Artificial Intelligence and Higher Education Quality: Survey Evidence from UNEC

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Abstract. Artificial intelligence (AI) technologies are increasingly transforming higher education systems worldwide by influencing teaching practices, learning processes, assessment methods, and institutional governance. This study examines the relationship between AI adoption and the quality of higher education using survey data collected from students and academic staff at the Azerbaijan State University of Economics (UNEC). The main objective is to evaluate how AI-based tools affect perceived educational quality, instructional effectiveness, student engagement, and institutional efficiency within the university context.
A structured questionnaire was administered to assess attitudes toward AI, patterns of use, and the perceived impact of AI applications on key dimensions of educational quality. Quantitative methods were applied to analyze the survey data. The findings indicate that AI-based technologies—such as intelligent tutoring systems, automated assessment tools, learning analytics, and adaptive learning platforms—are positively associated with several aspects of higher education quality, particularly personalized learning, timely feedback, and data-driven decision-making. However, the study also identifies key challenges related to AI integration, including concerns about data privacy, academic integrity, algorithmic bias, and unequal access to digital resources. These issues highlight the importance of effective institutional governance, ethical standards, and appropriate regulatory frameworks. Using UNEC as a case study, the research provides empirical evidence from a developing higher education context and contributes to the growing literature on AI in education. Overall, the study concludes that AI should be viewed as a complementary tool that supports and enhances human expertise in the educational process.

Keywords: Artificial Intelligence; Higher Education Quality; Educational Technology; Learning Analytics; Survey Analysis

1 Introduction

In recent years, rapid advances in artificial intelligence (AI) have significantly transformed the structure and operational mechanisms of higher education systems. The integration of AI into teaching and learning processes has enabled innovations such as personalized learning environments, automated assessment, early prediction of academic performance, and data-driven institutional decision-making [1,2]. As a result, AI is increasingly viewed as a strategic factor influencing higher education quality.

The concept of quality in higher education extends beyond academic outcomes to encompass instructional effectiveness, student satisfaction, inclusiveness, efficient resource utilization, and institutional adaptability to technological change. From this perspective, AI technologies offer considerable potential for quality enhancement, while simultaneously introducing ethical, legal, and social challenges. Issues related to data privacy, academic integrity, algorithmic transparency, and digital inequality require cautious and well-regulated approaches to AI adoption in higher education [3, 4].

Against this background, the present study aims to empirically investigate the impact of artificial intelligence on higher education quality using Azerbaijan State University of Economics (UNEC) as a case study. Employing a survey-based research design, the study systematically examines the perceptions of academic staff and students regarding AI adoption, levels of use, and perceived effects on key quality indicators. The findings are intended to inform both scholarly debate and institutional policy on the strategic integration of AI in higher education systems in developing and transition economies.

2 Problem Statement

2.1 Artificial Intelligence in Higher Education: Conceptual Foundations

The application of artificial intelligence in higher education has developed into a rapidly expanding interdisciplinary field over the past two decades. Artificial Intelligence in Education (AIEd) generally refers to the use of machine learning, natural language processing, learning analytics, and intelligent systems to enhance teaching, learning, and institutional decision-making processes [1]. Contemporary research conceptualizes AI not merely as an instructional technology, but as a systemic driver capable of reshaping higher education quality frameworks [2].

Higher education quality is increasingly understood as a multidimensional construct encompassing academic achievement, instructional effectiveness, student satisfaction, inclusiveness, institutional efficiency, and adaptability to technological change. Within this framework, AI-based solutions are regarded as enabling mechanisms for quality enhancement, while simultaneously raising ethical, governance, and equity-related concerns [4].

Personalized learning represents one of the most extensively studied applications of AI in higher education. Intelligent Tutoring Systems (ITS) dynamically adapt learning content, feedback, and assessment to individual learners' cognitive profiles and learning trajectories [5]. A substantial body of empirical research demonstrates that AI-

driven personalization can improve academic performance, learner motivation, and self-regulated learning skills [6].

Recent studies on generative AI and personal AI tutors further support these findings. [7] using a preprint case study, report positive effects of sustained interaction with AI tutors on learning outcomes through reduced cognitive load and reinforced learning principles. However, the literature also emphasizes that large-scale implementation of personalized AI systems remains constrained by infrastructural capacity, pedagogical readiness, and institutional resources, particularly in non-Western higher education systems [8].

2.2 Learning Analytics and Data-Driven Decision-Making

Learning analytics constitutes a central application of AI for enhancing higher education quality. By analyzing large-scale educational data, AI-based systems enable early identification of at-risk students, prediction of academic performance, and optimization of curriculum design [1]. Ifenthaler argues that data-driven decision-making can improve institutional effectiveness and support more efficient allocation of educational resources [9].

According to the EDUCAUSE Analytics Landscape Study (2024), more than half of surveyed higher education institutions report active use of AI-based analytics tools in academic and administrative processes. This trend reflects growing institutional reliance on AI for quality assurance and strategic planning. Nevertheless, concerns regarding algorithmic transparency, bias, and interpretability continue to limit trust in learning analytics systems and underscore the need for robust governance mechanisms [3].

AI-driven automation affects both instructional and administrative dimensions of higher education quality. Automated assessment systems have been shown to reduce faculty workload while accelerating feedback cycles, thereby enhancing students' learning experiences [10]. In addition, AI-powered chatbots and virtual assistants provide academic and administrative support services, contributing to higher levels of student engagement and satisfaction [11].

While evidence suggests that automation can improve institutional efficiency, the depth and effectiveness of AI integration vary substantially across institutions. This variation indicates that quality gains from AI adoption are contingent on organizational strategy, digital infrastructure, and staff competencies rather than technology alone.

The integration of AI with immersive technologies such as virtual reality (VR) and augmented reality (AR) has expanded opportunities for experiential and practice-oriented learning. [12] find that AI-enhanced VR/AR environments can significantly increase student engagement and skill acquisition, particularly in engineering, medical, and technical disciplines. Despite their pedagogical potential, high implementation costs and technical complexity continue to limit widespread adoption in higher education institutions.

2.3 Ethical, Social, and Governance Challenges

A substantial body of literature highlights ethical and social concerns associated with AI adoption in higher education. Key issues include data privacy, algorithmic fairness, academic integrity, and surveillance [3]. International organizations emphasize that insufficient governance frameworks may exacerbate digital inequality and erode trust in educational institutions [2].

Global survey evidence reported by the World Economic Forum indicates relatively low levels of public trust in AI technologies and widespread concern about associated risks [13]. These findings underscore the importance of responsible, transparent, and ethically grounded AI integration strategies in higher education.

Institutional Experiences and Research Gaps

Case studies from leading universities in advanced higher education systems suggest that AI-supported hybrid learning models can enhance educational quality when aligned with institutional strategies and regulatory frameworks. In contrast, evidence from non-Western and transition economies points to more limited and uneven integration of AI into everyday academic practice, despite significant technological potential [14,15].

Analytical reports further indicate that although students increasingly use generative AI tools, such use often remains informal and weakly regulated. Overall, the existing literature reveals a notable lack of empirical, survey-based studies examining the relationship between AI adoption and higher education quality in developing and transition economies. This study addresses this gap by providing original evidence from UNEC.

3 The Main Part

3.1 Econometric Assessment

This study employs a quantitative, cross-sectional survey research design to examine the relationship between artificial intelligence (AI) adoption and higher education quality. The quantitative approach is particularly suitable for capturing perceptions, attitudes, and usage patterns across a relatively large population, allowing for statistical inference and hypothesis testing.

A case study framework is adopted, focusing on the Azerbaijan State University of Economics (UNEC). While the empirical scope is institution-specific, the methodological design allows for analytical generalization to comparable higher education institutions in developing and transition economies.

The target population consists of:

-Academic staff (faculty members, researchers, instructors), and

-Students (undergraduate and graduate levels) at UNEC.

A stratified random sampling approach was used to ensure representation across key groups (academic staff vs. students, faculties, and levels of study). This approach minimizes sampling bias and improves the external validity of the findings.

Let the total population size be denoted by N, and the selected sample size by n. The final sample satisfies minimum requirements for multivariate statistical analysis, including regression and factor analysis.

Primary data were collected using a structured questionnaire designed specifically for this study. The questionnaire consists of five main sections:

Demographic characteristics (age, gender, academic position / level of study, years of experience);

AI adoption and usage intensity (frequency of AI tool usage, types of AI applications);

Perceived impact of AI on educational quality;

Institutional readiness and governance;

Ethical concerns and perceived risks (data privacy, academic integrity, algorithmic bias).

Most attitudinal items were measured using a five-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*.

Dependent Variable

Higher Education Quality (HEQ)

Higher education quality is operationalized as a latent composite construct, measured through multiple indicators, including:

instructional effectiveness,

learning personalization,

student engagement,

feedback timeliness,

perceived institutional efficiency.

The composite index is constructed as:

$$HEQ_i = \frac{1}{k}\sum_{j=1}^{k} Q_{ij} \tag{1}$$

where Q_{ij}represents the score of respondents $i$on quality dimension j, and $k$is the number of quality indicators.

Independent Variables

The key independent variable is AI Adoption (AI_USE), measured through:

frequency of AI usage,

diversity of AI tools used (e.g., tutoring systems, automated assessment, learning analytics),

depth of integration into teaching and learning activities.

An index-based measure is constructed as:

$$AI\_USE_i = \sum_{m=1}^{M} w_m A_{im} \tag{2}$$

where A_{im}denotes the usage intensity of AI application m, and $w_m$represents equal weighting.

Control Variables
To isolate the effect of AI adoption on higher education quality, the model includes several control variables:
Experience (years of teaching / study),
Digital competence,
Academic role (staff vs. student),
Field of study.
Econometric Model Specification

To empirically assess the relationship between AI adoption and higher education quality, the following baseline regression model is specified:

$$HEQ_i = \beta_0 + \beta_1 AI\_USE_i + \beta_2 GOV_i + \beta_3 ETH_i + \beta_4 X_i + \varepsilon_i \quad (3)$$

where:
HEQ_i— higher education quality index,
AI_USE_i— AI adoption index,
GOV_i— perceived institutional governance and regulatory readiness,
ETH_i— perceived ethical risks associated with AI,
X_i— vector of control variables,
ε_i— error term.
Reliability and Validity
Reliability Analysis
Internal consistency of the multi-item constructs was assessed using Cronbach's alpha coefficient. A threshold value of:

$$\alpha \geq 0.70$$

was considered indicative of acceptable reliability.
Construct Validity
To ensure construct validity:
Exploratory Factor Analysis (EFA) was applied to verify the dimensional structure of AI adoption and quality indicators;
Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity were used to assess sampling adequacy.
Estimation Strategy
Ordinary Least Squares (OLS) estimation was employed as the primary estimation technique. Robust standard errors were used to account for potential heteroskedasticity.
Additional robustness checks include:
alternative model specifications,
subgroup analysis (academic staff vs. students),
exclusion of extreme observations.
Ethical Considerations
Participation in the survey was voluntary and anonymous. Respondents were informed about the purpose of the study, and no personally identifiable information was collected. The study complies with internationally accepted ethical standards for social science research.

Table 1. Descriptive Statistics of Key Variables

Variable	N	Mean	Std. Deviation	Min	Max
Artificial intelligence usage frequency	381	1.56	0.77	0	3
Perceived effectiveness of artificial intelligence	381	2.14	0.84	0	3
Artificial intelligence use for self-directed learning	381	2.30	0.80	0	3
Support for deeper artificial intelligence integration	381	2.27	0.76	0	3
Ethical and regulatory concerns	381	1.45	0.70	1	3
Perceived future role of artificial intelligence	381	1.98	0.85	0	3

Descriptive results indicate that artificial intelligence is already moderately used in the educational process. Perceptions of effectiveness, self-directed learning support, and deeper integration cluster around mid-to-high scale values. Ethical concerns remain notable, though less intense than perceived benefits, suggesting cautious but generally positive attitudes toward artificial intelligence adoption.

A composite index of Higher Education Quality (HEQ) was constructed as the arithmetic mean of three indicators:

perceived effectiveness of artificial intelligence in education,

artificial intelligence use for self-directed learning,

support for deeper artificial intelligence integration.

Internal consistency analysis confirms acceptable reliability.

Construct	Items	Cronbach's α
Higher Education Quality	3	0.81

The reliability coefficient exceeds the commonly accepted threshold of 0.70, confirming that the indicators consistently measure the latent construct of higher education quality.

Table 2. OLS Regression Results: Determinants of Higher Education Quality

Dependent variable: Higher Education Quality index

Variable	β	Std. Error	t-statistic	p-value
Constant	1.893	0.090	20.99	0.0000
Artificial intelligence usage (AI_USE)	0.397	0.037	10.72	0.0000
Ethical concerns	−0.192	0.041	−4.69	0.0000

Model statistics:

Observations: 381

$R^2 = 0.277$

Adjusted $R^2 = 0.273$
F-statistic = 72.34 ($p < 0.001$)
The regression analysis demonstrates a strong and statistically significant positive relationship between artificial intelligence usage and higher education quality. A one-unit increase in artificial intelligence usage frequency is associated with an average 0.40-point increase in the higher education quality index, holding ethical concerns constant. This finding provides robust empirical support for the hypothesis that artificial intelligence adoption enhances instructional effectiveness, learning personalization, and overall educational efficiency.
In contrast, ethical and regulatory concerns exhibit a negative and statistically significant effect on perceived educational quality. Respondents expressing higher levels of concern regarding academic integrity, data protection, and regulatory uncertainty tend to report lower quality outcomes. This result highlights the importance of trust, transparency, and ethical governance in realizing the full benefits of artificial intelligence integration.
The explanatory power of the model ($R^2 = 0.277$) is substantial for survey-based educational research, indicating that artificial intelligence usage and ethical perceptions together explain a meaningful share of variation in perceived higher education quality.
Policy-Relevant Implications
From a policy perspective, these findings imply that:
Expanding artificial intelligence usage in higher education can significantly improve perceived quality outcomes.
Ethical and regulatory safeguards are not secondary considerations; they directly affect educational quality.
Institutional strategies should combine technological investment with governance reform and digital competence development.
In the context of UNEC and comparable universities in developing and transition economies, artificial intelligence adoption should therefore be embedded within a coherent institutional framework that prioritizes ethical standards and stakeholder trust alongside innovation.

3.2 Discussion

This study provides empirical evidence on the relationship between artificial intelligence usage and higher education quality based on real survey data collected at the Azerbaijan State University of Economics. The findings demonstrate a statistically significant and substantively meaningful positive association between the frequency of artificial intelligence usage and perceived higher education quality. This result supports the growing body of literature that conceptualizes artificial intelligence as a quality-enhancing instrument in higher education rather than as a disruptive substitute for academic labor.
The magnitude of the estimated coefficient for artificial intelligence usage indicates that increased exposure to artificial intelligence tools is associated with higher evaluations of instructional effectiveness, learning personalization, and support for self-directed learning. This finding aligns with prior research emphasizing the role of intelligent systems in improving feedback timeliness, learning efficiency, and access to edu-

cational resources. Importantly, the UNEC evidence confirms that these effects are observable not only in technologically advanced Western institutions, but also in a developing and transition economy context.

At the same time, the empirical results reveal that ethical and regulatory concerns exert a statistically significant negative effect on perceived educational quality. Respondents who report higher levels of concern regarding academic integrity, data protection, and insufficient institutional regulation tend to assess educational quality less favorably. This finding highlights a critical tension in artificial intelligence integration: while technological usage enhances perceived quality, unresolved ethical issues may partially offset these gains. The result reinforces arguments in the literature that trust, transparency, and accountability are central determinants of successful artificial intelligence adoption in education.

The explanatory power of the regression model, which accounts for approximately 28 percent of the variation in perceived higher education quality, is substantial for survey-based educational research. This indicates that artificial intelligence usage and ethical perceptions together represent key drivers of quality assessments, even when individual-level heterogeneity is present. However, the remaining unexplained variation suggests that artificial intelligence should be understood as one component of a broader quality ecosystem, rather than as a standalone solution.

From an institutional perspective, the UNEC case illustrates that artificial intelligence adoption is already occurring at a moderate level, primarily through individual and informal usage rather than fully institutionalized strategies. The strong positive effect of usage frequency implies that further quality improvements may be achievable through more systematic integration of artificial intelligence tools into curricula and teaching practices. At the same time, the negative role of ethical concerns indicates that such integration must be accompanied by clear institutional rules, guidance from instructors, and transparent governance frameworks.

Overall, the discussion of results suggests that the impact of artificial intelligence on higher education quality is conditional rather than automatic. The benefits of artificial intelligence materialize when usage is widespread and meaningful, but they are constrained when ethical uncertainty and regulatory ambiguity persist.

4 Conclusion

This study examined the relationship between artificial intelligence usage and higher education quality using original survey data from the Azerbaijan State University of Economics. Based on real empirical evidence, the findings demonstrate that artificial intelligence usage is positively and significantly associated with perceived higher education quality, while ethical and regulatory concerns exert a negative influence.

The results indicate that artificial intelligence enhances educational quality primarily by supporting instructional effectiveness, facilitating self-directed learning, and enabling deeper integration of digital tools into the learning process. However, these benefits are not unconditional. Ethical concerns related to academic integrity, data privacy, and insufficient regulation reduce perceived quality gains and may undermine trust in artificial intelligence-driven educational practices.

From a policy and managerial perspective, the findings carry several important implications. First, higher education institutions should recognize artificial intelligence as a strategic quality-enhancing resource rather than a marginal technological innovation. Second, expanding artificial intelligence usage alone is insufficient; universities must simultaneously invest in ethical governance, regulatory clarity, and instructor guidance. Third, institutional efforts to strengthen digital competence among students and academic staff are likely to amplify the positive effects of artificial intelligence adoption.

In the context of developing and transition economies, the UNEC case demonstrates that artificial intelligence can contribute meaningfully to higher education quality even in resource-constrained environments. However, sustainable quality improvements require coordinated institutional action that aligns technological adoption with ethical standards and quality assurance mechanisms.

By providing real, survey-based empirical evidence from a non-Western higher education system, this study contributes to a more balanced and globally relevant understanding of the role of artificial intelligence in higher education quality. Future research should build on these findings by employing longitudinal designs, multi-institutional samples, and mixed-method approaches to further explore the long-term implications of artificial intelligence integration in higher education systems.

Despite its contributions, this study is subject to several limitations. First, the analysis relies on self-reported survey data, which may be influenced by subjective perceptions and response bias. Future studies could complement survey-based measures with objective performance indicators, such as learning outcomes, completion rates, or administrative efficiency metrics.

Second, the research adopts a cross-sectional design, limiting the ability to draw causal inferences about the long-term impact of AI adoption on educational quality. Longitudinal studies would provide valuable insights into how the effects of AI evolve over time as institutional experience and governance frameworks mature.

Third, the empirical scope is limited to a single institution, which may constrain the generalizability of the findings. While the case study approach enables in-depth contextual analysis, future research could employ multi-institutional or cross-country designs to compare AI adoption patterns and quality outcomes across different higher education systems.

Finally, future research could explore discipline-specific effects of AI adoption, as well as 0the differential impacts on academic staff and students. Qualitative approaches, including interviews and focus groups, may also enrich understanding of how ethical concerns, trust, and institutional culture shape the effectiveness of AI integration in higher education.

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