


Chapter 5


From One-Size-Fits- All to Just-for-Me: Adaptive Learning Algorithms Transforming Blended Education

Uddalak Mitra

 <https://orcid.org/0000-0002-5682-5218>

JIS College of Engineering, India

Shafiq Ul Rehman

 <https://orcid.org/0000-0003-2266-218X>

Kingdom University, Bahrain

Barnik Podder

 <https://orcid.org/0009-0009-5019-8186>

JIS College of Engineering, India

Arpan Dutta

 <https://orcid.org/0009-0009-9284-1977>

JIS College of Engineering, India

Bishtu Bhowmick

JIS College of Engineering, India

ABSTRACT

Blended learning has emerged as a transformative educational model, combining digital instruction with conventional classrooms. As academic institutions try to answer the growing demands of learners, AI-aided adaptive learning algorithms become a tool for personalized data-driven means of instruction. The chapter explores adaptive learning algorithms for maximizing effective use of a blended

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learning environment by tailoring content, pace, and feedback to a student's needs in real-time. Focusing on the architecture and application of adaptive systems in various learning platforms, and discusses how AI models evolve continually on the basis of learner's behavior and performance. Real-world case studies provide the chapter with examples of adaptive algorithms in practice across disciplines. Issues of ethics like data privacy and biases in algorithmic decisions, are also critically analyzed. This chapter extends promising recommendations to instructors, instructional designers, and policymakers to develop an inclusive, efficient, and effective mode of AI-based education.

1. INTRODUCTION

The evolution of education in the digital age has prompted a fundamental rethinking of instructional strategies, with blended learning emerging as a preferred model for delivering flexible, accessible, and scalable education (Park, Y., & Doo, M. Y., 2024), Isaeva, R. et al. (2025). The quickly changing digital technologies have led to a complete rethinking of classical educational practices and a popular acceptance of blended learning as the new mode of instruction (Rohs & Ganz, 2015). Blended learning is accordingly considered an attractive concept appealing to a broad base of learners as it combines face-to-face instruction with digital tools and online content to create an environment that is flexible, accessible, and scalable (Park & Doo, 2024; Isaeva et al., 2025). This particular blended modality supports customization and learner independence, while engaging students through various avenues to absorb knowledge (Kumar et al., 2021; Müller & Mildenerger, 2021).

Still, several traditional limitations prevail in many of the existing blended learning environments: delivering static content, enforcing rigid linear instruction that does not cater to particular learning styles, speeds, or levels of grasping concepts (Sareen & Mandal, 2024; Bizami et al., 2023). Such a condition may cause mental stress on students (Mitra, U., & Rehman, S. U. (2025) a, Mitra, U., & Rehman, S. U. (2025) b). To better cover those gaps, creating an AI-assisted adaptive learning solution has been increasingly published by educators and technologists as a means to allow the personalized view of the learning path to be experienced really.

Adaptive learning is far beyond simple one-to-one personalization. Instead, via learning analytics, these systems dynamically evolve, learn, and modify their internal learner models to keep instruction aligned to the learner's specific knowledge gaps and cognitive needs (Kabudi et al., 2021; Gligorea et al., 2023). As of now, these systems find greater integration into digital and tech platforms, fostering learner engagement, retention, and delivering better results for K-12 institutions as well as higher education (Li & Wang, 2022; Halverson et al., 2023).

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