COMPARATIVE EDUCATIONAL METHODOLOGICAL ANALYSIS OF ARTIFICIAL INTELLIGENCE–BASED ONLINE COURSE CREATION APPLICATIONS

János Ollé*
Senior Research Fellow, University of Pannonia, Faculty of Humanities, Institute of Digital Methodology, Hungary
*Correspondence: olle.janos@htk.uni-pannon.hu

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Abstract

In recent years, the development of online course creation applications has entered a new phase with the emergence of artificial intelligence (AI). While previously these systems primarily served as tools for structuring learning materials, integrating multimedia, and providing assessment instruments, today an increasing number of platforms are capable of handling certain steps of content generation, course editing, and the assessment process as well. It is particularly noteworthy that next-generation applications deliberately employ generative artificial intelligence in the production of educational content and in the determination of learning pathways.

In our research, we examine online course creation applications that are equipped with built-in artificial intelligence functions and enable the rapid creation of standalone courses that are, in many cases, pedagogically appropriate in quality. The research does not focus on traditional learning management systems, but rather on content- and course-generating or course-automating systems. The aim of the comparative, analytical study is to provide a snapshot of the current situation: how and to what extent these online tools apply artificial intelligence while taking into account the principles and models of instructional design. The research places particular emphasis on examining the role AI plays at different stages of course design and the extent to which automated processes are capable of integrating didactic and educational methodological considerations.

Keywords: artificial intelligence, educational planning, course development, digital learning material development

1. Introduction

In recent years, the development of online course creation applications has entered a new phase with the appearance of artificial intelligence (AI). Whereas earlier these systems primarily functioned as tools for structuring learning materials, integrating multimedia, and providing assessment instruments, today an increasing number of platforms are capable of carrying out certain steps of content generation, course editing, and the assessment process as well. It is particularly noteworthy that new-generation applications deliberately employ generative artificial intelligence in the creation of educational content and in the determination of learner pathways.

In our research, we examine online course creation applications that are equipped with built-in artificial intelligence functions and enable the rapid creation of independent courses that are, in many cases, pedagogically appropriate in quality. The research did not focus on traditional learning management systems, but rather on content- and course-generating or course-automating systems. The aim of the comparative, analytical research is to provide a snapshot of the current situation: how and to what extent these online tools apply artificial intelligence while taking into account the principles and models of instructional design. The

research places particular emphasis on examining the role AI plays at different stages of course design and the extent to which automated processes are able to integrate didactic and educational methodological perspectives.

2. Theoretical Background

The integration of artificial intelligence into online course design systems has fundamentally transformed the practice of digital learning material development. New-generation course creation applications no longer merely enable the rapid production of content, but increasingly strive for the active application of instructional design models and pedagogical principles. Alongside the emergence of new applications, it can also be observed that previously well-known platforms have, without exception, incorporated some degree of artificial intelligence–based functionality. These tools are capable of generating structured learning materials, personalized learning pathways, feedback, and diverse learning activities based on learning objectives, thereby enabling virtually anyone to create high-quality digital learning materials. As a result, the design and development of digital learning materials has increasingly become an adaptive and reflective process based on "human–AI" collaboration. In recent years, AI-supported digital learning material development has evolved along three defining trends:

- **automation of content production:** generative AI models are capable of producing textual learning materials, tests, or visual illustrations within minutes. This revolutionizes the speed of educational material production; however, it raises the question of the extent to which such generated content meets didactic expectations.
- **standardizable learning materials:** AI tools are able to generate modular, reusable learning content elements, which increases the efficiency of the development process. This enables scalability, but may also imply pedagogical tasks that can be broken down into algorithms for the creation of personalized learning pathways.
- **adaptivity, personalized learning materials and tasks:** newer systems are capable of modifying content or difficulty levels based on learners' responses and behavior, thereby moving closer to truly adaptive learning environments.

However, automation is not merely a technological advancement, but also a pedagogical issue. From the perspective of instructional design, it is particularly critical whether automated processes are able to integrate development practices aligned with learning objectives, the meaningful incorporation of feedback opportunities, and the support of active learning activities—in other words, whether software environments that accelerate and automate development are capable of producing didactically high-quality courses and digital learning materials.

2.1. Educational Methodological Solutions Based on Artificial Intelligence

The design of personalized learning pathways is a key characteristic of many AI-based learning material platforms. These systems use machine learning algorithms to analyze learners' behavior, preferences, and performance in order to create individualized learning pathways. For example, Course Factory applies AI to generate personalized learning paths, ensuring that each learner follows a trajectory aligned with their own goals and pace (Blagoev et al., 2023). Virtual assistants and chatbots are also important components of AI-based learning material platforms. These tools provide real-time support to learners, answer their questions, and offer guidance throughout the learning process. LearnWorlds, for instance, integrates AI-based chatbots that assist with navigation, content recommendations, and basic problem-solving ("Exploring AI-Driven Pedagogical Tools," 2024).

The visual presentation and interactive activities of AI-based learning material platforms serve to enhance learner engagement and comprehension. Thinkific, for example, uses AI to generate interactive simulations, quizzes, and gamified activities that make learning more enjoyable and more immersive (Amado-Salvatierra et al., 2023). AI-based learning material platforms also simplify

assessment and grading processes. These systems use AI to automatically evaluate assignments and provide immediate feedback, allowing developers to focus on more important tasks. Thinkific, for instance, applies AI-based assessment tools to evaluate learner assignments and provide detailed feedback, enabling learners to progress in a timely manner with useful information (Asrifan et al., 2024).

AI-based learning material platforms are also highly suitable for generating and recommending learning materials. These materials are tailored to learners' needs, often based on the results of previous assessments. Coursly uses AI to recommend additional resources—such as videos, learning materials, and practice tasks—thereby ensuring diverse learning opportunities for learners (Peiqi, 2024). Collaboration between generative AI and educators is a key element of AI-based learning materials. While AI automates routine tasks, developers provide human oversight and ensure content quality. Teachable, for example, allows educators to collaborate with AI tools to create and refine learning materials, ensuring that the final outcome is engaging and effective (Kumar et al., 2024). Numerous studies and analyses have already shown that in the creation and use of online courses and digital learning materials, artificial intelligence is present in needs analysis, design and development processes, as well as in operational learning environments, and is capable of supporting efficiency and effectiveness analyses or even impact evaluations.

2.2. Instructional Design Guidelines in AI-Based Course and Learning Material Development Applications

AI-based learning material applications use generative AI tools such as ChatGPT to create personalized content that meets the specific needs of the target audience. These tools analyze user data—such as learning preferences, performance indicators, and activity levels—to generate context-dependent recommendations and customized content (Krouska et al., n.d.; Conklin et al., 2024). Aligning content with learning objectives is a key element of instructional design. With the help of AI, learning materials can be developed that align with learning goals and the prior knowledge of the target audience, thereby providing a more effective learning experience (Aftabi et al., 2024). AI-based support environments can also provide complex solutions and system-level support for development processes. Educators or learning material developers can use AI tools to design course maps that summarize learning objectives, assessments, and instructional strategies within a coherent system (Choi, 2024).

Feedback is a key element of the learning process, and AI-based learning material applications are particularly well suited to providing real-time, personalized feedback. These systems apply adaptive feedback mechanisms that analyze learner interactions and performance to deliver immediate, context-dependent feedback (Maity & Deroy, 2024; "Development of AI Adaptive, and Recommendation Course on LMS for Optimization of Digital Learning Services", 2024). AI also supports the integration of feedback loops into the course design process by continuously refining instructions and incorporating feedback from educators and learners (Conklin et al., 2024; Mehnen & Pohn, 2024). AI-based systems can generate automatic assessments—such as multiple-choice questions and interactive quizzes—to measure learners' understanding and provide immediate feedback (Pesovski et al., 2024). AI tools can also create interactive dialogue systems that respond to individual learner needs, offering guidance and support throughout the learning process (Maity & Deroy, 2024; Mehnen & Pohn, 2024).

AI-based learning material creation applications are versatile and capable of generating various types of courses by adapting content to learners' specific needs (Nikhil, 2024). With the use of AI, language learning courses can also be developed that include interactive activities and real-time feedback to enhance language skills (Drost & Shryock, 2024). AI-based systems are also able to establish adaptive learning pathways that align with learners' needs, ensuring that each learner follows a personalized learning path (Alawneh et al., 2024).

In summary, artificial intelligence today can appear not only as a tool, but also as an interactive partner throughout the entire process of digital learning material development. It can be embedded into the course development environment, where it provides functional support during planning, content generation, structuring, the creation of assessment points, and the design

of interactions. In addition, it is capable of partially or fully automating the creation of the course environment and digital learning content. AI-based solutions not only provide support in the early stages of learning material development, but can also play an active role in the operation of the learning environment and during the learning process—for example, through adaptive feedback, personalized learning pathways, or real-time learner support. However, the extent and quality of these solutions and possibilities depend significantly on the functionality of the software environment. AI-based support or development environments can be assembled in many ways, but it is by no means irrelevant what quality of service the user receives when working with them. Service quality can be examined not only in media-technological terms, but also in terms of how the currently known principles of instructional design and educational methodology are embedded in and can be utilized by the development environment to shape the educational quality of the resulting products (learning materials, course interfaces, interactive elements). The fundamental question of our research is to what extent the emergence of AI in learning material development software strengthens the instructional design and educational methodological foundations of these applications, which directly determine the quality of the produced digital educational products. This is particularly important given that these applications are increasingly easy to use not only for professional developers, but for virtually anyone. An experienced and well-prepared e-learning developer can correct individual steps in any software environment, but for less knowledgeable users, the automated, AI-supported production process greatly simplifies digital learning material production and course creation; consequently, while using visually impressive solutions, they may pay less attention to fundamental pedagogical issues.

3. Research Methods

The research was conducted within the methodological framework of qualitative content analysis, complemented by a comparative educational methodological examination. The study is exploratory and descriptive in nature; its focus is not on the market, developer, or technological evaluation of the software, but rather on the educational methodological relevance of their instructional design functions and artificial intelligence–based solutions. The aim was to interpret the functionality of the examined systems and the integration of AI from the perspective of supporting the course development and learning material development process.

The research sample consisted of 25 online course creation platforms that apply artificial intelligence at some level, are publicly accessible, can be tested through individual registration, and include AI-based course design or content support among their services. The analysis addresses the following systems: CanopyLab, Cornerstone, Course Box AI, Course Factory, CourseAI, Courseau, Coursly, CreateAiCourse, CYPHER Learning, Easygenerator, Heights AI, Kajabi, Lectora, Learning Studio AI, LearnWorlds, Lingio, Mind Smith AI, Mini Course Generator, SC Training, Shiken AI, StudyRiad, Teachable, Thinkific, Tutor AI, UJJI.
Sampling was criterion-based: every system was included that, according to its self-representation, uses an AI component at any stage of the course development process. The selected systems were not filtered according to the degree of AI integration, the level of detail of instructional design functionality, or the competence level of the targeted users. Systems and development environments that are closed, accessible only with institutional access, or do not provide public, trial-level insight into their operation were not included. The examined platforms do not fully cover the global e-learning development software market; however, the research sought to identify functional diversity and typical solutions, as well as to analyze the most popular and most frequently used applications. The focus of the study was primarily on course design and course development applications, rather than on general content generation systems. Tools were also included that, although they do not directly create digital learning materials, guide users through structured, AI-supported steps toward the creation of a course structure or learning material outline.

Data collection was based on the platforms' publicly available demonstrations, user interfaces, technical documentation, and trial registrations. For each application, we documented the available functions, their layout, and the specific steps at which AI intervenes in some form in the course development process.

During the research, we applied a methodological framework consisting of four criteria, which enabled the uniform examination of the individual systems. This set of criteria was developed based on relevant literature and the research results of case studies presenting the application of artificial intelligence in learning material development to date:

- content generation adapted to the characteristics of the target group
- consideration of learning objectives in the course structure
- integrability of feedback points
- creation of learning tasks and interactive activities

The platforms were not evaluated from a marketing or dissemination perspective, but rather on the basis of educational methodological relevance and the depth of AI integration; therefore, in the analysis the platforms are presented in anonymized or generalized form. We explicitly sought to avoid using the research to establish a comparative marketplace map of the applications or to produce any form of price/value/functionality comparison. From the perspective of the research, it is not essential to present the advantages or disadvantages of one software compared to others, and naming, for example, the top three applications would not be a relevant outcome in relation to the research objectives. Comparing applications is in itself a complex challenge; therefore, instead of market analysis–based evaluations, we focus much more on the question of where AI-supported development environments that comply with instructional design principles currently stand.

4. Research Results

4.1. AI-Based Content Generation and Target Group–Adapted Educational Content

The first aspect examined concerns how individual platforms use artificial intelligence to generate course texts and learning materials, and the extent to which they are able to take into account the characteristics of the target group (such as learners' prior knowledge level, professional background, or language needs). Many modern tools simply require a topic or keyword as input and, on this basis, automatically generate an outline or even a complete learning material. There are applications in which it is sufficient to specify the subject matter to be learned, and the platform generates a complete course on the given topic within seconds. This includes lessons, key points, and even quiz questions, as well as flashcards for practice. Another software solution is capable of producing a structured outline and the corresponding learning material within a few minutes: the user only needs to provide a topic, and the system automatically compiles a learning material outline, incorporating quizzes designed to increase learner engagement.

At the same time, an important difference is that some platforms allow the specification of target audience parameters, enabling the AI to shape the content accordingly. There are systems that explicitly offer personalized courses: based on the demographic and psychographic characteristics of the target audience, the AI recommends topics and constructs the content outline. For example, different materials are generated if the course is intended for first-year university students or for experienced corporate executives. In another application, the first step in course creation is the definition of the learner profile and learning objectives. Only after these are specified does the system generate customized learning materials in a style and depth appropriate to the given target group. The tone of the generated content can also be adjusted (for example, formal or informal), which further supports communication tailored to the target audience. There are also tools that require less detailed input but at least inquire about the target audience: they request the user's profession, target group, and a brief description of the course at the outset, and then propose a title and thematic structure based on this information. Specifying the target group in this case also ensures

that learning material intended for marketing professionals differs from that designed for a mini-course targeting secondary school students.

Some platforms serve specialized target groups. For example, there are applications designed specifically as mobile platforms for training employees working on production lines or in retail environments. Accordingly, the AI-generated learning materials are short, concise, easy to learn on mobile devices, and may be available in multiple languages. The system builds on the company's existing training materials, thereby ensuring the delivery of organization-specific knowledge. It uses reliable sources and allows experts to review the generated content before making it accessible to learners—this is crucial for quality assurance of content intended for a specific target group.

Not all platforms are equally advanced in personalized learning material development. There are systems that focus more on differentiating learning recommendations rather than on the automatic customization of the language of the content. Another application, for example, uses its own AI system to provide personalized course recommendations for employees—taking into account an individual's job role, skills profile, and prior learning history in order to suggest relevant learning materials. In this case, the AI segments the target group and matches learners with appropriate skill development content. A similar principle is applied by another platform that is familiar with competency frameworks and the skills required for specific job roles, and links the generated learning materials to these skills. This indirectly ensures that the content is relevant and tailored to the learner (or employee).

Most of the examined tools offer some form of AI solution for the rapid production of content; however, they differ in the extent to which they are able to adapt this content to the appropriate target group—ranging from the simplest solutions (generally generated text) to the most advanced ones (learning materials aligned with a specific learner profile and prior knowledge level).

4.2. Learning Objectives and the Design of Course Structure

A sound educational program is based on the clear definition of learning objectives and the development of a corresponding structure. In the research, we also examine how platforms handle learning outcomes and objectives—specifically, whether they assist in defining these and whether they ensure that the generated course structure supports these goals.

Some AI tools explicitly support the integration of learning objectives into course design. On one platform, for example, an AI-driven course outline generator operates that is capable of generating learning outcomes even from uploaded learning materials. Users can upload existing notes or presentations, and the system first extracts the main learning objectives from them, then automatically builds a customized instructional program plan based on these objectives that aligns with the defined training goals. Through this "smart outlining," the system ensures that course modules and lessons cover the specified learning outcomes. Another tool similarly requires the definition of learning objectives at the beginning of course generation. As a result, the structure of the generated learning material is built around these objectives: the system structures modules and lessons so that each develops a specific goal or competency, ensuring that the learning material does not deviate from its focus.

There are systems that explicitly emphasize the creation of didactically sound courses. Although the AI assistant in such cases primarily supports the correction and generation of textual content, according to the platform's philosophy anyone can create a didactically sound e-learning course, even without being a professional instructional designer. This is supported through pre-designed templates and guidance. The AI assistant, for example, can generate a complete course plan from a simple description, so the author does not need to invent the structure from scratch. The system also helps simplify or rewrite textual learning elements so that they clearly focus on learning objectives—ensuring that the content does not digress, with the AI filtering out unnecessary information and highlighting what is essential.

Another platform provides a good example of learning-objective-based design by offering a script-based editing interface in which users can instruct the AI at each step according to their own educational vision. The system allows learning materials to be created from any document in alignment with defined learning objectives. On the interactive design interface, concrete instructions can be given (e.g., "the goal here is for the learner to understand X"), and the AI generates content accordingly. In addition, the tool

takes educational standards and requirements into account—for example, when creating courses from higher education lecture notes, it aligns with curricular regulations. This is particularly useful when, for instance, a teacher wishes to compile digital learning materials with AI support for a specific topic within a national curriculum framework.

Naturally, there are also platforms where the integration of learning objectives is more the responsibility of the user rather than an automatic AI function. Some development systems, for example, generate complete courses from a given topic using built-in AI, but do not explicitly request learning objectives as input. Several systems integrate AI tools for the initial phase of course assembly (e.g., outline creators, module name generators), yet making learning objectives explicit remains the task of the instructor or developer. One AI curriculum generator, for example, produces a proposed course outline within minutes based on the specified topic, but it is the user's responsibility to verify whether this outline truly covers the intended objectives.

Among modern AI course development platforms, some explicitly implement goal-oriented course design, while others mainly facilitate outline creation and leave the conscious integration of learning objectives to the developer. The involvement of AI in this area also accelerates the process: a logically structured course outline can be produced much more quickly, which can then be aligned with the desired learning outcomes.

4.3. Integrability of Feedback Points

Regular feedback is an important component of effective learning—whether in the form of self-assessment quizzes, practice tasks, or instructor evaluation. In the research, we also analyze what tools different platforms offer for assessing learners' knowledge and providing feedback, and how AI facilitates the creation or management of these elements.

Almost all examined AI course platforms include some form of built-in quiz creation functionality. There are platforms that not only generate learning materials but also immediately provide assessment tools: these may include automatically generated multiple-choice quizzes, as well as longer, open-ended tasks for which the system also generates evaluation rubrics. Some more advanced systems are capable of automatically evaluating and grading submitted assignments, providing immediate feedback to learners. There are also solutions that enable the creation of realistic examinations using AI, including the automatic evaluation of responses to open-ended questions.

Many systems accelerate the generation of quiz questions based on the learning material. Some solutions introduced generative AI years ago to automatically produce quiz questions from course content—thus ensuring that feedback questions are closely aligned with the material studied. In another tool, after the user accepts the AI-generated outline and content, interactive quizzes and questionnaires can be added to complete a mini-course. There are also systems that generate assessment questions from uploaded documents and then embed them into the learning material. Some solutions apply gamified frameworks as well—learners can collect points by completing quizzes—so that feedback also functions as a motivational tool.

An interesting additional feature is that some platforms provide chatbot-like feedback. Certain tools, for example, do not generate traditional courses but function as AI-based personal tutors, allowing learners to ask questions and receive explanations. This creates a continuous interactive feedback process: the system responds immediately to learners' questions, provides additional examples if something is unclear, and allows learners to progress at their own pace. Although these solutions are not typical "course creation" platforms but rather learning support tools, they clearly demonstrate the potential of AI for real-time tutoring and personalized feedback. There are also systems that respond to learners' questions in an "AI tutor" mode and can even generate idea-initiating questions and posts in community forums.

More traditional learning management systems are also striving to keep pace with this trend. Several well-known platforms have recently introduced AI tools, including quiz generators. This means that instructors can enter a few lesson texts and the system automatically suggests assessment questions, such as multiple-choice tests. In addition, some systems have traditionally offered options for assignment submission and evaluation—these new AI tools now complement such features by assisting with the formulation of assignment prompts or automatically generating course titles and module names. In another system, a distinctive form of feedback is the spaced repetition method: the platform compiles personalized review quizzes for learners, focusing

specifically on areas where the learner is uncertain. In this way, the system automatically reinforces weak points while continuously providing feedback on progress.

AI-based course creation tools place strong emphasis on making the feedback process automatic and immediate, most commonly in the form of quizzes. A distinctive feature of many systems is that these quizzes and tests are generated by the AI itself, so instructors do not need to spend time writing questions. In addition, AI-based evaluation functions are appearing in more and more places—whether in the assessment of essay responses or in the form of an AI tutor to whom learners can turn with their questions. All of these developments serve to ensure that learners receive more and better feedback, while reducing the administrative burden on instructors.

4.4. Interactive Learning Tasks and Activities

In addition to textual or video-based learning materials, modern e-learning courses often include interactive elements that more actively engage learners in the learning process. During the research, we examined the extent to which different platforms support the creation of interactive learning activities—either generated by AI or provided in the form of templates.

Several AI course platforms are explicitly built around card-based, modular interactions. There are solutions that use so-called "card-based" formats: learning materials are presented on small cards that learners can flip through. These cards may contain text, images, or videos, and interactive quiz cards (e.g., true/false or multiple-choice) can also appear among them. Some AI assistants not only generate the text for the cards but also create suitable images for each card, thereby ensuring visual interaction as well. In addition, courses can be supplemented with quizzes, questionnaires, and videos to create a varied learning experience. There are also platforms that generate flashcards and interactive quizzes from uploaded materials, and even create "conversation-based role-playing" activities. The latter is particularly innovative: AI can, for example, generate foreign-language dialogue simulations in which learners practice communication with an artificial character. These are often embedded in a gamified framework, goals supporting mindful engagement can also be set, and the system tracks their completion.

Classic e-learning authoring tools are also known for their interactive capabilities, and AI supports these as well. There are systems that have always been strong in complex interactions—for example, they allow the creation of branching scenarios and drag-and-drop tasks. When paired with an AI assistant, developers can reach a basic interactive framework more quickly, which they can then enrich with their own creative ideas. In such cases, for instance, they can build branches where learners' decisions lead to different learning pathways. Other systems also offer built-in interactive task types, such as card sorting, various multiple-choice tasks, or matching exercises. In these cases, AI assists in simplifying or rephrasing textual content, while the instructional designer continues to assemble the interactive templates. Some systems even include AI-based image generation modules, enabling the creation of unique illustrations and thus enhancing the interactive experience—for example, illustrations can be created for story cards to help learners immerse themselves in a situation.

Some platforms also offer innovations in the field of interactive video. There are systems that generate instructional videos featuring AI avatars and synthetic voices: based on a written script, users can create videos presented by a virtual instructor. This allows instructors to avoid appearing personally on camera while still producing professional-looking videos. These videos can be supplemented with interactive elements, such as embedded quiz questions or pause points where learners can reflect. Other systems are capable of automatically generating interactive elements for uploaded videos—for example, subtitles, translations, summaries, and questions embedded at specific points in the video. This makes it possible to transform passive video viewing into an active learning experience.

Course creation platforms use AI not only for writing textual materials but increasingly also for creating rich interactive learning tasks. Whether it is a simple drag-and-drop task, a gamified point-collection system, or an AI-driven role-playing activity, these elements make online learning far more engaging and effective.

5. Summary and Conclusions

The analysis confirmed that AI is present not merely as a technological novelty, but also fulfills a didactic function: it is capable of supporting goal-oriented instructional design, enables the creation of individualized learning pathways, and promotes active learning.

The partial results of our research are consistent with previous research findings that identified the application of AI in education as particularly promising in accelerating content creation and personalizing the learning process. The existing literature (e.g., Holmes et al., 2022; Zawacki-Richter et al., 2019) has also confirmed that AI is capable of automating certain steps of didactic design, while responsibility for pedagogical decisions remains with the instructor or developer. Our research nuances this result: the most advanced platforms not only accelerate the development process, but also integrate learning objectives and scenarios in a structured manner, and some even provide assessment suggestions—thus moving beyond the level of simple content generation.

The diversity of AI tools—from prompt-based rapid generators to complex course ecosystems—indicates that developers are seeking solutions for different educational contexts. The most effective systems offer opportunities for instructors or developers to interactively participate in the design process, modify the structures proposed by the AI, and thereby realize genuine human–machine collaboration. Due to their maturity and diversity, AI-based development tools are already suitable for creating professional educational content. The most effective platforms do not replace pedagogical decision-making, but support it and, alongside automation, provide assisted decision points for developers in many areas. AI makes it possible to reinterpret the course creation process: it not only accelerates it, but also generates new types of learning experiences.

A very important research finding is that course creation applications are already capable of producing high-quality educational courses even for lay users. At the same time, professional instructional designers can use the various applications as an excellent toolkit.
Our research did not address the long-term effects of platform use (e.g., on learning effectiveness or motivation), nor did it include user testing, instructor interviews, or student feedback. A further limitation is the rapid development of platforms, meaning that the current picture may change significantly within a few months. Not all systems provided information of equal depth on their public interfaces, so certain elements of the comparison were based on background information of varying scope. Another significant limitation is that individual software environments communicate little or no information about the instructional design and methodological background of the development environment as a product.

In the future, it would be worthwhile to conduct empirical research on the learning outcomes of AI-generated courses; to explore, through qualitative studies, how instructors and learners evaluate AI-generated learning materials; to develop a methodological typology of the didactic roles of platforms (e.g., which pedagogical models they support most strongly); and to examine ethical and data protection issues, particularly with regard to learner data management in personalized learning materials.

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