






Hybrid MOOCs and the Future of Learning in the Age of Artificial Intelligence: Analysis and Identification of the Components of Students' Learning Ecology

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Article Info

Article type:

Original Research

How to cite this article:

Sharzehee, F., Masoomifard, M., Khatibzanjani, N., Pourasghar, N., & Sarmadi, M. R. (2026). Hybrid MOOCs and the Future of Learning in the Age of Artificial Intelligence: Analysis and Identification of the Components of Students' Learning Ecology. *Quarterly Journal of Research and Planning in Higher Education*, 32(2), 189-206.



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ABSTRACT

Hybrid MOOCs, as a blended educational technology, provide a suitable platform for the application of artificial intelligence in higher education. This study was conducted with the aim of identifying the components of the students' learning ecology in Hybrid MOOCs, using an inductive qualitative content analysis approach. The research population consisted of electronic documents and expert interviews; through purposive sampling, 41 studies and 7 experts were selected, and the data were collected. The data collection instruments were note-taking and semi-structured interviews. The data were coded and analyzed using MaxQDA software. The findings indicated that the six main categories of the students' learning ecosystem include audience preparation, interactions, evaluation, course management, content management, and support, all of which can be effectively enhanced by artificial intelligence tools. Thus, Hybrid MOOCs, as a blended educational technology, provide an appropriate foundation for integrating artificial intelligence into higher education. It is recommended that macro-level educational policies be designed in such a way that the use of artificial intelligence is considered not merely as an auxiliary tool but as an integral part of the architecture of the learning ecosystem, with the necessary legal and infrastructural frameworks developed for its expansion.

Keywords: Artificial Intelligence, Hybrid MOOC, Connectivism, Learning Ecology, Massive Open Online Courses.

Introduction

With the rapid proliferation of digital technologies and the emergence of artificial intelligence, higher education is undergoing fundamental transformations. These developments have expanded learning beyond traditional classrooms, enabling it to flourish within collaborative networks and innovative environments such as Massive Open Online Courses (MOOCs). These platforms facilitate the active participation of hundreds of thousands of learners worldwide and are recognized as one of the most significant educational innovations of the current century (Ashrafi, Arasteh, Zeinabadi & Abbasian, 2022). Amidst this shift, artificial intelligence serves as the driving engine of the Fourth Industrial Revolution, representing a pivotal force in contemporary society. AI has influenced university education more profoundly and rapidly than other technologies (Moghadam, 2023). Recent research findings also indicate that artificial intelligence introduces both opportunities and challenges for higher education, positively impacting students' learning, motivation, creativity, self-efficacy, and academic performance (Chegini, Zangeneh & Mohammadi, 2024). One comprehensive framework for understanding these transformations is the concept of the learning ecosystem, which is rooted in Siemens' theory of connectivism. Connectivism theory views learning as the outcome of networked interactions between humans and technology, emphasizing the importance of connections in knowledge formation. The aim of this research is to identify and analyze the components of the learning ecosystem within the hybrid MOOC model and to examine the role of artificial intelligence tools in optimizing these ecosystems.

Methodology

To achieve the research objectives, a qualitative content analysis approach with an inductive reasoning method was employed. Data were collected through two complementary methods: document analysis and interviews. In the first phase, the main components were extracted through the study and analysis of scientific documents. In the next phase, to ensure the accuracy and practicality of these components, data obtained from interviews with experts were utilized. During this process, new codes that did not fit into the initial framework were organized into new categories.

The statistical population for the document analysis included all domestic and international PhD theses and scientific research articles in the field of MOOCs, indexed in reputable databases such as IranDoc, Ghalilib, Magiran, SID, Springer, and Science Direct between 2017 and 2022 (1396 to 1400 in the Persian calendar). The final sample, selected through purposive sampling after a systematic screening process, consisted of 41 sources (27 articles and 14 theses). This process involved several stages: initial identification of sources, removal of duplicates, review of titles and abstracts, and finally, full-text review and application of inclusion criteria.

In the interview section, the statistical population consisted of experts in the fields of distance education and educational technology. Sampling was conducted purposively and sequentially until theoretical saturation was achieved. The inclusion criteria for participants were holding a PhD degree or having relevant professional experience in the field. Ultimately, theoretical saturation was achieved after 7 interviews. To ensure validity and reliability of the data, combined strategies including test-retest (to assess coding stability) and data triangulation (using multiple sources) were employed. Additionally, to prevent bias, the coding process was conducted in multiple stages using MAXQDA software and fully documented. Data analysis was performed in three stages: open, axial, and selective coding. Finally, the main components of the research were extracted and presented within a coherent framework.

Findings

This study employed qualitative content analysis to identify the core components of learning ecosystems in hybrid MOOCs. Findings reveal that this ecosystem consists of six main components:

1. Audience Preparedness: Including technology acceptance, personal goal setting, prior knowledge, and participation context
2. Interactions: Encompassing software-content, software-facilitator, facilitator-learner, and learner-learner interactions
3. Assessment: Comprising peer assessment, simulations, feedback systems, and e-portfolios
4. Course Management: Including planning, scheduling, access levels, and course introduction

5. Content Management: Involving educational approaches, cognitive strategies, content design, and copyright compliance
6. Support Systems: Covering motivational, educational, technical, and post-course support

This comprehensive framework provides a foundation for designing intelligent and effective learning environments in hybrid MOOC contexts

Conclusion

The findings of this study confirm that the successful design and implementation of learning ecosystems in hybrid MOOCs require the intelligent integration of the six identified key components (audience preparedness, interactions, assessment, course management, content management, and support systems) within the connectivism conceptual framework. Artificial intelligence serves as an educational transformation catalyst, playing an enabling role in optimizing each of these components. The analytical and predictive capabilities of AI enable deep personalization of the learning process, facilitate dynamic interactions, and provide constructive assessment. This study establishes a bridge between connectivism theory and practical applications of AI in higher education by presenting a comprehensive framework. The results demonstrate that integrating AI into the design of learning ecosystems not only enhances educational quality but also paves the way for a paradigmatic shift from standardized teaching towards flexible, data-driven, and student-centered learning models. The study underscores AI's transformative potential in creating adaptive learning environments that can respond to diverse learner needs while maintaining the core principles of connectivity and knowledge networking inherent in connectivist approaches.

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