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Annotation. *This article examines the role of artificial intelligence in education on the basis of the international research literature of the last decade. It classifies the principal areas of application — adaptive and personalised learning, intelligent tutoring systems, automated assessment and feedback, learning analytics, language learning support and administrative management — and analyses the effects documented for each. Attention is given to the changing professional role of the teacher, to the risks of generative artificial intelligence, and to questions of academic integrity, algorithmic bias and the digital divide. The analysis shows that the educational value of these technologies is determined not by the technology itself but by the pedagogical model within which it is embedded, and the article argues for a human-centred approach in which artificial intelligence amplifies teacher expertise rather than substituting for it.*

Keywords: *artificial intelligence, education, AIED, personalised learning, intelligent tutoring systems, generative artificial intelligence, learning analytics, automated assessment, teacher role, academic integrity, digital competence.*

Introduction. The question of the role of artificial intelligence in education is no longer a speculative one. Systems capable of generating coherent text, solving structured problems and responding to a learner in natural language have become freely accessible, and they entered classrooms faster than the frameworks intended to regulate them. Expectations tend to polarise between an optimism which presents artificial intelligence as a solution to the structural problems of mass education and a scepticism which regards it as a threat to independent thinking. Both positions attribute educational outcomes to the technology as such, whereas the research evidence indicates that outcomes depend on the pedagogical design within which the technology operates.

The aim of this article is to classify the main areas in which artificial intelligence is applied in education together with the effects documented for each, and to identify the conditions of its pedagogically justified introduction. The material consists of systematic reviews and empirical studies of 2016–2025 together with international policy documents; the methods are conceptual and comparative analysis and the synthesis of review evidence.

Literature Review. R. Luckin, W. Holmes and co-authors argued that the purpose of artificial intelligence in education is not to automate teaching but to make visible those aspects of learning hidden from the teacher — the learner's misconceptions and the points at which understanding breaks down [1]. O. Zawacki-Richter, V. Marín, M. Bond and F. Gouverneur, in a systematic review of research on artificial intelligence in higher education, showed that most publications originate in computer science, that critical reflection on risk is weak and that the connection to pedagogical theory is tenuous — the educators, as their title states, are largely absent from this literature [2].

L. Chen, P. Chen and Z. Lin systematised the application of artificial intelligence across administration, instruction and learning, and showed that adoption has been broadest where tasks are structured and repetitive [3]. F. Ouyang and P. Jiao distinguished three paradigms — artificial intelligence directed at the learner, directed by the learner, and in partnership with the learner [4] — making explicit that identical technology may occupy different pedagogical positions. T. Chiu and co-authors established that the documented opportunities cluster around personalisation, immediate feedback and the support of teacher decision-making, while the challenges cluster around ethics, data protection and insufficient digital competence [5]. With the appearance of generative systems, E. Kasneci and co-authors emphasised that large language models create value only where the learner

is competent to evaluate the output critically [6], and M. Bond, H. Khosravi and co-authors concluded that the field requires greater methodological rigour and a more serious engagement with ethical questions [7]. At the level of policy, the UNESCO guidance developed by F. Miao and W. Holmes advanced a humanistic approach founded on human agency, inclusion, equity and the protection of learners' data [8], while N. Selwyn showed that the pedagogical relation contains components — trust, moral authority, the recognition of a learner as a particular person — not reducible to information processing [9].

Research in Central Asia and neighbouring regions is also relevant. B. Turaeva, A. Sobirov, G. Ruzmatova and co-authors showed that the effect of integrating artificial intelligence into education, science and practice depends on institutional readiness rather than on the technical characteristics of the systems employed [10], and E. Nuroh, T. Linggowati and co-authors established that teacher attitude predicts the adoption of digital learning management systems more strongly than the capability of the platform itself [11]. Both results confirm that the decisive factor is pedagogical rather than technological.

III. Analyses

Adaptive and personalised learning. The mechanism consists in constructing a model of the individual learner from their responses, errors and pace, and selecting the next task accordingly. Its value lies in maintaining an optimal level of difficulty: a task that is too easy produces no development, one that is too difficult produces demotivation, and a teacher working with thirty learners cannot calibrate this for each of them. Review evidence indicates measurable gains in structured areas with a clear hierarchy of skills — mathematics, grammar, programming — and weaker effects where the object of learning is interpretation [3; 5].

Intelligent tutoring systems. Such a system models not only the level of the learner but the structure of their reasoning, and can therefore intervene within the process of solution: where a learner takes a mistaken step, it identifies the character of the misconception and offers a hint directed at it. Its value consists less in correcting the answer than in making explicit the reasoning that produced it [1].

Automated assessment and feedback. Automated systems reliably assess closed-form and structured tasks, and for extended written work they evaluate formal characteristics — grammatical correctness, lexical range, structural coherence — with reasonable consistency. The significant advantage is not the saving of teacher time but the immediacy of response: feedback received within seconds is incorporated into understanding far more effectively than feedback received a week later. The limitation is equally clear: judgement concerning the originality of an idea or the persuasiveness of an argument these systems do not perform, and delegating it to them distorts the object of assessment [5; 7].

Learning analytics and early-warning systems. The analysis of educational data permits the identification of learners at risk of failure while intervention is still possible, detecting combinations of indicators a teacher may not observe in time. A prediction, however, possesses value only where a pedagogical action follows it; a system leading to no conversation and no adjustment of workload generates no benefit and a real risk of stigmatisation.

Language learning support. In language education the principal difficulty is the shortage of opportunities for practice. A conversational system provides an interlocutor available at any hour and, pedagogically most important, one before whom the learner does not fear making an error; the reduction of communicative anxiety is substantial, since anxiety is among the principal inhibitors of speech production in a foreign language. Research on the components of speaking ability confirms that the volume and regularity of practice are decisive for fluency [12]. The limitation lies in the absence of genuine communicative purpose.

Administrative and institutional management. Timetabling, resource allocation, the processing of documentation and responses to standard enquiries are adopted with the least controversy, precisely because these tasks are structured and pedagogically neutral [3]. Formalised methods of multi-criteria analysis are applied in the same way to evaluating institutional performance, permitting comparison across heterogeneous indicators [13]. The significance of this application is indirect but real: the reduction of administrative burden releases teacher time for functions which cannot be automated.

IV. Discussion

The classification above permits the central generalisation of this analysis. Artificial intelligence demonstrates its highest effectiveness where the object of learning is formalisable, the correct outcome is determinable, and the value of the intervention resides in its speed and individual calibration; effectiveness declines sharply where learning is directed towards interpretation or evaluative judgement. The professional role of the teacher is transformed accordingly: the teacher does not become redundant, but the transmission of information and routine checking pass in part to automated systems, while the design of learning, motivation, the interpretation of difficulty and the formation of values acquire greater weight [9]. Introducing artificial intelligence without a programme for developing teachers' competence therefore produces not improved quality but a fragmentation of practice; studies of teaching after the transition to distance formats confirm that the decisive factor is systematic methodological support rather than the availability of technology [11; 14].

The risks of generative artificial intelligence differ in kind from those of earlier educational technologies. The first concerns academic integrity: a system capable of producing an acceptable text in response to a standard assignment renders much of the traditional assessment apparatus uninformative. The productive response consists not in attempting to detect such use — detection tools are unreliable and generate false accusations, which is ethically unacceptable — but in redesigning assessment towards forms in which the process of work is observable: oral defence, locally specific material, staged submission with intermediate discussion, and reflective commentary on the learner's decisions. The second risk is the erosion of cognitive independence: where a learner obtains a ready solution before making an independent attempt, the productive difficulty which constitutes the mechanism of learning does not occur. This is a property of the sequence of use rather than of the technology, and it is regulated pedagogically [6].

The third group of risks concerns algorithmic bias, the protection of learners' data and the digital divide. Systems trained on data reflecting existing inequalities reproduce them in their recommendations, and in education this carries particular weight, since it affects decisions about the trajectory of a person's life. Educational data are among the most sensitive categories of personal data, and the UNESCO guidance accordingly requires the ethical and pedagogical validation of such systems prior to adoption [8]. For multilingual environments this is of heightened importance, since the quality of these systems varies considerably across languages, and institutional collaboration is therefore regarded as a condition of balanced development [15]. In Uzbekistan the corresponding framework is established by the national digitalisation strategy [16].

V. Conclusion

The role of artificial intelligence in education is that of an instrument which amplifies the capacities of the teacher within a defined range of tasks and cannot substitute for them beyond it. It performs effectively the calibration of difficulty, the provision of immediate feedback, the expansion of practice and the reduction of administrative burden; it does not perform the formation of values, evaluative judgement concerning the originality of thought, or the assumption of moral responsibility for a pedagogical decision [9].

The principal practical implication is a reordering of priorities: the question that determines the educational outcome is not which system to select, but which pedagogical purpose it is intended to serve, and how the educational process must be restructured so that this purpose is attained. A technology introduced into an unchanged pedagogical design reproduces the limitations of that design at greater speed; the same technology introduced into a design in which the teacher's time has been redistributed towards non-automatable functions, in which assessment measures the process of thinking rather than its product alone, and in which learners have been taught to evaluate machine-generated output critically, does produce a gain in quality. Further research is required above all on long-term effects and within specific national and linguistic contexts [7].

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