Personalized learning allows students to take charge of their learning process and achieve educational goals aligned with their interests. Intelligent tutoring systems go further by providing one-on-one guidance, acting as personal tutors, and analyzing students' learning patterns, weaknesses, and strengths to customize content and pace for each learner (Ng et al., 2022; Sari et al., 2024).

Even outside classrooms, AI's influence is evident in automating administrative tasks. Schools and academic administrations become more efficient with AI-optimized

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