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Artificial Intelligence and Gamification Literacy in Higher Education Language Learning: Insights from a Gamified Diagnostic Test

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Abstract. The rapid integration of artificial intelligence (AI) and gamification into higher education has transformed approaches to teaching, learning, and assessment. This study introduced and validated a case-based gamified diagnostic test for language education. The test was designed to measure students' literacy in AI, gamification, and ethical-pedagogical competence in English as a foreign language (EFL) learning contexts. A purposive sample of 227 undergraduate pre-service teachers from Zh.A. Tashenev University (Kazakhstan) participated in the study. A mixed-methods research design was used, integrating quantitative data from gamified diagnostics and qualitative insights from a post-test group discussion with students. The diagnostic instrument, implemented on the Wayground gamified platform, incorporated adaptive scoring, leaderboards, real-time feedback, and progress visualization to foster engagement and reflective learning. Quantitative data included performance indicators (total score, accuracy, completion time), while qualitative reflections captured students' motivation, ethical awareness, and perceptions of usability. Results reveal moderate to high literacy levels across all domains, with the highest scores in ethical awareness ($M = 74.19, SD = 24.01$). ANOVA results confirmed significant differences in accuracy across readiness levels ($F(2,224) = 634.36, p < .001$). Strong correlations among AI literacy, gamification literacy, and ethical awareness ($r = .73-.94, p < .01$) demonstrated the interconnected nature of cognitive, motivational, and ethical dimensions. The findings support the main hypothesis that gamified diagnostics can enhance digital pedagogical competence by combining engagement, ethical reflection, and data-driven learning. The study offers a replicable framework for integrating responsible AI and gamification training in higher education.

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1. Introduction

This study builds on two closely related theoretical foundations – artificial intelligence (AI) literacy and gamification literacy – both viewed as essential components of digital pedagogical competence. According to Ng et al. (2021), AI literacy is made up of cognitive, ethical, and practical aspects. In simple terms, it means knowing how AI works, using it responsibly in education, and understanding how it affects teaching and learning. Chiu (2025) and Johnson (2022) expanded this view through the intelligent-TPACK (I-TPACK) framework, which integrates AI literacy into teachers' technological, pedagogical, and content knowledge. These approaches align with the UNESCO (2025) and OECD (2021) principles of responsible, human-centered AI education.

Gamification literacy, as defined by Glover (2013), Landers (2014), and Lampropoulos and Sidiropoulos (2024), focuses on learners' understanding of game-based elements. There are points, badges, leaderboards, and narrative structures that support motivation, autonomy, and collaboration in learning. Grounded in self-determination theory (SDT), it highlights the pedagogical value of gamification beyond superficial reward systems. Ethical and pedagogical awareness connects these literacies, emphasizing fairness, transparency, and accountability in AI-enhanced education (Floridi & Cows, 2019; Mahmood & Afzaal, 2025). Together, these frameworks form the basis of the diagnostic gamified approach used in this study, which integrates AI literacy, gamification literacy, and ethical–pedagogical competence into a unified interactive model.

The integration of AI and gamification is reshaping higher education, especially in language learning. Recent advances—such as AI-driven writing assistants (Kondoro & Nkwabi, 2025), adaptive speaking evaluators (Litman & Pan, 2002), and game-based learning platforms (Kütüklü, 2025)—show how these tools can improve both student engagement and instructional design. In other fields, such as cybersecurity education, AI has already transformed traditional classrooms into adaptive, data-driven environments that provide real-time feedback, personalized learning paths, and intelligent assessment (Mahmood & Afzaal, 2025).

As universities increasingly adopt emerging technologies, it becomes essential to understand how learners interact with AI and gamified tools. This knowledge is important not only for national education systems but also for the global movement toward digital transformation (Acuna et al., 2024). From this cross-disciplinary and cross-cultural perspective, exploring AI and gamification literacy among future educators gains particular relevance. However, students' ability to use AI (O'Dea et al., 2024) and gamification for teaching and learning remains underexplored. While many studies examine teachers' perceptions or system design, there is little empirical evidence on how pre-service teachers and language learners actually use, evaluate, and integrate AI-supported tools (Panda, 2024). As AI-based gamification becomes more adaptive and personalized, ethical issues

such as fairness, transparency, and data privacy also need to be addressed to ensure responsible innovation in education (Mahmood & Afzaal, 2025).

To examine these competencies, this study developed a case-based diagnostic test with five scenarios that reflect real-world challenges in AI-integrated pedagogy (Schlick, 2024). The cases include examples such as AI-assisted writing, automated feedback analysis, ethical dilemmas in AI-based assessment, and gamified course design. This approach allows for the evaluation of students' cognitive, ethical, and practical understanding of AI and gamification. Drawing on international models of evidence-based innovation, the test design combines global and local perspectives on digital pedagogy. Beyond assessing knowledge, its case-driven structure encourages critical reflection, offering a meaningful contribution to current research on AI and gamification literacy.

This study addresses existing gaps by introducing a gamified, case-based diagnostic tool that measures students' literacy in AI and gamification within higher education language learning. The platform integrates adaptive challenge generation, real-time scoring, leaderboards, and instant feedback to make assessment interactive and engaging. By linking pedagogical motivation with AI-driven adaptivity, the research contributes to AI literacy studies through an integrated ethical, cognitive, and motivational framework. It also provides insights that can inform international educational contexts and support global digital competence in AI-enhanced language education.

By operationalizing these constructs through a case-based diagnostic test, the study links theoretical competence frameworks with real-time behavioral and engagement analytics, enabling a holistic assessment of students' cognitive, motivational, and ethical understanding of AI and gamification in language education. While earlier studies have addressed either AI literacy (O'Dea et al., 2024; Panda, 2024) or gamification literacy (Glover, 2013; Kütüklü, 2025) in isolation, and others have discussed ethical aspects of AI in education (Mahmood & Afzaal, 2025), few have attempted to empirically integrate these domains within a single diagnostic framework.

This study, therefore, introduces a case-based, gamified diagnostic test that unites cognitive, motivational, and ethical dimensions of AI and gamification literacy. By linking scenario-based assessment with real-time engagement analytics, it offers a novel methodological contribution to the measurement and development of digital pedagogical competence. In this context, the study aims to explore students' competence and awareness in using AI and gamification pedagogically and to identify how gamified assessment can promote engagement and digital innovation. It is hypothesized that an interactive, case-based gamified diagnostic test will lead to higher levels of AI and gamification literacy among students than traditional assessment formats, as it combines game-based motivation, automated feedback, and immersion in digital learning environments (H_1). The null hypothesis (H_0) states that the use of a gamified diagnostic test does not produce a significant difference in students' AI and gamification literacy compared to conventional evaluation methods.

2. Literature Review

2.1 Conceptualizing AI Literacy in Education

Artificial intelligence literacy extends beyond digital literacy by including a cognitive, ethical, and reflective understanding of intelligent systems (Ng et al., 2021). Ng et al. (2021) identified four interrelated dimensions: knowing, applying, evaluating, and acting ethically – shifting focus from functional use to critical engagement with AI. Later works (Chiu, 2025; Johnson, 2022) emphasized that AI literacy involves understanding how AI systems learn and make decisions. Chiu's I-TPACK (2025) framework integrates AI literacy into teachers' technological and pedagogical knowledge, aligning with the UNESCO (2025) and OECD (2021) goals for human-centered, responsible AI education.

Empirical studies confirm persistent gaps between awareness and practice. Kalniņa et al. (2024) found limited AI adoption among Latvian pre-service teachers despite recognizing its potential. Similarly, O'Dea et al. (2024) noted that many students use AI daily but lack ethical and pedagogical understanding. In language education, AI tools such as writing assistants and speech evaluators (Kondoro & Nkwabi, 2025; Litman & Pan, 2002) enhance learning but are often used superficially (Alharbi, 2023). Overall, AI literacy represents a pedagogical meta-competence combining technical, critical, and ethical dimensions (Chiu, 2025; Ng et al., 2021). Assessing this literacy requires tools that capture both conceptual knowledge and ethical decision-making in authentic contexts.

2.2 Gamification and Motivation in Language Learning

Gamification, rooted in SDT (Buckler, 2015), enhances learning by satisfying needs for autonomy, competence, and relatedness. When well designed, it promotes intrinsic motivation (Landers, 2014). While points, badges, and leaderboards (PBL) drive persistence (Peralta, 2019), excessive focus on rewards may hinder deep engagement (Barik et al., 2016). Balanced designs combine feedback, narrative, and collaboration. Meta-analyses have confirmed the effectiveness of gamification. Lampropoulos and Sidiropoulos (2024) reported higher success and retention rates in gamified courses, while Kütüklü (2025) found enhanced persistence in blended EFL classes. Cooperative gamification increases social relatedness (Dindar et al., 2021) and interaction (Creighton & Szymkowiak, 2014).

Recent evidence from Kazakhstan also supports the pedagogical value of technology-enhanced environments. Antontseva et al. (2025) demonstrated that integrating digital speech simulators into foreign language instruction significantly improved students' communicative competence, particularly in sociocultural and cognitive domains. Furthermore, teachers' attitudes strongly influence adoption. In addition, perceived usefulness and social influence predict intention to use gamification (Asiri, 2019), although skepticism persists in terms of superficial engagement (González Vallejo, 2024). Overall, gamification serves as a pedagogical innovation that promotes collaboration and reflective motivation. In this study, gamified elements (feedback, leaderboards, reactions) are used diagnostically – to support engagement and insight, not entertainment.

2.3 Integration of AI and Gamification into Higher Education

The combination of AI and gamification creates adaptive, engaging, and personalized learning environments (Kumar Minz & Balani, 2023). Artificial intelligence personalizes learning through data analytics, while gamification sustains motivation through challenge and reward. AI-driven systems such as adaptive EFL platforms (Liu, 2025) and gamified scaffolds (Jiang et al., 2025) improve performance and engagement. Learning analytics tools (Sajja et al., 2025; Yan et al., 2024) visualize progress and foster reflection. However, ethical and human-centered designs remain critical for maintaining transparency and autonomy (Alfredo et al., 2024). Together, these approaches support diagnostic gamified learning, where AI dynamically adjusts tasks, while gamification sustains motivation—enhancing literacy, reflection, and self-regulation.

2.4 Ethical and Pedagogical Dimensions of AI Use

Artificial intelligence in education raises ethical issues of fairness, transparency, and bias (Mahmood & Afzaal, 2025). Floridi and Cowls (2019) proposed five guiding principles—beneficence, non-maleficence, autonomy, justice, and explicability—vital for responsible AI use in learning contexts. Explicability and accountability are essential for trust in AI-based feedback systems. Teaching ethical reasoning through active methods—case studies, simulations, and gamified dilemmas—builds reflective competence (Wiese et al., 2025). Abisheva et al. (2024) identified six domains of ethical competence for EFL teachers, where ethical AI use remains weakest. Teacher competence mediates the effect of AI tools on student outcomes (Alwakid et al., 2025). Thus, ethical literacy is not auxiliary but central to pedagogical digital competence, ensuring that AI enhances rather than replaces human judgment.

2.5 Diagnostic Assessment and Digital Measurement

Modern assessment shifts from static testing to dynamic, data-driven, and formative evaluation. Diagnostic assessment integrates learning and measurement into continuous feedback cycles (Schlick, 2024; Welsandt et al., 2024). Authentic, case-based diagnostics assess reasoning and decision-making, aligning with real-world contexts (Kusdiyanti et al., 2024; Mejías-Acosta et al., 2024). Gamified testing tools such as Quizizz combine engagement with feedback, turning assessment into learning (Sholihah & Miranty, 2025). Artificial intelligence enhances this process through adaptive scoring and analytics, supporting self-regulation and personalized feedback. In language education, AI-driven gamified diagnostics capture cognitive, behavioral, and affective data, transforming assessment into an interactive, ethically grounded learning experience.

2.6 Research Gaps

Despite growing research on AI and gamification, three major gaps persist. First, there is a limited focus on students, with most studies targeting teachers, leaving student AI literacy underexplored (Abisheva et al., 2024; KangJie et al., 2025). Second, there is a lack of integrated frameworks. Artificial intelligence and gamification literacies are often examined separately (Jiang et al., 2025; Kassenkhan et al., 2025; Liu, 2025). Third, there are few gamified diagnostic models, with existing assessments relying on self-reports and lacking an

interactive, case-based design (Mejías-Acosta et al., 2024; Schlick, 2024). This study addresses these gaps by developing a unified gamified diagnostic model that merges AI literacy, gamification literacy, and ethical-pedagogical competence into one adaptive framework.

3. Methodology

3.1 Research Design

This study employed a quantitative diagnostic design with complementary qualitative feedback to examine students' AI literacy, gamification literacy, and ethical-pedagogical awareness. A case-based gamified diagnostic test, namely Case-Based Test of Pedagogical Readiness for AI and Gamification, was developed and implemented to assess these competencies through authentic scenarios embedded within a gamified online platform (Wayground). The design followed an assessment-as-learning approach, where diagnostic feedback and engagement data served both evaluative and instructional purposes. The platform automatically recorded participants' performance, behavioral interactions, and engagement metrics (e.g., points, total score, leaderboard position, and completion time).

In addition to the quantitative diagnostic data, a brief post-test group reflection was conducted to capture students' perceptions of motivation, usability, ethical awareness, and pedagogical relevance of the gamified assessment. These qualitative insights enriched the interpretation of the quantitative results and provided additional evidence supporting the validity of the assessment-as-learning approach.

3.2 Participants

A total of 227 valid responses were obtained from second- and third-year undergraduate students enrolled in teacher education and language programs at Zh.A. Tashenev University (Shymkent, Republic of Kazakhstan). All participants were pre-service teachers specializing in foreign language (English), mathematics, informatics, chemistry, and biology. As part of their curriculum, all students studied EFL at an average proficiency level of B1 according to the CEFR scale.

Participants were typically between 18 and 20 years old, representing the standard age range for second- and third-year undergraduate students. The sample was predominantly female (approximately 80%), reflecting the demographic profile of teacher education programs in Kazakhstan. A purposive sampling method was employed, as these students were already familiar with the credit-based learning system and the university's assessment structure. First-year students were excluded because they had not yet completed their initial semester, while fourth-year students were excluded due to their engagement in teaching internships and graduation projects.

All participants had prior exposure to digital or blended learning environments, ensuring a basic level of technological competence relevant to the focus of the study on AI and gamification literacy. Data collection took place during the autumn semester of 2025 as part of scheduled coursework. Participation was

voluntary, and all respondents provided informed consent before completing the gamified diagnostic test. Data was collected anonymously and processed in compliance with institutional ethical standards.

3.3 Instrument

3.3.1 Case-based gamified diagnostic test

The diagnostic instrument consisted of five interactive cases designed to assess the cognitive, ethical, and motivational dimensions of AI and gamification literacy. Each case presented an authentic educational scenario involving AI-enhanced learning or gamified assessment, designed to reflect real-life decision-making situations in AI-enhanced pedagogy and to ensure construct validity through alignment with established theoretical frameworks in AI literacy (Ng et al., 2021), gamification (Landers, 2014), and ethical AI education (Floridi & Cows, 2019). The case-based diagnostic test is presented in Appendix 1 and summarized in Table 1.

Table 1: Structure and rationale of the case-based diagnostic test

Case	Focus/ scenario	Target construct	Purpose of measurement	Theoretical/ empirical rationale
No1 AI assistant in a lecture context	Use of AI writing tools in academic language tasks	AI literacy (cognitive- ethical)	To evaluate students' understanding of the pedagogical appropriateness, benefits, and risks of AI-assisted writing	Based on AI literacy dimensions (Ng et al., 2021) and ethical use of AI in education (O'Dea et al., 2024)
No2 Gamification of a course context	Integration of points, badges, and leaderboards in a course design	Gamification literacy (motivational - pedagogical)	To assess students' ability to apply motivational principles (SDT) in educational contexts	Rooted in Landers (2014) and Buckler (2015) on gamification and motivation
No3 AI analysis of student feedback	AI-based text analysis for course evaluations	Ethical- analytical awareness	To measure awareness of algorithmic bias, transparency, and fairness in AI-driven analytics	Linked to Floridi and Cows' (2019) ethical AI framework; Alfredo et al. (2024)
No4 Creating an AI-supported course	Designing adaptive and personalized digital learning experiences	AI & gamification literacy (applied- integrative)	To examine students' ability to integrate AI and gamification tools pedagogically	Informed by Chiu's (2025) I-TPACK framework and Liu's (2025) perspective on adaptive EFL learning
No5 The assessment dilemma	Ethical reasoning about AI-assisted grading	Ethical- pedagogical competence	To elicit critical thinking about fairness, accountability, and data-driven evaluation	Based on Floridi and Cows (2019); Wiese et al. (2025) on ethical AI education

The diagnostic test was implemented on the Wayground platform (formerly Quizizz) in a real-time, teacher-led mode, allowing all participants to progress synchronously. To prioritize reflection over speed, time limits were disabled, and answer order randomization was enabled to minimize predictability. Participants accessed the session via a unique link and six-digit code. Upon entry, they selected an avatar (“Save my Qbit”) and joined the leaderboard, which displayed live rankings throughout the session. The instructor initiated and paced the activity to maintain consistency and fairness among participants. Figure 1 illustrates the main interface elements of the Wayground platform as experienced by participants during the gamified diagnostic assessment.

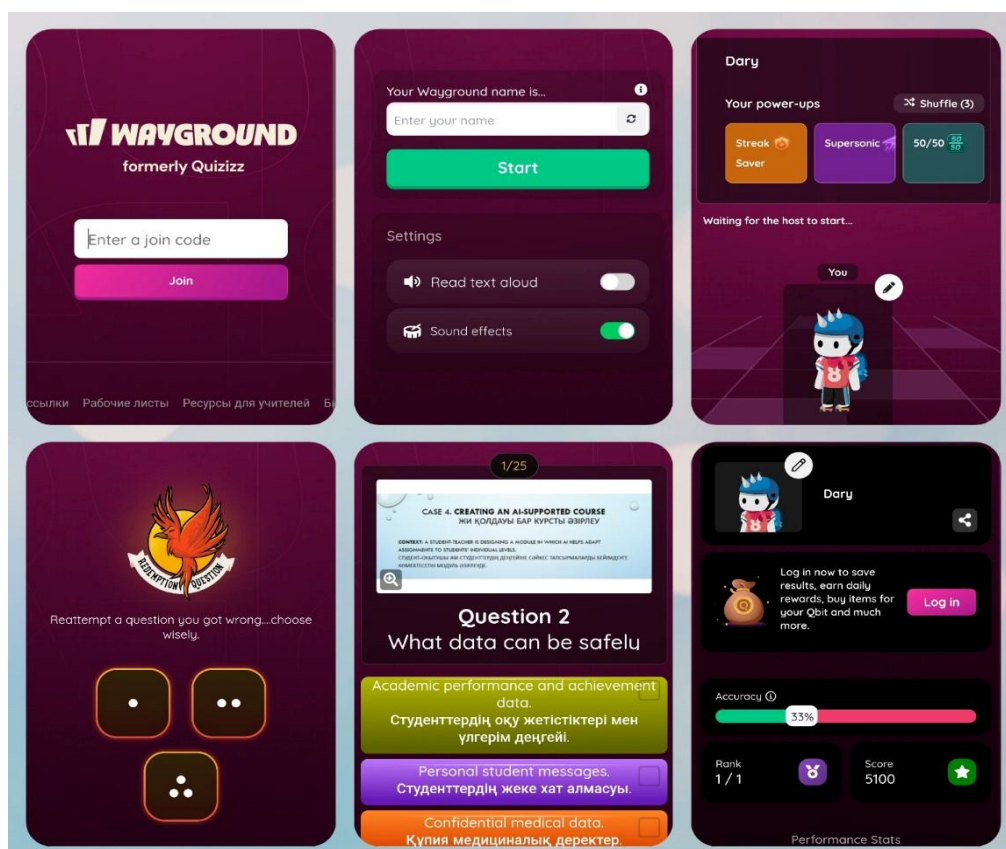


Figure 1: Key interface elements of the Wayground platform (e.g., session entry, activities, quizzes, assessments, and feedback)

The test was implemented on an interactive, gamified digital platform specifically designed to enhance motivation, engagement, and reflective learning. The architecture of the system was aligned with the principles of SDT and game-based learning, ensuring that each feature served a pedagogical purpose rather than being merely decorative.

- **Scoring mechanics (0–3 points per question)**

The point system provided immediate feedback and a sense of competence, allowing students to monitor their progress and gain confidence as they advanced through increasingly complex cases.

- **Leaderboards displaying top performers**

Leaderboards introduced moderate social competition, supporting the relatedness component of SDT by connecting learners through shared performance space. Peer visibility promoted benchmarking, persistence, and self-regulation.

- **Live reactions and real-time feedback**

Real-time feedback (emojis, sound, visual cues) served both motivational and diagnostic functions—reinforcing engagement while guiding learners toward reflective decision-making. This element also fostered ethical awareness by enabling students to see the consequences of their choices in simulated classroom scenarios.

- **Progress visualization and adaptive challenge sequencing**

A progress bar and adaptive pacing maintained autonomy and engagement by providing an optimal level of challenge. Tasks were dynamically adjusted based on prior responses, reducing cognitive overload and enhancing authenticity in measuring behavior.

Collectively, these gamified elements transformed the diagnostic assessment into a feedback-rich, interactive learning environment. They operationalized the assessment-as-learning model by integrating cognitive, motivational, and ethical engagement dimensions while simultaneously generating analyzable behavioral data (accuracy, total score, completion time, and reaction frequency). The Wayground system automatically recorded both performance metrics and behavioral analytics, including total score and accuracy rate (%), completion time (minutes), leaderboard activity, feedback, and reaction use.

To complement system-generated data, participants also provided qualitative reflections through a brief post-assessment discussion and open-ended survey items addressing motivation, usability, and ethical awareness. These reflections were thematically analyzed to triangulate behavioral and perceptual evidence, strengthening the validity of the mixed-methods design.

Figure 2 summarizes the gamification framework embedded in the diagnostic system. Each element, such as points, badges, avatars, live reactions, leaderboards, and adaptive challenge, was intentionally aligned with the assessment-as-learning model. Together, these components created a dynamic environment where engagement data (e.g., accuracy, reaction frequency, leaderboard activity) served as both motivational drivers and empirical indicators of learning behavior. The model therefore demonstrates how gamified mechanics can simultaneously function as instructional tools and diagnostic analytics, bridging performance measurement with active learning.

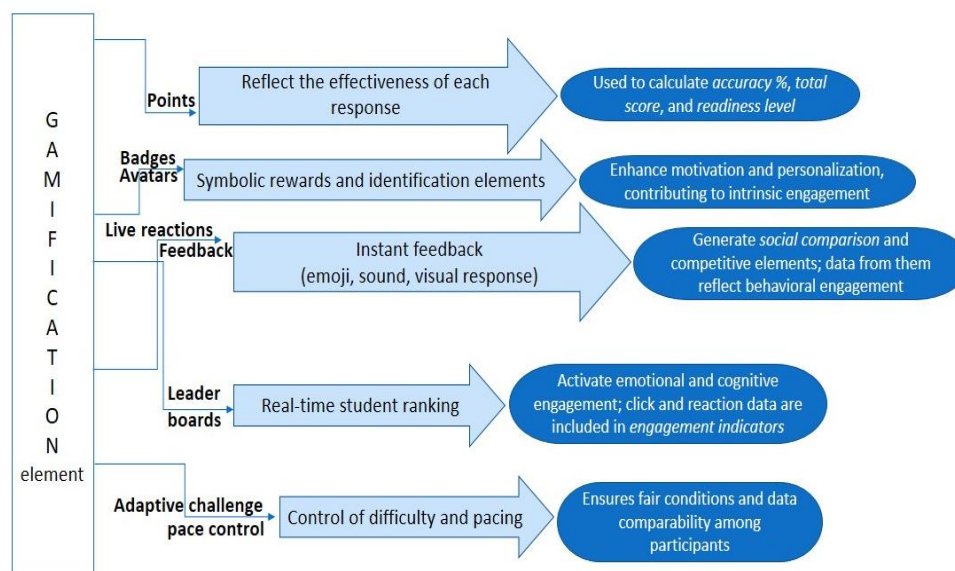


Figure 2: Gamification as a mechanism for enhancing participant engagement in educational research

3.3.2 Post-test reflection survey

In addition to the quantitative diagnostic data, a brief oral reflection was conducted immediately after the gamified test to capture students' perceptions of motivation, usability, ethical awareness, and pedagogical relevance. This qualitative component aimed to complement the quantitative results and deepen understanding of how students experienced the gamified diagnostic process. The reflection included five guiding questions, summarized in Table 2. Students' spontaneous answers were later grouped thematically under five categories and analyzed to identify common perceptions, challenges, and learning effects.

Table 2: Structure and focus of the post-test reflection questions

Question code	Question	Focus	Purpose
Q1	How did the gamified diagnostic test influence your motivation and engagement during the session?	Engagement	To explore students' perceived motivation and interest
Q2	Which parts of the test (cases, feedback, leaderboard, or reactions) helped you learn or reflect on AI and gamification in education?	Reflection	To identify helpful gamified elements for learning
Q3	Did the test make you think about any ethical or fairness issues related to the use of AI in teaching and assessment?	Ethics	To examine awareness of fairness and responsibility

Q4	What difficulties or challenges did you experience during the gamified diagnostic test?	Usability	To reveal challenges or cognitive load issues
Q5	Would you like to use similar AI- and gamification-based assessments in your future learning or teaching practice? Why or why not?	Pedagogical relevance	To assess willingness to adopt such assessments

3.4 Data Collection

The study measured three primary constructs derived from the theoretical framework of AI and gamification literacy. Each construct was operationalized through specific indicators embedded within five diagnostic cases. Students' performance was quantified by the total score (0–74) and supported by brief qualitative reflections integrated within the test.

The diagnostic instrument consisted of 25 multiple-choice items, distributed evenly across the five authentic cases (five items per case). Each question contained four response options. In most items, two answers were correct: selecting both awarded 3 points, while choosing one or an incorrect combination yielded 0 points. An exception was Case 1, Question 4, which had only one correct answer worth 2 points. The maximum attainable score was 74 points, reflecting comprehensive competence across AI literacy, gamification literacy, and ethical-pedagogical awareness.

Short, open-ended reflection prompts followed selected cases, allowing students to justify their choices or comment on ethical or pedagogical implications. These qualitative mini-reflections served as complementary evidence for interpreting diagnostic performance, aligning with the assessment-as-learning approach of the study. All quantitative and behavioral data (scores, accuracy, time on task, reactions, and leaderboard activity) were automatically recorded by the Wayground platform, and 227 participants completed the test synchronously under identical conditions.

The AI literacy index was computed by summing the scores from cases 1, 3, 4, and 5 (Table 3), which together assessed the ability to understand and apply AI tools in teaching, design adaptive courses, and reflect on algorithmic transparency. Gamification literacy was derived from cases 2 and 4, representing knowledge of motivational design and effective integration of gamified elements in pedagogy. Finally, ethical awareness was calculated from cases 3 and 5, capturing students' reflection on fairness, bias, and responsible AI use in education. All scores were converted into a normalized percentage scale (0%–100%) to allow comparison across constructs and participants.

Table 3: Structure of measured constructs within the case-based gamified diagnostic test

Construct	Dimension	Measured indicators	Measurement source
1. AI literacy	Cognitive, ethical, practical	Understanding of AI functions in education; responsible use of AI tools; awareness of algorithmic bias, transparency, and pedagogical integration	Cases 1, 3, 4, 5
2. Gamification literacy	Motivational-pedagogical	Understanding of gamification principles (points, badges, leaderboards); ability to design engaging and pedagogically sound game elements	Cases 2, 4
3. Ethical and pedagogical awareness	Reflective-affective	Ability to identify ethical dilemmas, fairness, privacy issues, and pedagogical implications of AI use in assessment and learning contexts	Cases 3, 5
4. Engagement behavior	Behavioral analytics	Participation level, time on task, feedback interactions, and leaderboard activity during the gamified session	System analytics/ platform logs

Based on the structure of the diagnostic instrument, composite indicators were calculated to represent students' AI literacy, gamification literacy, and ethical awareness. During the session, both **quantitative** and **behavioral** data were automatically recorded by the Wayground platform. This included: total and case-based sub-scores (AI literacy, gamification literacy, ethical awareness); accuracy rate (% of correct answers per participant); completion time (minutes); and leaderboard position, reaction frequency, and feedback interactions as engagement indicators. Extreme outliers in completion time (top 1%-2%) were removed to ensure valid comparisons. For the final dataset (N = 227), performance results and engagement analytics were combined, enabling statistical examination of both learning outcomes and motivational behavior.

The gamified diagnostic system incorporated core game-based mechanics: points, badges, avatars, leaderboards, and live reactions. This approach enhanced motivation and engagement during assessment. *Points* reflected the accuracy of each response and formed the basis for total and readiness scores. *Leaderboards* displayed real-time rankings, promoting light social competition and behavioral engagement. *Badges and avatars* acted as symbolic rewards that strengthened personalization and intrinsic motivation. *Live reactions* (emojis, sounds, animations) provided immediate emotional feedback. These mechanics not only sustained participation but also generated rich behavioral data—such as completion time and reaction frequency—that were later analyzed to evaluate engagement levels and their correlation with literacy measures. Based on

cumulative performance, students were categorized into three readiness levels, integrating quantitative results with qualitative interpretation (Table 4).

Table 4: Scoring interpretation and readiness level descriptors

Readiness level	Score range	Description
Low readiness	0–29	Fragmented understanding; weak ethical awareness
Moderate readiness	30–52	Partial understanding; limited reflection
High readiness	53–74	Comprehensive and ethical integration of AI and gamification concepts

The test combined multiple-choice questions, short, open-ended responses, and scenario-based reflection prompts. Gamified features (points, leaderboards, badges, and total score) were automatically generated by the Wayground platform. Although the platform provided the infrastructure, the diagnostic construct, item design, and scoring criteria were uniquely developed for this research.

3.5 Validity and Reliability

The internal consistency of the diagnostic test was evaluated using Cronbach's alpha. The overall reliability coefficient for the 25-item instrument was $\alpha = 0.870$, indicating a high level of internal consistency and confirming that the test reliably measures AI and gamification literacy as an integrated construct. To ensure content validity, the instrument underwent expert review by five specialists in educational technology and applied linguistics. They evaluated the clarity, relevance, and alignment of each item with the intended constructs – AI literacy, gamification literacy, and ethical-pedagogical awareness. Minor wording adjustments were made based on their feedback to improve precision and consistency. These results indicate that the diagnostic test demonstrates strong reliability and satisfactory content validity, making it an appropriate tool for assessing AI and gamification literacy in higher education language learning contexts.

3.6 Data Analysis

Data was analyzed using both descriptive and inferential statistical methods to evaluate students' literacy levels, readiness, and performance within the gamified diagnostic environment. Descriptive statistics (mean, standard deviation, and minimum and maximum values) were used to summarize the results for each literacy construct. To examine differences among readiness groups, a one-way analysis of variance (ANOVA) with post hoc Tukey test was applied. Pearson's correlation coefficients were calculated to explore relationships among literacy dimensions and engagement indicators such as accuracy and completion time. All statistical procedures were performed using IBM SPSS Statistics 28, with a significance level set at $p < .05$. In addition, a short qualitative analysis of students' post-test reflections was conducted to complement quantitative findings and capture participants' perceptions of the gamified diagnostic experience.

4. Results and Findings

4.1 Distinct Digital Pedagogical Literacy and Readiness Profiles

The diagnostic instrument assessed three interrelated domains of competence: AI literacy, gamification literacy, and ethical awareness. Each construct was operationalized through the case-based diagnostic framework, with normalized percentage scores enabling direct comparison (Table 5).

Table 5: Descriptive statistics for students' AI literacy, gamification literacy, and ethical awareness (N = 227)

Variable	Mean (M)	SD	Min	Max
AI literacy (%)	71.10	22.92	10.17	100.00
Gamification literacy (%)	68.82	24.77	0.00	100.00
Ethical awareness (%)	74.19	24.01	10.00	100.00

Overall, the results indicate moderate to high literacy levels across all domains. Students demonstrated the strongest competence in ethical awareness (M = 74.19, SD = 24.01), reflecting a developed understanding of fairness, bias, and responsible AI use in education. AI literacy (M = 71.10, SD = 22.92) also showed strong results, suggesting confident comprehension of AI principles and their pedagogical applications. However, the variability implies uneven exposure to AI tools across disciplines. Gamification literacy (M = 68.82, SD = 24.77) was slightly lower and showed the greatest variability, indicating that while students recognize gamified elements such as points and leaderboards, fewer understand how to integrate them pedagogically.

Taking together, these findings reveal a balanced but differentiated literacy profile: ethical awareness is more developed than design-oriented gamification competence. This supports the internal coherence of the triadic model, confirming that AI literacy, gamification literacy, and cognitive awareness operate as complementary dimensions of digital pedagogy.

Students' total scores were grouped into three readiness categories: **low (0-29)**, **moderate (30-52)**, and **high (53-74)** (Table 6).

Table 6: Distribution of students across readiness levels (N = 227)

Readiness level	Score range	Number of participants	Percentage
High readiness	53-74	130	57.3%
Moderate readiness	30-52	67	29.5%
Low readiness	0-29	30	13.2%
Total		227	100%

More than half of the participants (57.3%) demonstrated high levels of readiness, indicating a solid integration of AI and gamification principles alongside ethical awareness. These students showed the ability to apply digital tools reflectively and responsibly in pedagogical contexts. Approximately 29.5% of the students

exhibited moderate levels of readiness, showing a partial conceptual understanding but limited critical reflection, suggesting a need for guided practice in applying AI-based and gamified tools to authentic learning scenarios. A smaller group (13.2%) displayed low levels of readiness, with fragmented understanding and minimal awareness of ethical implications. This highlights the necessity of targeted capacity-building programs that foster both conceptual and ethical competencies for effective use of AI in education. Taken together, this distribution reflects a positive but uneven landscape of digital pedagogical readiness, where most students are prepared to engage with AI-enhanced learning environments, yet a notable proportion still requires structured support to achieve full competence.

A one-way ANOVA was performed to determine whether **students' accuracy rates** differed significantly across the three readiness levels (Table 7). The analysis confirmed a **strong main effect** of readiness on accuracy ($F(2,224) = 634.36$, $p < .001$).

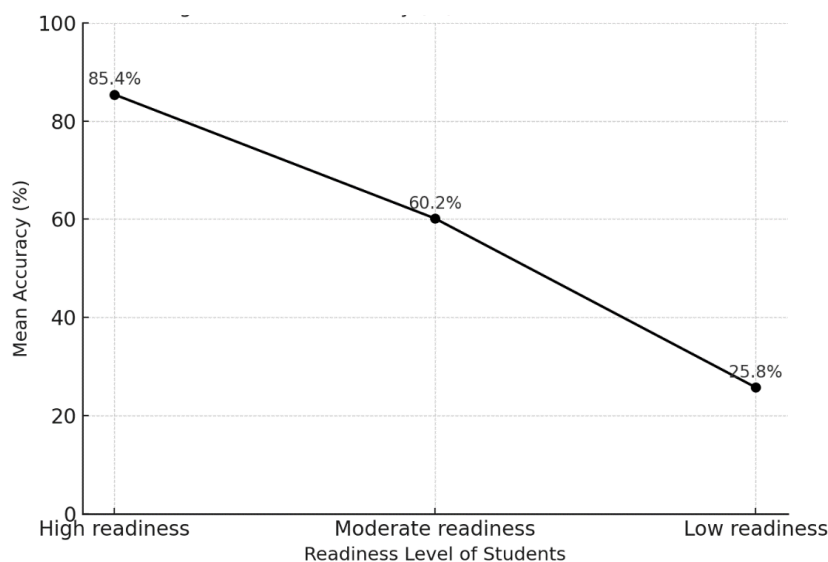
Table 7: One-way ANOVA results

Source	Sum of squares	df	Mean square	F	Sig.
Between groups	95,978.456	2	47,989.228	634.36	.000
Within groups	16,945.553	224	75.650		
Total	112,924.009	226			

Note. The post hoc Tukey HSD test confirmed that all pairwise differences among readiness levels were statistically significant ($p < .001$)

These results indicate that students with higher AI and gamification literacy achieved substantially greater accuracy than those at moderate or low readiness levels. In addition to better performance outcomes, these students also exhibited more strategic engagement, suggesting that their interaction with gamified diagnostic features was both cognitively and motivationally adaptive. This pattern supports the assessment-as-learning perspective, in which diagnostic feedback and gamified interaction contribute to metacognitive growth and sustained motivation. The significant variance between groups further validates the sensitivity of the diagnostic test in distinguishing levels of digital pedagogical competence.

To further illustrate performance differences, mean accuracy scores were analyzed across the three readiness groups (Figure 3). Students with high readiness ($n = 130$) achieved a mean accuracy of 85.39%, those with moderate readiness ($n = 67$) averaged 60.16%, and those with low readiness ($n = 30$) reached only 25.77%. This steady decline in performance clearly demonstrates that students with higher AI and gamification literacy consistently outperform peers with lower readiness, indicating that literacy level is a strong predictor of diagnostic accuracy.



Note: The graph shows a clear downward trend in mean accuracy as readiness decreases

Figure 3: Mean accuracy (%) across readiness levels

The overall pattern provides strong empirical support for the assessment-as-learning framework, where diagnostic gamification enhances both measurement accuracy and active learning engagement.

4.2 Interdependence of AI Literacy, Gamification Literacy, and Ethical Awareness

Pearson correlation coefficients were computed to examine the relationships among AI literacy, gamification literacy, and ethical awareness (Table 8).

Table 8: Correlations among variables (N = 227)

Variable	1	2	3
1. AI literacy	—		
2. Gamification literacy	.830**	—	
3. Ethical awareness	.938**	.727**	—

$p < .01$ (two-tailed)

All correlations were positive and statistically significant, suggesting that the variables develop interdependently. The strongest relationship was observed between AI literacy and ethical awareness ($r = .938, p < .01$), indicating that the ability to understand and apply AI systems is closely connected to ethical reasoning and responsible decision-making in educational contexts. The association between AI literacy and gamification literacy ($r = .830, p < .01$) further implies that students who understand AI concepts also tend to grasp motivational and design principles underlying gamified learning. Meanwhile, the substantial correlation between gamification literacy and ethical awareness ($r = .727, p < .01$) reflects that ethical reflection and motivational design reinforce one another in AI-supported learning environments.

These strong intercorrelations confirm that AI understanding, ethical reasoning, and gamified engagement are not isolated skills but mutually reinforcing components of digital pedagogical competence. Findings support Hypothesis 1 (H₁), which posits that higher literacy in one domain is associated with enhanced competence in the others, demonstrating the integrative nature of digital pedagogical literacy.

Descriptive statistics of **engagement indicators** (Table 9) showed that students demonstrated moderate to high levels of performance and engagement during the gamified diagnostic test.

Table 9: Descriptive results of students' diagnostic performance and engagement

Variable	Min	Max	Mean	SD	Interpretation
Total score	12.00	74.00	51.79	16.48	Moderate-high diagnostic achievement
Accuracy (%)	16	100	70.07	22.35	Consistent cognitive engagement
Total time (min)	1	44	11.51	7.88	Stable behavioral engagement, variable pacing

The total mean score was 51.79 (SD = 16.48) out of 74 possible points, indicating generally strong mastery of AI and gamification concepts. The average accuracy rate reached 70.07% (SD = 22.35), showing that most participants answered correctly in the majority of tasks. The average completion time was 11.5 minutes (SD = 7.88), suggesting active engagement and sustained attention throughout the test. A relatively wide standard deviation in both accuracy and time indicates individual differences in learning strategies and pace – some participants worked quickly and confidently, while others spent more time reflecting on cases.

Building on these findings, a second correlational analysis was conducted to examine how literacy levels relate to performance outcomes and behavioral engagement indicators within the gamified environment. To explore interrelationships between literacy dimensions and engagement indicators, Pearson's correlation coefficients were computed. The analysis included six core variables: AI literacy, gamification literacy, ethical awareness, total diagnostic score, accuracy (%), and total time (min) (Table 10).

All literacy dimensions were strongly and positively correlated with each other:

- AI literacy ↔ Gamification literacy: $r = .83, p < .001$
- AI literacy ↔ Ethical awareness: $r = .94, p < .001$
- Gamification literacy ↔ Ethical awareness: $r = .73, p < .001$

Table 10: Pearson correlations between literacy domains, performance, and engagement indicators (N = 227)

Variable	1	2	3	4	5	6
1. AI literacy	–	.83**	.94**	.98**	.98**	.22**
2. Gamification literacy		–	.73**	.90**	.90**	.18**
3. Ethical awareness			–	.92**	.92**	.22**
4. Total score				–	1.00**	.24**
5. Accuracy (%)					–	.24**
6. Total time (min)						–

Note. $p < .01$ (two-tailed)

Each literacy dimension also demonstrated very high correlations with the total diagnostic score ($r = .90-.98$, $p < .001$), confirming internal coherence of the diagnostic model and consistency of the composite literacy construct. Performance accuracy exhibited an almost perfect correlation with AI literacy and total score ($r = .98-1.00$, $p < .001$), showing that more competent students not only performed better conceptually but also achieved higher precision in task completion. Weak yet significant positive correlations with total time ($r = .18-.24$, $p < .01$) indicated that students who spent slightly more time on tasks tended to obtain higher literacy scores. This pattern reflects reflective engagement – deliberate, meaningful interaction with the gamified tasks rather than superficial participation.

4.3 Interpretation of Findings

The correlational pattern provides clear empirical support for the main hypothesis (H_1) of the study, which proposed that the interactive, gamified diagnostic environment enhances students' AI and gamification literacy through engagement and reflective interaction. Accordingly, the null hypothesis (H_0) was rejected. This indicates that the gamified diagnostic approach positively influenced students' literacy development. The following interpretations have been made.

1. Internal coherence of the diagnostic model

The very high intercorrelations between AI literacy, gamification literacy, and ethical awareness (.73–.94) suggest that these domains form a unified construct of digital pedagogical competence. This supports the validity of the diagnostic framework and indicates that the cases within the gamified test consistently measured overlapping but distinct components of literacy.

2. Learning performance and engagement

The almost perfect correlation between accuracy and literacy scores suggests that the gamified diagnostic does more than just measure knowledge. It actively engages students cognitively, allowing them to show their understanding through accurate actions. The weak positive correlations with completion time indicate that time spent was not wasted effort, but rather reflective effort – those who took longer likely engaged in more thoughtful analysis of the case scenarios.

3. Gamification and reflective ethics

The strong relationship between gamification literacy and ethical awareness ($r = .73$) points to the integrative impact of gamified design: as students navigate challenges and feedback, they not only learn mechanics but also develop ethical reasoning in digital pedagogy contexts.

Overall, the results highlight that gamified assessment can function as both a diagnostic and a learning tool, reinforcing motivation and promoting deeper digital awareness. These findings align with contemporary educational innovation frameworks, which emphasize experiential, feedback-driven environments as catalysts for professional literacy and ethical digital behavior.

To complement the quantitative findings, qualitative insights were gathered through a short, oral group reflection conducted immediately after the diagnostic session. This informal discussion aimed to capture students' spontaneous perceptions of the gamified test – including its motivational, cognitive, and ethical dimensions. Although participation in the discussion was voluntary, most students contributed brief comments reflecting their engagement and impressions. Their responses provided valuable context for interpreting the quantitative outcomes, revealing how the gamified environment shaped not only performance but also students' emotional and reflective experiences during assessment. Thematic analysis of the comments identified five recurring categories: motivation and competition, novelty and reflection, ethical awareness, usability, and pedagogical relevance. Table 11 presents a summary of the analysis.

Table 11: Thematic summary of students' oral responses

Theme	Description	Illustrative student comments
1. Motivation and competition	Students reported that the gamified format made the session more dynamic and competitive, motivating them to focus and perform better	<p>"I liked that it felt like a competition."</p> <p>"I wanted to complete the test faster and do it better."</p> <p>"I enjoyed competing."</p> <p>"It felt like a game, not a test – the competition made me think faster."</p>
2. Novelty and reflection	Students appreciated the new, scenario-based approach, which required reading and reasoning rather than simple recall	<p>"It was my first time taking a test where I had to read a situation and a question about it."</p> <p>"It was different from usual tests – I had to think about real situations, not just choose an answer."</p>
3. Ethical and cognitive reflection	Some participants indicated that the test made them reflect on ethical aspects of AI use and fairness in education	"I realized I often use AI, but never thought about its fairness."

		"It made me see that AI in grading can be useful but also risky."
4. Usability and interface issues	A few students mentioned minor usability issues, such as font size or reading comfort	"I didn't like the small font." "Sometimes it was hard to read quickly because of the small text."
5. Pedagogical relevance and future use	Students expressed willingness to use similar gamified assessments in their own teaching for engagement and motivation	"I'd like to use this kind of test with my students – it keeps everyone active." "This approach could help make lessons more interesting."

Overall, the qualitative feedback reinforces the quantitative results, demonstrating that the gamified diagnostic system effectively promoted active engagement and reflective learning. Students described the experience as motivating and competitive, aligning with the SDT principles of competence and autonomy. The novelty of the scenario-based design encouraged deeper thinking about real educational contexts and the ethical implications of AI use. Moreover, participants recognized the pedagogical value of such assessments, expressing interest in integrating similar approaches into their future teaching practice. Minor usability concerns, such as the small font size, were mentioned but did not significantly affect overall satisfaction. Collectively, these findings support the study's *assessment-as-learning* framework, illustrating that gamified diagnostics can serve simultaneously as tools for evaluation, motivation, and ethical reflection in teacher education.

5. Discussion

The focus of the study on language learning contexts highlights the growing need for future EFL educators to develop AI and gamification literacy as part of their digital pedagogical competence. This helps ensure the responsible and motivating use of technology in communicative language teaching.

The findings of this study demonstrate that students' readiness levels in AI and gamification literacy significantly influence their performance and engagement in gamified diagnostic environments. The one-way ANOVA results confirmed that students with higher readiness levels achieved substantially greater accuracy and engagement than those at moderate or low readiness levels ($F(2,224) = 634.36$, $p < .001$). This indicates that learners with a deeper understanding of AI tools, gamification principles, and ethical considerations are better equipped to navigate digital environments strategically and reflectively.

The descending pattern of mean accuracy (85.4% → 60.2% → 25.8%) illustrates a clear gradient of digital pedagogical competence. Students at higher readiness levels actively used feedback and demonstrated adaptive decision-making, consistent with the *assessment-as-learning* paradigm, where the diagnostic process itself fosters learning. In contrast, low-readiness students engaged more

superficially, emphasizing the need for scaffolding and explicit instruction in responsible and reflective AI use. The strong interrelationships among AI literacy, gamification literacy, and ethical-pedagogical awareness indicate that cognitive, motivational, and ethical competencies evolve synergistically. Students with higher literacy levels not only performed more accurately but also interacted more dynamically with gamified features, reflecting adaptive engagement rather than passive participation.

Qualitative reflections further confirmed this pattern, as students described the test as motivating, competitive, and thought-provoking in terms of fairness and responsibility in AI-based education. These results collectively support Hypothesis 1 (H₁), demonstrating that gamified, case-based diagnostics can promote both engagement and reflective learning, bridging assessment and instruction through the principles of assessment-as-learning. The results empirically validate the integrated framework proposed in this study. The strong correlations among AI literacy, gamification literacy, and ethical-pedagogical awareness confirm that these constructs function interdependently rather than separately. The close association between AI literacy and ethical awareness ($r = .938, p < .01$) supports Floridi and Cowls' (2019) model of ethical AI, emphasizing that technical competence must be grounded in fairness, transparency, and accountability.

Similarly, the positive relationship between AI literacy and gamification literacy ($r = .830, p < .01$) aligns with Landers' (2014) theory of gamified learning, which suggests that cognitive and motivational engagement reinforce each other. These findings extend prior studies (e.g., Kütüklü, 2025; O'Dea et al., 2024) by demonstrating that AI-driven gamified environments simultaneously sustain motivation and foster ethical reflection. Consequently, the study contributes to a triadic model of digital pedagogical competence, integrating cognitive (AI literacy), motivational (gamification literacy), and ethical (pedagogical awareness) dimensions. This framework provides a novel methodological foundation for evaluating and cultivating educators' readiness for AI-enhanced teaching and learning.

From a pedagogical perspective, the findings highlight the transformative potential of gamified diagnostics in higher education. Embedding authentic, scenario-based cases within a gamified platform allowed students to experience realistic educational dilemmas involving AI, promoting both critical reflection and engagement. The system's combination of real-time feedback, leaderboards, and adaptive pacing turned assessment into an interactive, reflective learning experience. For teacher education programs, this approach can serve as a powerful training tool, helping future educators design, evaluate, and ethically integrate AI-supported instruction.

The results suggest that embedding gamified diagnostics into coursework enhances digital competence, nurtures ethical awareness, and increases engagement among students preparing for careers in education, STEM, and language teaching. Integrating ethical reflection into AI and gamification training

also helps prevent uncritical or purely instrumental technology use. Future educators who learn to balance engagement with responsibility will be better prepared to design inclusive, transparent, and learner-centered digital environments.

6. Conclusion

This study introduced and validated a case-based gamified diagnostic model designed to assess students' literacy in AI, gamification, and ethical-pedagogical competence within higher education. The results demonstrated that these literacies are deeply interconnected and collectively shape students' ability to engage responsibly and effectively with AI-driven learning environments. Students with higher readiness levels exhibited stronger accuracy, motivation, and reflective awareness, confirming that cognitive, motivational, and ethical dimensions of digital competence reinforce one another.

The research makes three key contributions. Theoretically, it advances the conceptual understanding of digital pedagogy by empirically supporting a triadic model of AI literacy, gamification literacy, and ethical awareness. Methodologically, it offers a replicable gamified diagnostic framework that integrates scenario-based assessment with real-time engagement analytics, uniting learning and evaluation in a single process. Pedagogically, it provides practical guidance for teacher education programs aiming to prepare future educators for the responsible, creative, and reflective use of AI in teaching and learning.

Practically, the study demonstrates that gamified diagnostic tools can serve as powerful instruments for both assessing and developing AI and gamification literacy among pre-service teachers. By transforming assessment into an engaging, reflective, and ethically informed learning experience, the proposed model bridges the gap between digital competence and pedagogical practice. Although developed within a language learning context, the diagnostic framework is broadly applicable and can be adapted for students across disciplines, offering universities a scalable approach to integrating responsible AI and gamification training into diverse curricula. For policymakers and curriculum designers, the findings highlight the need to embed ethical and motivational dimensions into digital education strategies.

This ensures that technological competence remains grounded in inclusive and human-centered values. By linking diagnostic assessment with gamified learning, the study places ethical and pedagogical awareness at the core of digital competence development. Future research should further validate and refine this framework across cultural and disciplinary contexts to support equitable AI-enhanced education.

7. Limitations and Future Research

Although this study provides robust empirical support for the integrated model of AI and gamification literacy, several limitations need to be addressed. First, the sample was limited to one university in Kazakhstan, with participants sharing similar educational and linguistic backgrounds. Future research should replicate

the study across diverse institutions and cultural contexts to test the generalizability of the model. Second, the current design captured data from a single diagnostic session. Longitudinal studies could examine how AI and gamification literacy evolve over time and how these competencies affect long-term learning outcomes. Third, the qualitative component was limited to short, oral reflections. Future work could include structured interviews or reflective journals to capture deeper insights into learners' reasoning and ethical decision-making during gamified assessment. Expanding the model to include emotional or collaborative literacy dimensions would also enrich understanding of affective and social engagement factors in AI-supported learning.

In summary, this study demonstrates that AI literacy and gamification literacy are deeply interconnected through ethical-pedagogical awareness, forming a unified competence crucial for modern teacher education. The proposed gamified diagnostic approach represents both a methodological and a pedagogical innovation, functioning as an assessment tool and a learning experience simultaneously. By integrating cognitive, motivational, and ethical dimensions within a single diagnostic model, the study offers a replicable framework for promoting responsible and reflective AI use in higher education. These findings contribute to the growing body of research on ethical and evidence-based AI integration, supporting the advancement of digital pedagogical competence in global educational contexts.

8. Conflict of Interest

The authors declare no conflict of interest.

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Appendix 1

Test: Case-Based Test of Pedagogical Readiness for AI and Gamification

Total questions: 25

Case 1. AI Assistant in a Lecture

Context: the instructor introduces ChatGPT and similar models to assist students in essay writing and data analysis.

Question 1

Which of the following ways of using AI best corresponds to the principle of academic integrity?

- a) Generate text with AI and not inform the instructor about it.
- b) Copy the text generated by AI and insert it into the essay without changes.
- c) Use AI as a source of ideas and then independently revise the material with proper citation.
- d) Ask AI to write a complete essay and slightly modify the wording.

Question 2

How can a student verify the accuracy of information obtained from an AI assistant?

- a) Trust the answer if it sounds convincing.
- b) Ask AI the same question several times to see if the answers match.
- c) Verify the data through academic sources and official publications.
- d) Ask friends to confirm the accuracy of the information.

Question 3

How can the use of AI enhance a student's critical thinking?

- a) Allows students to get ready-made answers without effort.
- b) Teaches students to memorize large amounts of information.
- c) Makes the student completely dependent on technology.
- d) Encourages comparison of different perspectives and analysis of arguments.

Question 4

What risks arise from blindly copying AI-generated answers?

- a) Strengthening trust between student and teacher.
- b) Loss of independent analytical skills and violation of academic ethics.
- c) Faster task completion without consequences.
- d) Improved academic performance and simplified learning process.

Question 5

Give an example of ethical interaction with AI when preparing a research paper.

- a) Use AI only for translation without editing.
- b) Avoid mentioning AI use in any form.
- c) Copy a paper written by AI and submit it as your own.
- d) Use AI to refine the essay structure and then write the text independently.

Case 2. Gamification of the Course

Context: the course "Pedagogical Technologies" is redesigned using gamification elements such as points, badges, and leaderboards.

Question 1

Which gamification elements best enhance students' intrinsic motivation?

- a) Personal goals and a progress bar showing development.
- b) Ranking and leaderboard system.
- c) Random rewards unrelated to learning.
- d) Virtual badges for achieving learning outcomes.

Question 2

How can excessive competition be avoided when using leaderboards?

- a) Use team-based leaderboards instead of individual ones.
- b) Publicly display scores of all students.
- c) Display only personal progress without comparison to others.
- d) Increase the number of tasks to intensify competition.

Question 3

What is the pedagogical purpose of implementing badges and rewards?

- a) Replacing traditional grading completely.
- b) Controlling attendance and discipline.
- c) Creating positive feedback and internal motivation.
- d) Reinforcing achievements and improving students' self-esteem.

Question 4

What can be improved if students' motivation declines after the first weeks of the game?

- a) Reduce teacher feedback.
- b) Introduce group missions and shared achievements.
- c) Add new levels, tasks, and surprise elements.
- d) Increase difficulty of all tasks without explanation.

Question 5

Give an example of a gamification element that promotes collaboration rather than competition.

- a) Team quests with shared goals and rewards.
- b) Individual ranking by task completion speed.
- c) Collective point accumulation to unlock a new level.
- d) Hidden bonuses only for top students.

Case 3. AI Analysis of Student Feedback

Context: the instructor collects student feedback via an online platform and uses AI to analyze the comments.

Question 1

What data are necessary for the correct analysis of feedback by an AI system?

- a) Anonymous data with no interpretive context.
- b) Raw text comments from students.
- c) Metadata: date, course topic, and comment context.
- d) Only teacher grades.

Question 2

How can a student verify the correctness of AI interpretations?

- a) Check whether key meaning categories are misrepresented.
- b) Compare AI conclusions with the original comments.
- c) Modify the data to fit the AI result.
- d) Trust AI results without analysis.

Question 3

What ethical principles must be followed when processing student feedback?

- a) Analyzing feedback without informing students.
- b) Publishing all feedback publicly without filtering.
- c) Data confidentiality and anonymity.
- d) Obtaining informed consent for using feedback.

Question 4

What should an instructor do if the AI gives ambiguous results?

- a) Manually review results or consult with colleagues.
- b) Use the first AI results as final.
- c) Ignore contradictory data.
- d) Adjust AI analysis settings and criteria.

Question 5

How can the instructor use AI analysis to improve teaching?

- a) Identify problem topics and adjust the course.
- b) Use the results to personalize learning.
- c) Delete comments with low ratings.
- d) Penalize students who left negative feedback.

Case 4. Creating an AI-Supported Course

Context: a student-teacher is designing a module in which AI helps adapt assignments to students' individual levels.

Question 1

How can one determine that the AI module truly personalizes learning?

- a) Use identical tasks for all students.
- b) Analyze students' results before and after AI implementation.
- c) Track whether tasks change according to student level.
- d) Check only the technical functionality of the system.

Question 2

What data can be safely used to adapt assignments?

- a) Academic performance and achievement data.
- b) Information about preferred learning styles.
- c) Personal student messages.
- d) Confidential medical data.

Question 3

How can a student-teacher evaluate the effectiveness of the implemented AI tool?

- a) Evaluate only the system's processing speed.
- a) Compare learning outcomes before and after AI use.
- b) Draw conclusions without data analysis.
- c) Survey students about their perceptions and usability experience.

Question 4

What should be provided to ensure algorithmic transparency for students?

- a) Restrict student access to AI-related information.
- b) Explain how AI works and what assessment criteria it uses.
- c) Hide the algorithm's logic to avoid criticism.
- d) Allow students to ask questions and receive clarifications.

Question 5

How does AI usage promote inclusivity in education?

- a) Makes learning identical for everyone.
- b) Enables task adaptation to individual learner needs.
- c) Ensures accessible materials for students with special needs.
- d) Excludes low-performing students from analysis.

Case 5. The Assessment Dilemma

Context: the instructor uses AI for automatic essay grading, but students question the fairness of the results.

Question 1

What steps should a student take if they believe the AI's assessment is unfair?

- a) Contact the instructor to request a review of the result.
- b) Ignore the result and not inform the instructor.
- c) Change the essay topic to avoid review.
- d) Provide arguments and examples supporting their disagreement.

Question 2

How can one ensure that the grading algorithm is not biased?

- a) Compare AI grades with expert (human) evaluations.
- b) Use only one dataset for training.
- c) Test results on a sample of essays from different authors.
- d) Keep the grading criteria hidden.

Question 3

What indicators should be considered when validating AI grading results?

- a) Number of students in the group.
- b) Accuracy in identifying semantic and linguistic errors.
- c) Reliability and consistency of grades with human experts.
- d) Speed of result delivery.

Question 4

How can automatic grading be combined with human expertise?

- a) Apply double-checking: AI + expert review.
- b) Exclude the instructor entirely from grading.
- c) Give priority to random AI outputs.
- b) Use AI for preliminary grading, but leave final decisions to the instructor.

Question 5

Why is it important to teach students how AI graders work?

- a) So, students won't question the results.
- b) It helps students critically analyze automated grades.
- c) It increases transparency and trust in results.
- d) To completely replace instructors.