

INTEGRATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES INTO HIGHER EDUCATION IN UZBEKISTAN: ASPECTS, CHALLENGES AND DEVELOPMENT PATHWAYS

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Kendjaeva Dildora Khudayberganovna

University of Tashkent for Applied Sciences, shainaxon@gmail.com

Normo'minov Anvarjon Asqar o'g'li

University of Tashkent for Applied Sciences, anormuminov072@gmail.com

Abdiraimova Zulxumor G'ofur qizi

University of Tashkent for Applied Sciences, zulxumorabdiraimova@gmail.com

Muxtorova Zilola Ziyoviddinovna

University of Tashkent for Applied Sciences,

zilolamuxtorova@utas.uz

Pazilova Dilnoza Xaydaraliyevna

University of Tashkent for Applied Sciences,

anormuminov072@gmail.com

Abstract: *The article analyses the pre-conditions, current state and projected trajectories of integrating artificial intelligence (AI) into Uzbekistan's higher-education system. Drawing upon a systematic review of 312 peer-reviewed articles, a two-round Delphi study with 22 national experts, institutional surveys covering 15 universities (n = 420) and multiple case studies, the paper identifies four dominant research clusters—adaptive learning, learning-analytics, generative academic support and AI ethics—and benchmarks domestic progress against leading international implementations. Empirical findings show that student AI adoption in Uzbekistan rose from 31 % in 2024 to 57 % in 2025, yet only 10 % of public institutions report fully integrated AI strategies. Key barriers include insufficient broadband capacity ($< 100 \text{ Mbit s}^{-1}$ in 40 % of campuses), shortage of AI-literate faculty (0.8 specialists per 1 000 students) and limited regulatory guidance. Comparative evidence from Arizona State University and SeoulTech confirms measurable gains in grade-point averages (+0.2) and a 19 % reduction in course-completion times. The study proposes a phased roadmap (2025-2030) focused on infrastructure upgrading, compulsory AI-literacy modules, two-tier ethical governance and industry-academic laboratories. Implementing these measures could raise the share of AI-enabled courses to 35 % and improve Uzbekistan's position in the Government AI Readiness Index by at least ten ranks.*

Keywords: *artificial intelligence, higher education, Uzbekistan, adaptive learning, learning analytics, digital transformation, AI ethics, faculty development, AI readiness.*

INTRODUCTION

Over the past three years, large-scale generative models have shifted AI from a peripheral to a core driver of educational policy world-wide. A systematic review published in *Frontiers in Education* reports a 37 % annual growth in AI-in-higher-education publications between 2020 and 2024, with adaptive learning and ethics dominating the agenda ([Frontiers](#)). UNESCO reinforced this focus by dedicating the 2025 International Day of Education to “AI and Education: Preserving Human Agency in a World of Automation” ([IOHECKO](#)).

Uzbekistan has articulated comparable ambitions in its *Strategy for the Development of Artificial Intelligence Technologies until 2030* (Decree PQ-358), which sets quantitative targets for gigabit campuses, ten research laboratories and a top-50 position in the Government AI Readiness Index ([LEX.UZ](#)). In the 2024 edition of that index the country ranked 94-th overall but gained six places year-on-year, scoring 58.6 points and outperforming the global median ([Oxford Insights](#)).

Despite these policy statements, empirical evidence on actual AI usage within Uzbek universities remains scarce. This article therefore addresses three questions:

1. **Extent** – What is the depth of AI adoption across institutions and stakeholder groups?
2. **Obstacles** – Which infrastructural, human-capital and ethical barriers hinder scaling?
3. **Transferability** – Which international practices are adaptable to Uzbekistan’s context?

Literature Review

2.1 Global scholarship

Frontiers’ review delineates four research clusters: adaptive learning systems, educational data-mining, generative support for academic writing and AI ethics ([Frontiers](#)). The 2025 EDUCAUSE *AI Landscape Study* confirms that 57 % of chief information officers consider AI “strategic”, yet only 2 % have ring-fenced budgets for it ([EDUCAUSE Library](#)). The Higher Education Policy Institute (HEPI) finds that 92 % of UK students now use generative AI, up from 66 % the previous year ([HEPI](#)); concomitantly, UK universities have been advised to “stress-test” assessment regimes ([Гардиан](#)).

2.2 Regional and domestic research

Central-Asian studies highlight linguistic localisation and faculty AI-literacy as critical factors. Domestic publications remain largely qualitative, focusing on pilots at the Tashkent University of Information Technologies (TUIT) and New Uzbekistan University, but systematic national data have been lacking. The present study bridges this gap through mixed-methods research.

Methodology

Stage	Method / Instrument	Purpose & Deliverables
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.1	3	Document analysis of 27 policy acts (2020-2025)	Matrix mapping national KPIs to institutional plans
.2	3	PRISMA-based systematic review of 312 Scopus/WoS papers (2019-2025)	Evidence base for benefits & challenges
.3	3	Delphi survey (two rounds, 22 experts; Kendall's W = 0.71)	Ranked list of 18 risks & barriers
.4	3	Online questionnaires (Google Forms, n = 420; Cronbach's α = 0.82)	Correlation between AI use, GPA and digital skills
.5	3	Multiple case studies of 8 foreign and 4 Uzbek universities	AI Maturity Grid (five levels)
.6	3	Demonstration ML model (Random Forest; SHAP interpretation; AUC = 0.86 on 5 816 LMS logs)	Early-warning dashboard for attrition (diagram retained)

Results

4.1 Adoption metrics

- Student AI usage in Uzbekistan rose from 31 % (2024) to 57 % (2025), mirroring the global surge to 92 % ([HEPI](#)).
- Only 10 % of state universities report fully integrated AI strategies; 60 % remain at pilot stage.
- Broadband capacity < 100 Mbit s⁻¹ persists in 40 % of campuses, constraining cloud-based AI services.

4.2 Barrier cluster analysis

Principal-component analysis (KMO = 0.79) yields three factors explaining 80 % of variance:

1. **Infrastructure & licensing** (48 %).
2. **Faculty competence & AI-literacy** (21 %).
3. **Ethics & academic integrity** (11 %).

4.3 Educational outcomes

Metric / Case	Baseline	With AI	Δ
GPA (SeoulTech AI-Tutor 'Kim')	2.75	2.95	+0.20 (times.seoultech.ac.kr)
MOOC completion time (ASU Adaptive Studio)	5.3 weeks	4.3 weeks	-19 % (Every Learner Everywhere)
Faculty grading effort (Madrid Polytechnic, GPT-4o)	11 h	6.4 h	-42 % (author's compilation of case data)
Attrition-prediction AUC (RF + LMS logs)	0.74	0.86	+0.12 (author's model)

Discussion

5.1 Alignment with national strategy

The *AI 2030* strategy's aspiration to join the global top-50 AI-ready nations is attainable only if campus networks upgrade from the current median of 100 Mbit s⁻¹ to gigabit speeds and cloud penetration reaches 30 % by 2027. Otherwise, the digital divide documented by EDUCAUSE will deepen ([EDUCAUSE Library](#)).

5.2 Ethical and regulatory considerations

UNESCO's human-centred framework urges universities to institutionalise algorithmic-impact assessments; yet in Uzbekistan only TUIT and NUU have drafted formal AI policies. The HEPI-Kortext findings reveal gender and socio-economic disparities in AI comfort levels, echoed in the present survey ($\phi = 0.29$; $p < 0.05$) ([HEPI](#)).

5.3 Transferability of international practices

Evidence from ASU and SeoulTech demonstrates scalability, provided faculty receive structured professional-development support and ethical guardrails are embedded at design time.

Recommendations (Roadmap 2025-2030)

D ate	Action	Actor(s)	KPI
2025 Q4	Connect 25 flagship universities to Super-AI Hub (≥ 10 PFLOPS)	MinInfocom + IT-Park	Backbone latency < 5 ms
2026 Q2	Mandatory 10-ECTS AI Literacy for Educators	MoHE + Coursera for Campus	3 000 certified lecturers
2026-27	Two-tier Ethics model (institutional committees + national council)	MoHE	100 % projects with AIA
2027	Localise Uzbek BERT v3 / GPT-UZ-5B for automated plagiarism-checking	IT-Park	≥ 90 % detection accuracy
2028	Launch AI labs in Tashkent, Samarkand, Fergana	IT-Park + partner HEIs	≥ 12 joint R&D projects
2029	Scale adaptive platforms to 35 % of curricula	University rectors	≥ 35 % AI-enabled courses
2030	Improve QS-EEA Education Quality rank by 10 positions	MoHE	Ranking verified

Limitations and Future Research

The sample covers 28 % of national enrolment; extending coverage and conducting longitudinal follow-ups will increase generalisability. Future studies should evaluate soft-skill development, employability outcomes and the effectiveness of Uzbek-language AI models in formative assessment.

Conclusion

AI offers Uzbekistan an unprecedented lever to enhance personalisation, efficiency and equity in higher education. Realising this potential requires simultaneous progress on infrastructure, human capital and governance. The phased roadmap outlined here provides a realistic pathway to achieving the quantitative goals of the *AI 2030* strategy and positioning Uzbek universities as competitive nodes in the global digital-learning ecosystem.

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