ARTIFICIAL INTELLIGENCE AS A MEANS OF IMPLEMENTING INDIVIDUAL EDUCATIONAL TRAJECTORIES: A TEACHER-READINESS PERSPECTIVE

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Abstract: The study addresses the gap between the technological potential of artificial intelligence (AI) to design individual educational trajectories (IETs) and teachers' actual methodological readiness to use AI for this purpose. Synthesizing recent systematic reviews and survey-based studies, and re-visualizing primary survey data, the paper identifies an asymmetry in teacher perception: AI's discrete instructional functions are well recognized, while its capacity for systemic trajectory design remains underrecognized. A hypothesis on the necessity of targeted methodological training is formulated for verification through a forthcoming pedagogical experiment.

Keywords: artificial intelligence, individual educational trajectory, adaptive learning, teacher readiness, personalized learning

This paper is a conceptual/synthesis study: it does not report a new primary empirical experiment but systematically synthesizes secondary sources and re-analyzes previously published survey data to formulate an empirically grounded hypothesis for subsequent verification.

1. Introduction

Individualization of instruction is constrained by the limited capacity of a single teacher to simultaneously diagnose and respond to the cognitive, motivational, and pacing characteristics of every learner. Artificial intelligence — particularly adaptive learning systems (ALS) — is increasingly proposed as a means of automating diagnostic and adaptive procedures: adaptive platforms adjust content to a learner's individual route and forecast academic success for early intervention [1].

An individual educational trajectory (IET) is treated here as a personalized curricular pathway shaped by a learner's attainment level, cognitive interests, and learning pace. International reviews confirm that AI integrates machine learning, deep learning, and multimodal analytics to adapt content to learner profiles in real time [3], and that it can customize content and guide learners toward optimized paths [4]. Yet a methodological gap persists at the level of practice: teachers' readiness to use AI for the systemic design of an IET, as opposed to discrete instructional tasks, remains insufficiently studied — the specific focus of this paper.

2. Materials and Methods

The study uses a qualitative, theory-building design combining systematic synthesis of secondary sources with secondary statistical analysis of previously published survey data, structured in four stages — identification, screening, content analysis, synthesis — following PRISMA-type logic adapted to a pedagogical context (Figure 1).

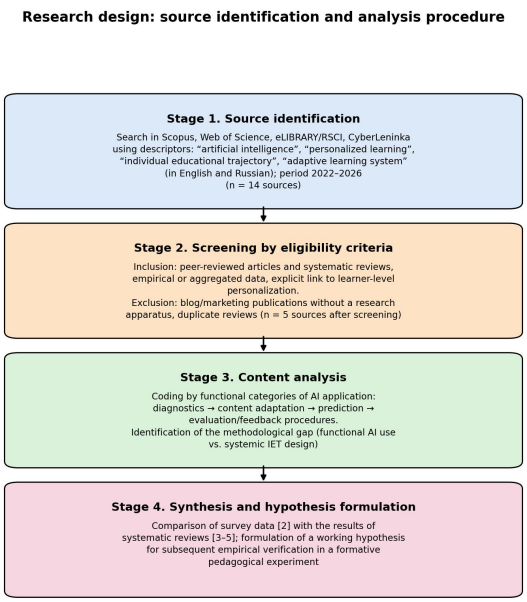


Figure 1. Research design: source identification and analysis procedure (compiled by the authors).

Sources were searched in Scopus, Web of Science, eLIBRARY/RSCI, and CyberLeninka (2022–2026) using the descriptors "artificial intelligence" AND "personalized learning"; "individual educational trajectory" OR "individual learning pathway"; "adaptive learning system" AND teacher readiness (English and Russian), yielding 14 candidate sources. These were screened against the eligibility criteria in Table 1 — which explicitly excludes blog and marketing material in favor of peer-reviewed, empirically grounded sources — reducing the corpus to 5 sources retained for full-text analysis and citation.

Criterion	Inclusion	Exclusion
Publication type	Peer-reviewed article, systematic review, indexed proceedings	Blog posts, vendor/marketing material
Topical focus	Explicit treatment of AI in learner-level personalization/IET	General AI-in-education overviews without an IET component
Evidentiary basis	Empirical data or systematically aggregated evidence	Purely conceptual/promotional argumentation
Scope / redundancy	Published 2022–2026; first/most comprehensive review	Pre-2022 (non-seminal); duplicate reviews

Table 1. Inclusion and exclusion criteria applied at the screening stage.

The retained corpus was subjected to directed content analysis using an a-priori coding scheme covering four recurring AI-application functions: (a) diagnostic analytics of learner data, (b) adaptive content sequencing, (c) predictive modelling of performance, and (d) automated evaluation/feedback, with each source coded for the presence of these categories and any associated quantitative indicators. This isolated the specific divergence between functional AI use and systemic trajectory design analytically rather than descriptively.

Where the corpus contained primary survey data, Likert-scale distributions were extracted and re-visualized for direct comparison. Specifically, responses to two statements from a higher-education teacher survey [2] — "AI can develop course content/assignments" (M = 4.03) and "AI can design a

learner's IET" (M = 3.03) — are compared in Figures 2–3. This statistical step is descriptive rather than inferential; the forthcoming formative pedagogical experiment is intended to generate primary inferential data between control and experimental groups.

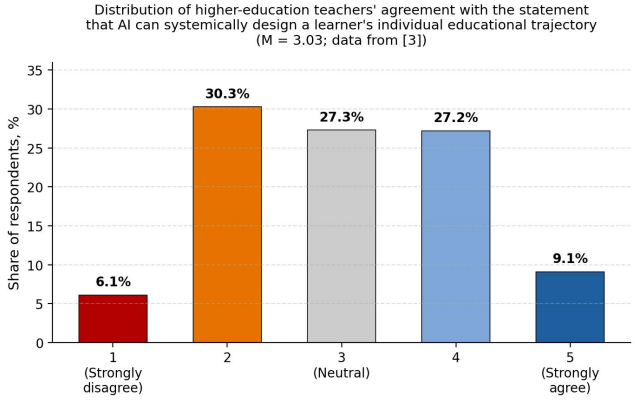


Figure 2. Teachers' agreement that AI can systemically design a learner's IET (M = 3.03; data from [2]).

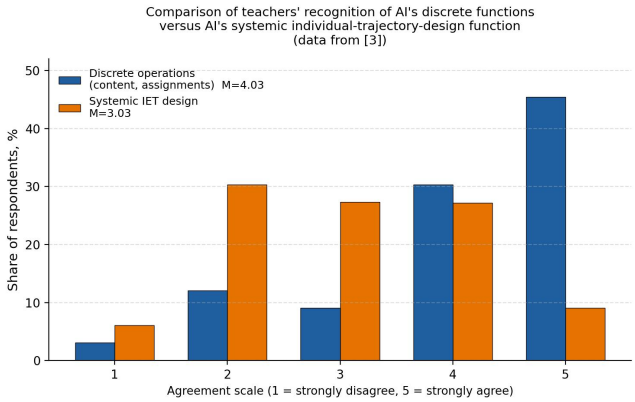


Figure 3. Comparative agreement: AI's discrete instructional functions vs. its systemic IET-design function (data from [2]).

3. Results

Three findings emerge. First, international reviews converge on a stable set of AI functions in personalized learning — diagnostic analytics, adaptive sequencing, predictive modelling — confirmed across 142 peer-reviewed studies as enhancing personalization, engagement, and equity [3], while generative models have intensified interest in AI's role in trajectory design specifically [5].

Second, despite this maturity, surveyed teachers show an asymmetry: discrete AI operations are well recognized (M = 4.03), while AI's capacity to systemically construct a learner's IET is markedly less recognized (M = 3.03) [2] (Figures 2–3) — the functional and systemic applications of AI are perceived asymmetrically even where the underlying technology supports both.

Third, comparative cross-country research notes that AI integration into personalized pathways recalibrates the instructor's role and optimizes the teaching–learning environment while introducing new challenges [4] — implicitly including teachers' preparedness to manage, rather than merely consume, AI-generated pathway decisions.

4. Discussion

The principal barrier to AI-supported IET implementation thus appears to be methodological mediation rather than technological availability: teachers remain recipients of AI-generated artifacts rather than designers of AI-supported trajectories. This is consistent with a competency-based framework in which the instructor's role shifts toward supervision, validation, and didactic correction of algorithmically generated pathways, structured by four didactic principles:

- Individualization — algorithmic diagnostics of baseline attainment.

- Adaptivity — dynamic content restructuring based on performance data.
- Systematicity — algorithmic verification of curricular sequencing.
- Feedback — automated analytics informing pedagogical correction.

Delegating diagnostic and adaptive functions to algorithmic systems without retaining pedagogical oversight risks reducing the learner's subjectivity to formally measurable indicators; instructor supervision is therefore a structural, not transitional, requirement of competency-based AI integration.

Accordingly, the study formulates the hypothesis that the effectiveness of AI-supported IETs is conditioned by targeted methodological training of teaching staff in the systemic — rather than purely functional — application of AI, to be verified through a formative experiment comparing a control group (standard AI-assisted instruction) with an experimental group (instruction preceded by structured methodological training in AI-supported trajectory design).

5. Limitations

Three limitations qualify the conclusions of this study. First, the evidentiary base for the central asymmetry finding rests on a single survey instrument [2]; replication across additional national samples is needed before generalizing the magnitude of the gap. Second, the statistical comparison in Section 2 is descriptive (re-visualization of previously reported distributions), not inferential, so no claim of statistical significance is made. Third, as a conceptual/synthesis study, the paper does not yet provide primary experimental evidence for the proposed hypothesis; this is addressed directly by the formative pedagogical experiment proposed in Section 4.

6. Conclusion

AI possesses substantial didactic potential for automating the diagnostic, adaptive, and evaluative procedures underlying individual educational trajectories, as confirmed by extensive international research. This potential, however, is realized unevenly: teachers readily adopt AI for discrete tasks but underutilize its capacity for systemic trajectory design. Closing this gap requires a dedicated model of methodological training, whose development and empirical validation constitute the next stage of this research.

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