



7th International Conference

Higher Education Learning
Methodologies and Technologies
Online

23-25 September 2025, Naples, Italy

Book of Abstracts

Organized by



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HELMeTO 2025 - Book of
Abstracts Tutti i diritti sono riservati

Editore STUDIUM s.r.l. a socio unico
Prima edizione Settembre 2025

ISBN 978-88-99978-68-6

Questa opera è protetta dalla legge n. 633/1941 sul diritto d'autore
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Special Track 5

AI in Higher Education: Empowering Design

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Artificial Intelligence and Instructional Design: A Systematic Review in Higher Education

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1 Introduction

In recent decades, the scientific community has shown a marked increase in interest in Artificial Intelligence in Education (AIED), as evidenced by the growing number of studies addressing various dimensions of the teaching and learning process in relation to the affordances of AI technologies [1]. Findings from a recent review [2] highlight key topics discussed both in domain-specific contexts and in more general instructional settings, including support for personalized and adaptive instruction, assessment and feedback, and the prediction of learner performance. While much of the existing literature focuses on enhancing the student learning experience, there is a parallel effort to identify strategies that support faculty in developing and refining course design and curriculum, a domain that remains relatively underexplored and warrants further investigation.

2 Methodology

The present systematic review was conducted following the PRISMA guidelines [3] and adopted a qualitative, descriptive approach to address the following research questions: (1) Which aspects of instructional design are affected by the use of AI in university settings, including both micro-level course design and broader curriculum-level design? and (2) What perceptions, experiences, and attitudes do faculty members express regarding the use of AI-based tools, with particular attention to perceived opportunities and challenges?

The search process was conducted across the Web of Science, Scopus, and ERIC databases using the string: ("artificial intelligence" OR "AI") AND ("learning design" OR "instructional design" OR "course design") AND ("higher education" OR "university*"). Peer-reviewed contributions (journal articles, book chapters, and conference proceedings) published between 2015 and 2025 in either English or Italian were included, provided they were available in full text, referred to the university context, and presented a theoretical or empirical focus on the use of AI in instructional design (whether face-to-face, blended, or online).

Excluded were works published prior to 2015; those concerning other educational levels; studies focusing exclusively on student outcomes or fully automated AI systems

without teacher involvement; non-peer-reviewed materials; and texts not available in full. The selection process took place between April and May 2025. Two independent reviewers conducted a blind screening of abstracts and full texts. Discrepancies were resolved through discussion. Of the 453 records identified, 154 were removed as duplicates. The remaining 299 were screened by abstract, with 263 contributions excluded for lack of relevance. The main reasons for exclusion included thematic misalignment, unsuitable publication type, or unavailability of the full text. Of the 36 articles screened in the final stage, 18 studies were ultimately included in the review: 14 journal articles, 2 book chapters, and 2 conference proceedings, published between 2023 and 2025. A content analysis [4] was conducted by the two researchers to develop and share interpretative categories emerging from the coding process, which identified three main dimensions of interest: conceptual, organizational, and experiential.

3 Discussion

AI is frequently seen as a valuable support in designing content, learning objectives, learning activities, and assessment tools, in alignment with structured approaches such as Constructive Alignment and Universal Design for Learning. In addition, benefits in terms of efficiency and time savings in course design, especially in online contexts, were reported. However, significant limitations were also identified, including the unreliability or generic nature of AI-generated content, its limited contextual relevance, the risk of technological dependency, and the ongoing need for human oversight and validation. A gap was also noted between the recognition of AI's potential and its actual adoption, often hindered by low levels of digital literacy, insufficient training provision, and institutional constraints. Moreover, the introduction of AI prompts a redefinition of the faculty didactical roles, increasingly oriented towards critical mediation and guidance in the interpretation of information.

The review highlights that AI is having a growing impact on instructional design in higher education, offering opportunities in terms of efficiency, personalization, and innovation. However, its actual integration into teaching practices remains uneven and is conditioned by several enabling factors, including faculty competencies, pedagogical vision, and appropriate institutional support.

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