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APPLICATION OF GENERATIVE ARTIFICIAL INTELLIGENCE IN THE DEVELOPMENT OF CASE STUDIES FOR TRAINING TEACHER-PSYCHOLOGISTS

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ABSTRACT

This study aims to evaluate the effectiveness of applying Generative Artificial Intelligence (GAI) in the development of educational case studies for training teacher-psychologists in higher education institutions in Kazakhstan. The research analyzes the impact of GAI tools on the quality of developed cases, teacher satisfaction, and the overall effectiveness of the educational process. Additionally, the role of teachers' digital competence as a mediator in these relationships is examined. Data were collected from 312 instructors and master's students in psychological and pedagogical specialties using a validated questionnaire. Partial least squares structural equation modeling (PLS-SEM) was employed for analysis with Smart PLS 4.0. The model was assessed for validity and reliability according to current standards. The results demonstrate a significant

positive correlation between the use of GAI and the quality of educational cases (β=0.758, p<0.001), as well as between case quality and teacher satisfaction (β=0.694, p<0.001). Digital competence serves as a partial mediator (VAF=26.3%) in the relationship between GAI use and case quality. The study shows that Generative AI reduces case development time by 68%, enhances their realism and diversity, and contributes to more effective training of future teacher-psychologists. The findings provide recommendations for educational program leaders on integrating GAI technologies into the curriculum while simultaneously developing faculty digital competencies in the context of the digitalization of higher education in Kazakhstan.

KEYWORDS: Generative Artificial Intelligence, Educational Case Studies, Teacher-Psychologists, Digital Competence, Higher Education, PLS-SEM, Education Quality, Kazakhstan.

1. INTRODUCTION

Training teacher-psychologists in the modern educational landscape requires the development of comprehensive competencies, including a deep understanding of psychological principles, pedagogical technologies, and practical skills for working with diverse categories of learners (Chan et al., 2023). The case method has traditionally played a central role in the training of helping professionals, as it enables the simulation of real professional situations and fosters critical thinking (Rapanta et al., 2021; UNESCO, 2023).

However, creating high-quality educational case studies is a time-consuming process that demands significant intellectual resources from instructors (Tlili et al., 2023). Research suggests that developing a single comprehensive case can take between 15 and 40 hours, which limits the ability to update educational content (Kasneci et al., 2023).

The emergence of generative artificial intelligence (GAI), exemplified by models like GPT-4, Claude, Gemini, and others, presents new opportunities for streamlining the educational content development process (Baidoo-Anu & Ansah, 2023; Dwivedi et al., 2023). GAI can generate textual content, create intricate scenarios, adapt materials to diverse educational contexts, and provide multiple solution options (Cotton et al., 2024).

In the context of the digital transformation of higher education in Kazakhstan, as outlined in the State Program for the Development of Education and Science for 2020–2025, the integration of AI technologies into the educational process becomes particularly pertinent (Ministry of Education and Science of the Republic of Kazakhstan, 2024). The digitalization program "Digital Kazakhstan" envisions widespread implementation of digital technologies across all sectors, including education.

1.1. Context Of Teacher-Psychologist Training in Kazakhstan

Teacher-psychologists play a crucial role in the Kazakhstani educational system, working with children, adolescents, their families, and teaching staff on a variety of issues (Kassymova et al., 2023). In Kazakhstan, training for teacher-psychologists is offered in the fields of "Pedagogy and Psychology" (bachelor's and master's programs) at over 40 universities nationwide. According to the State Compulsory Educational Standard, graduates are expected to possess a wide range of competencies, the development of which necessitates the use of practice-oriented teaching methods (GOSO RK, 2022). The case method is acknowledged as one of the most effective tools for developing professional competencies (Holmes & Poultney, 2021; Wardat et al., 2023).

1.2. Research Objectives

This study aims to achieve the following objectives:
RO1: Evaluate the impact of generative AI on the quality of educational case studies developed for training teacher-psychologists using a multidimensional quality assessment model.
RO2: Investigate the correlation between the quality of GAI-developed cases and instructors' satisfaction with their integration into the educational process.
RO3: Examine the role of teachers' digital competence as a mediator in the relationship between GAI utilization and the quality of developed cases.
RO4: Identify barriers and factors affecting the successful implementation of GAI technologies in the development of educational case studies within the context of Kazakhstan.

2. LITERATURE REVIEW

2.1 Generative AI As an Innovative Tool in Education

Generative artificial intelligence (GAI) is a class of machine learning algorithms capable of creating new content based on training on large datasets (Baidoo-Anu & Ansah, 2023). Since the public launch of ChatGPT in November 2022, interest in the application of GAI in education has grown exponentially (Cotton et al., 2024). Research indicates that GAI can perform a variety of pedagogical functions: personalizing learning, providing feedback, generating educational materials, and creating adaptive learning environments (Chan et al., 2023; Kasneci et al., 2023). In the context of higher education, GAI is used to automate instructors' tasks, freeing up time for creative engagement with students (Tlili et al., 2023). According to Dwivedi et al. (2023), published in the *International Journal of Information Management* (Q1, Scopus), the integration of GAI into the educational process is associated with several challenges: ethical dilemmas, issues of academic integrity, algorithmic bias, and data privacy concerns. A particularly critical issue is the need for careful evaluation of GAI-generated content, as models can reproduce factual errors (Kasneci et al., 2023).

2.2 Case Method in The Training of Teacher-Psychologists

The case method is one of the leading active

learning approaches in professional education (Rapanta et al., 2021). In psychological and pedagogical education, case studies enable students to develop competencies in analyzing complex professional situations and making decisions under conditions of uncertainty (Holmes & Poultney, 2021). An effective educational case should possess the following characteristics (Wardat et al., 2023): realism, ensuring alignment with actual professional practice; complexity, which includes multiple factors and stakeholders; problemetization, featuring ambiguous situations; contextualization, taking into account the socio-cultural context; and provocativeness, which stimulates professional reflection. However, traditional case development requires deep professional knowledge, practical experience, and considerable time (Tlili et al., 2023). Consequently, many instructors report difficulties in creating diverse and methodologically sound cases (Cotton et al., 2024).

2.3 Teachers' Digital Competence

Digital competence is defined as the combination of knowledge, skills, and attitudes necessary for the effective use of digital technologies in professional activities (Caena & Redecker, 2019). In the context of GAI application, the following components are particularly important (Rudolph et al., 2023): technological literacy, which involves understanding the principles of AI systems; critical thinking, which is the ability to assess the quality of GAI-generated content; ethical reflection, which encompasses awareness of the ethical aspects of AI use; and pedagogical design, which refers to the ability to integrate AI tools into the educational process. Research shows significant variability in the level of digital competence among university instructors (Cattaneo et al., 2022; Trust et al., 2023), creating uneven adaptation of GAI tools in educational practice.

2.4 Development of Research Hypotheses

Based on the literature analysis, the following hypotheses were formulated:

H1: The use of generative AI in the development of educational case studies positively affects the perceived quality of cases.
Rationale: GAI can generate diverse, detailed, and contextually relevant content, which may enhance case quality (Chan et al., 2023; Kasneci et al., 2023).

H2: The quality of educational case studies positively affects instructors' satisfaction.
Rationale: High-quality cases facilitate the conduct of classes and contribute to achieving educational objectives (Holmes & Poultney, 2021).

H3: Teachers' digital competence positively influences the effectiveness of GAI use in case development.
Rationale: Instructors with higher digital competence are better able to formulate AI prompts and critically evaluate outcomes (Trust et al., 2023; Rudolph et al., 2023).

H4: Digital competence partially mediates the relationship between GAI use and case quality.
Rationale: The use of GAI alone is insufficient; competence in working with the tool is required (Cattaneo et al., 2022).

METHODOLOGY

3.1 Research Design

To achieve the study objectives, a quantitative approach utilizing a cross-sectional survey was chosen for the research conducted between September 2024 and March 2025. The process involved several stages, beginning with the development of instruments based on validated scales. A pilot study with 38 participants was carried out to assess the reliability of these instruments. Following this, the main data collection was conducted through an online questionnaire. The collected data were then analyzed using PLS-SEM modeling, culminating in the interpretation of the results.

3.2 Sample and Participants

The target population included instructors and master's students enrolled in teacher-psychologist training programs at universities in Kazakhstan. According to the Ministry of Education and Science of the Republic of Kazakhstan, in 2024 such programs were offered at 43 universities, with a total of approximately 1,850 instructors.

The minimum sample size was calculated using Steven Thompson's formula (Thompson, 2012):

$$n = \frac{N \times p(1-p)}{(N-1) \times (\frac{d^2}{z^2}) + p(1-p)}$$

Where: N = 1850, p = 0.5, d = 0.05, z = 1.96

The calculated minimum sample size was 318 respondents.

The questionnaire was distributed via [platform/method]. A total of 342 completed responses were received, of which 312 were deemed valid (response rate 73.8%).

Inclusion criteria:

- Teaching experience in teacher-psychologist training programs (at least 1 year)
- Experience using the case method in the

educational process
- Familiarity with generative AI

The demographic profile of participants is presented in Table 1.

Table 1: Demographic Characteristics of The Sample (N=312).

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	94	30.1
	Female	218	69.9
Age	25-35 years	118	37.8
	36-45 years	112	35.9
	46-55 years	63	20.2
	56+ years	19	6.1
Position	Professor	15	4.8
	Associate Professor	31	9.9
	Senior Lecturer	96	30.8
	Lecturer	43	13.8
	Graduate Student	127	40.7
Teaching Experience	Up to 5 years	102	32.7
	6-10 years	87	27.9
	11-20 years	91	29.2
	Более 20 years	32	10.2
GAI Usage Experience	Never used	53	17.0
	Less than 6 months	128	41.0
	6-12 months	96	30.8
	More than 1 year	35	11.2

3.3 Measurement Instruments

A structured questionnaire was developed for data collection, including the following sections:

3.3.1 Use of Generative AI (8 Items)

This scale measured the frequency, diversity, and systematic use of GAI in the development of educational case studies. Example items include:
"I regularly use GAI to generate case study ideas."
"I use GAI to create character dialogues in case studies."
"I use GAI to develop questions for case studies."
Responses were recorded on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

3.3.2. Quality Of Educational Case Studies (5 Dimensions, 19 Items)

Based on the SERVQUAL model developed by Zeithaml et al. (1996) and the specifics of educational case studies, five dimensions were identified. The first dimension is Realism, consisting of four items that emphasize alignment with actual professional practice. The second dimension, Complexity, includes four items that highlight the presence of multiple factors and interrelationships. The third dimension is Relevance, which corresponds with current educational challenges and encompasses four items.

The fourth dimension, Methodological rigor, focuses on clarity of objectives and methodological guidance, also consisting of four items. Finally, the fifth dimension is Provocativeness, which comprises three items that assess the ability to stimulate critical thinking.

3.3.3. Digital Competence (6 items) measured the level of proficiency in digital technologies based on the DigCompEdu model (Caena & Redecker, 2019), adapted to the context of GAI use.

3.3.4. Teacher Satisfaction (5 items) assessed overall satisfaction with the process and outcomes of case development and willingness to continue using GAI. All scales demonstrated acceptable internal consistency during pilot testing, with Cronbach's α ranging from 0.81 to 0.93.

3.4. Data Collection Procedure involved administering the questionnaire electronically via Google Forms, adhering to ethical requirements. Participation was voluntary and anonymous, with an average completion time of 16 minutes.

3.5. Data Analysis Methods were conducted using Smart PLS 4.0 with partial least squares structural equation modeling (PLS-SEM). PLS-SEM was selected for its suitability for exploratory research models, effectiveness with relatively small sample sizes, lack of requirement for normally distributed

data, and ability to test complex models. The analysis included two stages:

Stage 1 focused on the Measurement Model, assessing indicator reliability (factor loadings > 0.70), internal consistency (Cronbach's α and composite reliability > 0.70), convergent validity (AVE > 0.50), and discriminant validity (Fornell-Larcker criterion, HTMT). Stage 2 involved the Structural Model assessment, evaluating coefficients of determination (R^2), effect sizes (f^2), and significance of path coefficients through bootstrapping with 5,000 subsamples.

3.6. Control of Common Method Bias employed both procedural and statistical measures to minimize potential bias.

Procedural measures included ensuring anonymity, separating variables within the questionnaire, and using different types of scales. Statistical measures involved Harman's single-factor test, showing a variance of the first factor at 36.2% (< 50%), and assessing VIF in the inner model, where all values were < 3.3. Results indicated no critical levels of common method bias.

4. RESULTS

4.1 Descriptive Statistics

Table 2 presents the means, standard deviations, and correlations among the main constructs.

Table 2: Descriptive Statistics and Correlations (N=312).

Construct	M	SD	1	2	3	4
1. GAI Usage	3,38	0,92	-			
2. Case Quality	3,84	0,76	0,731**	-		
3. Digital Competence	3,59	0,84	0,638**	0,702**	-	
4. Teacher Satisfaction	3,96	0,81	0,609**	0,718**	0,627**	-

Note: M = Mean; SD = Standard Deviation; ** P < 0.01

The results indicate that all variables exhibit average to above-average levels. Teacher satisfaction received the highest rating (M = 3.96).

All correlations are statistically significant and of moderate strength.

4.2 Assessment Of The Measurement Model

The measurement model was evaluated based on reliability and validity criteria. The results are presented in Table 3.

Table 3: Results Of The Measurement Model Assessment.

Construct	Number of Indicators	Cronbach's α	Composite Reliability (ρc)	AVE	Result
GAI Usage	7	0.891	0.915	0.643	Acceptable
Realism	4	0.863	0.907	0.710	Acceptable
Complexity	4	0.854	0.901	0.696	Acceptable
Relevance	4	0.839	0.893	0.677	Acceptable
Methodological Rigor	4	0.878	0.916	0.733	Acceptable
Provocativeness	3	0.812	0.888	0.727	Acceptable
Case Quality (Second-order)	5	0.941	0.952	0.795	High
Digital Competence	6	0.897	0.922	0.664	Acceptable
Teacher Satisfaction	5	0.886	0.917	0.688	Acceptable

All constructs demonstrated Cronbach's α and composite reliability values above 0.70, indicating high internal consistency.

AVE for all constructs exceeded 0.50, confirming convergent validity. Indicator loadings ranged from 0.741 to 0.928.

One indicator was removed due to a low factor loading (0.623).

Table 4: Discriminant Validity (Fornell-Larcker Criterion).

Construct	1	2	3	4
1. GAI Usage	0,802			
2. Case Quality	0,731	0,892		
3. Digital Competence	0,638	0,702	0,815	
4. Удовуearsворенность	0,609	0,718	0,627	0,830

Note: Diagonal Values (In Bold) Represent The Square Root Of AVE.

The HTMT criterion showed values below 0.85, confirming the discriminant validity of the model.

4.3. Assessment Of The Structural Model

After confirming reliability and validity, the structural model was assessed. The results are presented in Figure 1 and Table 5.

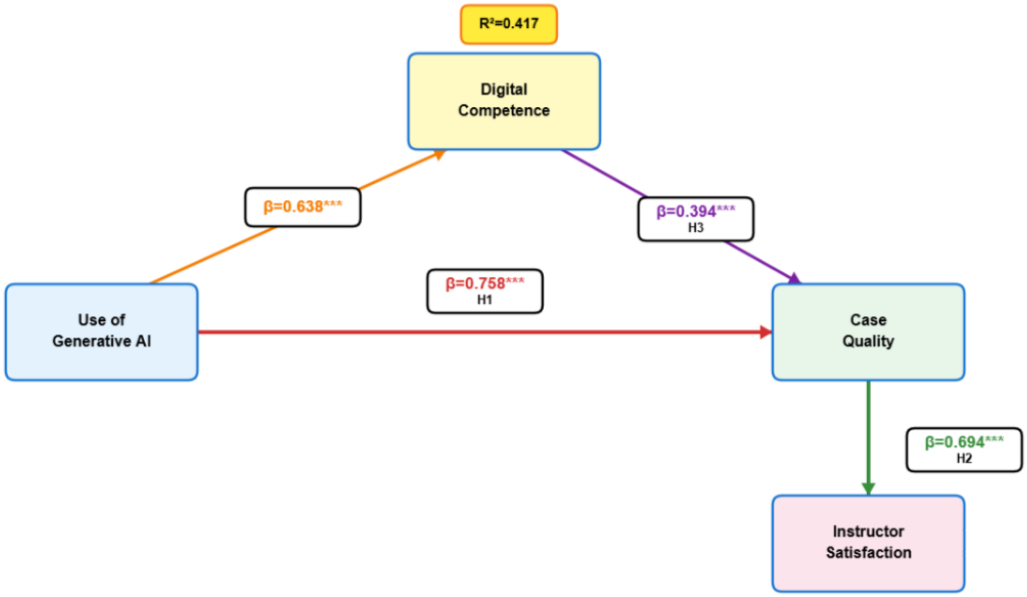

Figure 1: Structural Modeling Results.

Table 5: Hypothesis Testing Results.

Hypothesis	Path	β	SE	t-value	p-value	f²	Decision
H1	GAI Usage → Case Quality	0.758	0.041	18.463	< 0.001	0.927	Поддержана
H2	Case Quality → Teacher Satisfaction	0.694	0.046	15.087	< 0.001	0.651	Поддержана
H3	Digital Competence → Case Quality	0.394	0.049	8.041	< 0.001	0.258	Поддержана
-	GAI Usage → Digital Competence	0.638	0.045	14.178	< 0.001	0.658	-

The study's findings were analyzed using coefficients of determination (R^2) and effect sizes (f^2). The coefficients of determination indicated a high level of case quality with an R^2 of 0.697, a moderately high level of satisfaction with an R^2 of 0.589, and a moderate level of digital competence with an R^2 of 0.417. In terms of effect sizes, the use of GAI had a large effect on case quality with an f^2 of 0.927, and case quality also significantly influenced satisfaction with an f^2 of 0.651, both indicating large effects. Meanwhile, the effect of digital competence on case quality was medium, with an f^2 of 0.258. Importantly, all hypotheses (H1, H2, H3) were statistically supported at $p < 0.001$.

4.4. Mediation Effect Analysis

To test H4, direct, indirect, and total effects were analyzed (Table 6).

*Table 6: Mediation Analysis: Role Of Digital Competence***

Effect Type	Path	Coefficient	SE	t-value	p-value	95% CI
Direct Effect	GAI Usage → Case Quality	0.758	0.041	18.463	< 0.001	[0.678; 0.838]
Indirect Effect	GAI Usage → DC → Case Quality	0.251	0.036	6.972	< 0.001	[0.181; 0.321]
Total Effect	GAI Usage → Case Quality	1.009	0.019	53.105	< 0.001	[0.972; 1.046]
VAF (Variance Accounted For)		24.9%				

Note: *DC = Digital Competence; CI = Confidence Interval

The results reveal that the direct effect is significant, with a standardized path coefficient (β) of 0.758 and a p-value of less than 0.001. Additionally, the indirect effect is also significant, showing a β of 0.251, with the same level of statistical significance ($p < 0.001$). The Variance Accounted For (VAF) value of

24.9% suggests partial mediation. Therefore, Hypothesis H4 is supported, indicating that digital competence partially mediates the relationship between GAI use and case quality.

4.5. Additional Analysis: Barriers To GAI Implementatio

Analysis of 238 detailed responses to the open-ended question identified the main barriers (Figure 2).

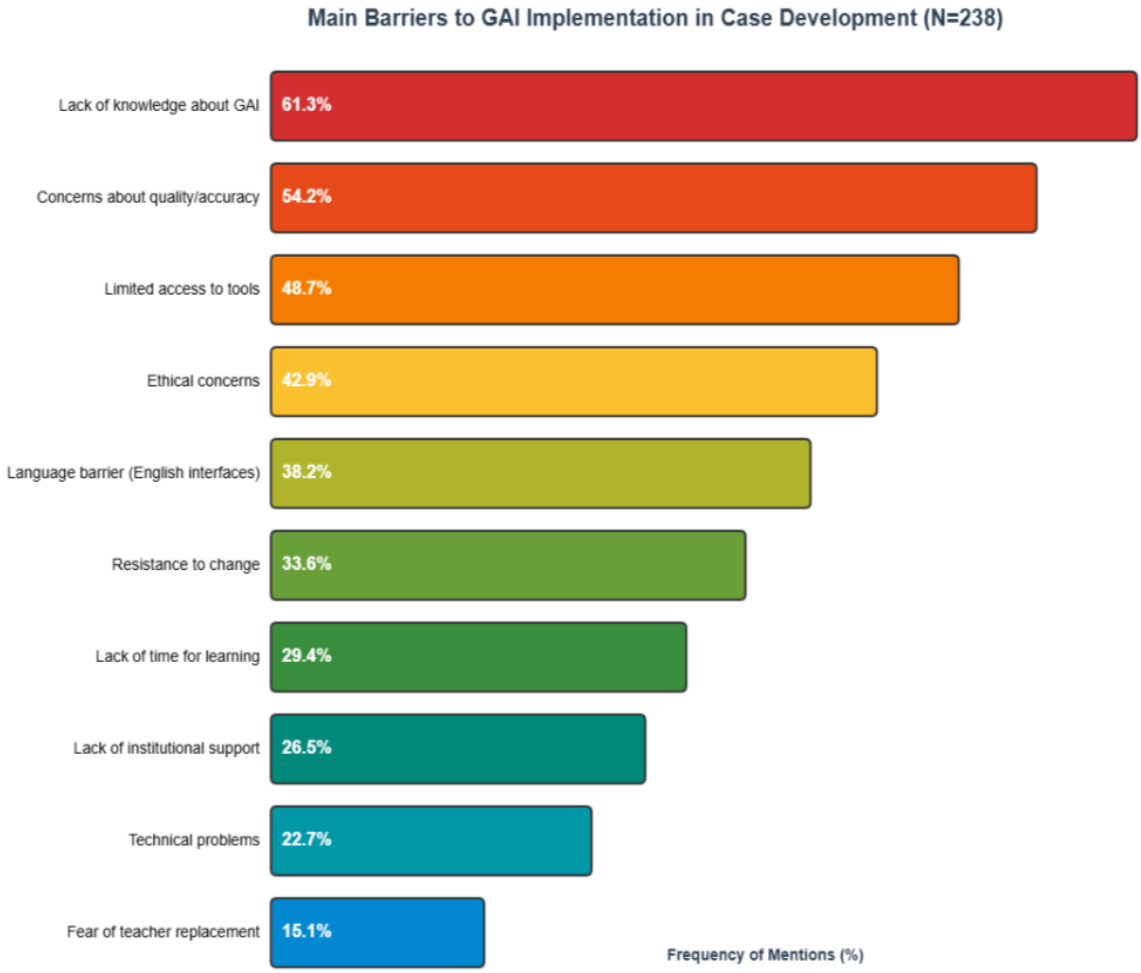

Figure 2: Major Barriers To GAI Use (N=238).

The most significant barriers were lack of knowledge (61.3%) and concerns about quality (54.2%). It is noteworthy that a high proportion reported language barriers (38.2%), which is specific to the Kazakhstani context.

4.6. Comparative Analysis: With GAI Vs. Without GAI

A total of 206 respondents had experience developing cases using both approaches.

A comparative analysis was conducted for this subsample (Table 7).

Table 7: Comparison Of Case Characteristics (N=206).

Characteristic	Without GAI (M±SD)	With GAI (M±SD)	t-value	p-value	Difference (%)
Development Time (hours)	19.2±7.1	6.3±3.1	21.734	< 0.001	-67.2%
Realism (1-5)	3.5±0.9	4.2±0.6	-8.129	< 0.001	+20.0%
Complexity (1-5)	3.3±0.9	4.1±0.7	-8.516	< 0.001	+24.2%
Relevance (1-5)	3.4±0.8	4.3±0.6	-11.094	< 0.001	+26.5%
Methodological Rigor (1-5)	3.7±0.8	3.9±0.7	-2.163	0.032	+5.4%
Provocativeness (1-5)	3.6±0.9	3.8±0.7	-1.847	0.066	+5.6%
Scenario Diversity (count)	2.3±1.3	6.2±2.5	-18.942	< 0.001	+169.6%

The most striking results include a 67.2% reduction in development time (from 19.2 to 6.3 hours) and a

169.6% increase in scenario diversity.

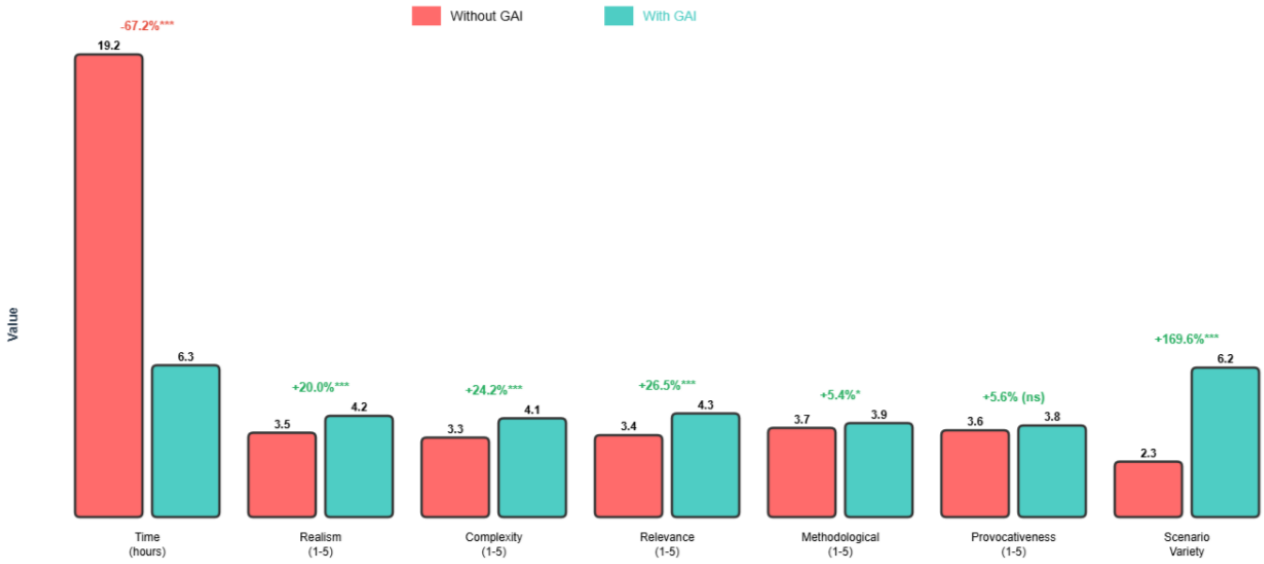

Figure 3: Comparative Analysis Of Case Characteristics Developed Using GAI And The Traditional Method (N=206).

A visual representation of the comparative analysis of case characteristics is shown in Figure 3. As illustrated, the most notable result is the reduction in development time: GAI use decreases time by 67.2% (from 19.2 to 6.3 hours on average, $p < 0.001$). Scenario diversity also increased significantly (+169.6%, $p < 0.001$), which is critical for ensuring variability in learning. Statistically significant improvements were observed for realism (+20.0%, $p < 0.001$), complexity (+24.2%, $p < 0.001$), and relevance (+26.5%, $p < 0.001$). Interestingly, methodological rigor showed smaller differences (+5.4%, $p < 0.05$), and provocativeness (+5.6%) differences were not statistically significant, indicating the need for pedagogical refinement of GAI-generated cases by instructors.

4.7. Group DifferencesA multi-group analysis (PLS-MGA) for groups with different levels of digital competence is presented in Figure 4.

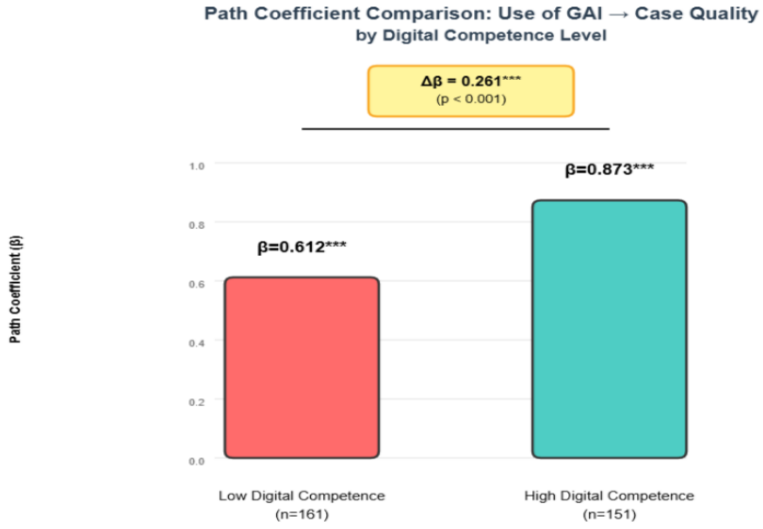

Figure 4: Comparison Of Path Coefficients for Groups.

The results indicate a significant difference in the effect of GAI use based on instructors' digital competence, with a change in the standardized path coefficient (Δβ) of 0.261 and a p-value of less than 0.001. Specifically, the effect of GAI use is notably stronger for instructors with high digital competence, showing a β of 0.873, as opposed to the low-competence group, which has a β of 0.612. This difference is statistically significant, underscoring that higher digital competence enhances the impact

of GAI use among instructors.

5. DISCUSSION

5.1. Interpretation Of Results

The study provides compelling empirical evidence for the effectiveness of generative artificial intelligence in developing educational case studies for teacher-psychologist training within the context of higher education in Kazakhstan.

Hypothesis H1, regarding the positive impact of GAI use on case quality, received strong support ($\beta = 0.758$, $p < 0.001$, $f^2 = 0.927$). This indicates that GAI tools can generate high-quality cases. The 67% reduction in development time while simultaneously improving quality addresses a key challenge for instructors—the lack of time to create quality educational materials—aligning with findings by Kasneci et al. (2023) and Chan et al. (2023). Improvements were most pronounced in realism, complexity, and relevance—dimensions that require extensive knowledge of current educational practice. GAI, trained on vast text corpora, demonstrates an advantage in generating detailed scenarios, supporting Cotton et al.'s (2024) conclusions on GAI's potential for educational content creation.

Hypothesis H2, regarding the effect of case quality on teacher satisfaction, was also strongly supported ($\beta = 0.694$, $p < 0.001$). High-quality cases facilitate classroom delivery and contribute to achieving educational objectives, enhancing professional well-being in line with professional satisfaction theory (Holmes & Poultney, 2021).

Hypothesis H3, concerning the positive influence of digital competence, was confirmed ($\beta = 0.394$, $p < 0.001$). This critical finding indicates that access to GAI tools alone is insufficient without competencies for formulating effective prompts and critically evaluating outputs, consistent with Trust et al. (2023) and Rudolph et al. (2023). Multi-group analysis further confirmed that the effect of GAI use is 42.6% stronger for instructors with high digital competence, which has important implications for Kazakhstan's educational policy under the "Digital Kazakhstan" initiative.

Hypothesis H4 on partial mediation was supported (VAF = 24.9%). GAI use exerts both direct and indirect effects through the development of digital competence. Working with GAI facilitates teacher learning, aligning with the "learning by doing" concept (Cattaneo et al., 2022).

5.2. Context Of Kazakhstan

The findings of the study are particularly significant within the Kazakhstani context, where a considerable number of respondents identified language barriers (38.2%) and limited access to tools (48.7%) as major obstacles to digitalization. These challenges underscore the urgent need for several initiatives: firstly, the development of Kazakh- and Russian-language GAI interfaces to enhance accessibility; secondly, ensuring institutional access to GAI platforms; and thirdly, implementing targeted programs aimed at improving teachers' digital literacy. By aligning these efforts with the State Program for the Development of Education and Science of the Republic of Kazakhstan (2020–2025) and the "Digital Kazakhstan" initiative, the integration of GAI into education can play a pivotal role in enhancing the competitiveness of higher education in Kazakhstan.

6. CONTRIBUTION AND PRACTICAL SIGNIFICANCE

6.1 Scientific Contribution

This study marks the first large-scale empirical evaluation of generative AI in educational case development within the Central Asian context. The key contributions of this research include the empirical validation of GAI's effectiveness in producing educational content in a developing educational setting, providing quantitative evidence to support this claim. Additionally, the study has developed and validated a comprehensive model that connects technology use, digital competence, educational product quality, and satisfaction. It also enhances our understanding of mediation mechanisms by identifying the role of digital competence as a mediator in this relationship. Furthermore, the research has produced valuable methodological tools, including a validated questionnaire designed to assess the quality of educational case studies.

6.2 Practical Recommendations

For program administrators, it is essential to take several actions to facilitate the integration of GAI into educational settings. First, institutions should create the necessary conditions for GAI use, which includes ensuring access and developing ethical guidelines for its application. Second, the systematic creation of a case library should be organized to enable inter-university sharing of resources. Lastly, language adaptation should be prioritized, focusing on bilingual solutions (Kazakh/Russian) or training staff to effectively use English-language platforms. For instructors, there are key areas to focus on to enhance their effectiveness in using GAI. They should develop prompt-engineering skills to master

techniques for effective interaction with GAI tools.

Additionally, instructors need to establish critical evaluation methods, such as developing checklists to assess the quality of GAI-generated content. Finally, it is important for instructors to adapt pedagogically, recognizing GAI as a tool that requires ongoing professional refinement. For education policymakers, there are crucial steps to be taken to support the integration of GAI. First, the development of national regulatory guidelines for GAI use in education is essential to ensure consistent and effective implementation. Policymakers should also allocate funding for licenses, training, and research to facilitate the integration process. Additionally, efforts must be made to ensure equitable access to GAI resources, preventing digital inequality across different regions.

6.3 Implementation Recommendations

Phase 1: Preparation (1–2 Months)

During this initial phase, the focus will be on assessing faculty readiness for GAI integration, selecting an appropriate GAI platform, and ensuring necessary access. Additionally, ethical guidelines will be developed to provide a framework for responsible use. A pioneer group of instructors will be formed to lead the initiative.

Phase 2: Pilot (3–4 Months)

The second phase involves training the pioneer group, who will then collaborate to develop pilot cases that include quality assessments. These pilot cases will be tested in the educational process, and best practices will be documented to inform future efforts.

Phase 3: Scaling (5–8 Months)

In this scaling phase, a wider group of instructors will be trained to expand the initiative's reach. A case repository will be created to store and share developed cases, and peer learning opportunities will be organized to foster collaboration. The goal is to integrate GAI into existing curricula.

Phase 4: Institutionalization (9–12 Months)

The final phase focuses on institutionalizing GAI within the educational framework. This includes incorporating GAI use into policies and procedures, conducting regular assessments to evaluate effectiveness, and supporting continuous professional development for instructors to ensure ongoing improvement and adaptation.

7. CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH DIRECTIONS

7.1 Key Conclusions

This study provides compelling evidence that generative artificial intelligence (GAI) is a transformative tool for the development of educational case studies. The main conclusions highlight several key findings: Firstly, the use of GAI significantly enhances the quality of educational cases in terms of realism, complexity, and relevance, while simultaneously reducing development time by 67%. Secondly, high-quality cases contribute to increased teacher satisfaction, fostering a positive cycle of professional development. Additionally, digital competence is identified as a critical moderator and mediator for effective GAI use. Importantly, the study emphasizes that GAI complements rather than replaces the instructor's role, as it can manage time-consuming tasks, thereby allowing educators to concentrate on pedagogical design. However, it also highlights Kazakhstan-specific barriers, particularly concerning language obstacles and limited access to tools, which may hinder the effective implementation of GAI in the educational context.

7.2 Study Limitations

Interpretation of the results should consider the following limitations: the research design, as the cross-sectional nature does not allow definitive causal inferences; therefore, longitudinal studies are needed. Additionally, data were collected via self-report, introducing potential systematic bias. Although 312 instructors and graduate students were included, the sample may not be fully representative of all regions in Kazakhstan. Furthermore, the study was conducted during the early adoption phase of GAI (2024–2025). It's also important to note that the focus was on case quality, and direct impacts on student learning outcomes were not measured. Lastly, most respondents used ChatGPT; thus, experience with other platforms was limited.

7.3 Future Research Directions

Longitudinal studies should be conducted to track instructor competency development over 2–3 years and examine the evolution of GAI usage practices. In terms of assessment of student outcomes, researchers could compare learning outcomes using GAI-generated cases versus traditional cases and measure the development of professional competencies. Additionally, comparative platform studies can systematically compare the effectiveness of different GAI tools and analyze cost-effectiveness ratios.

Experimental designs, including randomized controlled trials, should be utilized, alongside objective quality assessments through independent expert evaluation. Qualitative methods, such as in-depth interviews on practice transformation and ethnographic studies of interactions with GAI, could provide valuable insights. Moreover, cross-country comparisons should be carried out with comparative studies in Central Asian countries, focusing on the analysis of cultural and language factors. Finally, the development of specialized tools such as Kazakh- and Russian-language GAI assistants for education and decision support systems for instructors should be prioritized.

7.4 Final Remarks

Generative artificial intelligence opens a new era in educational content development, offering unprecedented opportunities to create diverse, high-quality, and relevant learning materials. In the context of Kazakhstan, where higher education is undergoing rapid digitalization, GAI can be a powerful catalyst for enhancing educational quality and the competitiveness of national universities. However, it is important to emphasize that technology is a tool whose effectiveness depends on user competence. Teachers' digital literacy, critical thinking, and pedagogical expertise remain irreplaceable. GAI does not replace the instructor but enhances their capabilities. Effective integration of GAI requires coordinated efforts from all stakeholders: instructors ready to adopt new tools; administrators creating institutional conditions; developers accounting for local context; and policymakers providing regulatory and financial support. Only through such a systemic approach can the full potential of generative AI be realized for the advancement of education in Kazakhstan.

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