



Journal of Hunan University (Natural Sciences)

Vol. 53 No. 3

March 2026

Available online at

<https://joununs.com>



ELSEVIER
Scopus



Clarivate
WEB OF SCIENCE

Open Access Article

 <https://doi.org/10.55463/issn.1674-2974.53.3.10>

Gamification Design and Effectiveness Analysis of Bilingual Website-Based Historiopreneurship Learning Media at Lambung Mangkurat University

Muhammad Rahmattullah^{1*}, Dwi Atmono¹, Rizky Febriyani Putri¹, Sharfina Puteri Amima¹,
Novan Alkaf Bahraini¹, Ananda Setiawan¹

¹ Economics Education Department, Lambung Mangkurat University, Banjarmasin, Indonesia

* Corresponding author: mrahmattullah@ulm.ac.id

Article History:

Received: February 9, 2026

Revised: March 16, 2026

Accepted: March 24, 2026

Published: March 31, 2026

Abstract: This study aims to design and evaluate the validity, practicality, and effectiveness of a gamified bilingual website as a learning medium for historiopreneurship at Lambung Mangkurat University (ULM). The novelty of this research lies in the integration of gamification with historiopreneurship, an emerging pedagogical approach that combines historical literacy with entrepreneurial competencies.

The study adopts a Design Science Research Methodology (DSRM), involving subject-matter experts in gamification, entrepreneurship education, and educational technology, as well as 50 university students. The developed platform is based on the Mechanics–Dynamics–Aesthetics (MDA) framework and incorporates key gamification elements, including progress indicators, badges, points, and leaderboards.

Expert validation results indicate a high level of validity across multiple dimensions (presentation: 88%; content design: 81%; interface design: 79%; usability: 84%). Student evaluations demonstrate strong practicality, with an average score of 86.3%. Furthermore, statistical analysis using paired-sample t-tests reveals significant improvements in learning outcomes, including gains in historical understanding (10.02 points), entrepreneurial knowledge (7.04 points), and integrated historiopreneurship competence (17.06 points) ($p < 0.001$).

The findings suggest that gamification can effectively enhance student motivation, engagement, and learning outcomes in historiopreneurship education. This study contributes to the literature by providing empirical evidence on the application of gamified digital platforms in interdisciplinary learning contexts and supports ULM's strategic vision as an entrepreneurial university.



Copyright: © 2026 by the authors. Licensee JHU

This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>)

Keywords: Gamification; Historiopreneurship; Bilingual website; Entrepreneurial education; Higher education.

基于双语网站的历史创业学习媒体的游戏化设计及其效果分析：以拉姆邦·曼库拉特大学为例

摘要：本研究旨在设计并评估一种用于拉姆邦·曼库拉特大学（ULM）历史创业（Historiopreneurship）学习的游戏化双语网站在有效性、实用性与效度方面的表现。本研究的创新之处在于将游戏化机制与历史创业相结合，这是一种融合历史素养与创业能力的跨学科教学方法。

本研究采用设计科学研究方法（DSRM），参与者包括游戏化、创业教育与教育技术领域的专家，以及50名大学生。所开发的平台基于“机制-动态-体验”（MDA）框架，并融合了进度条、徽章、积分和排行榜等关键游戏化元素。

专家评估结果表明，该平台在多个维度上具有较高的效度（呈现：88%；内容设计：81%；界面设计：79%；可用性：84%）。学生反馈显示其具有较高的实用性（平均得分为86.3%）。此外，配对样本t检验结果表明，学习效果显著提升，包括历史知识（提高10.02分）、创业知识（提高7.04分）以及综合历史创业能力（提高17.06分）（ $p < 0.001$ ）。

研究结果表明，游戏化能够有效提升学生在历史创业学习中的学习动机、参与度与学习成效。本研究通过提供实证证据，丰富了游戏化数字学习平台在跨学科教学中的应用研究，并支持ULM建设创业型大学的战略愿景。

关键词：游戏化；历史创业；双语网站；创业教育；高等教育

1. Introduction

The strategic evolution of universities into entrepreneurial institutions has emerged as a pivotal approach to enhancing education quality and graduate employability in the 21st century. At Lambung Mangkurat University (ULM), this transformation is articulated in the 2023–2027 Master Plan, which envisions the institution as a world-class wetland development center producing graduates who are both entrepreneurs and wetland experts [1]. Within this framework, entrepreneurship education plays a crucial role. While existing entrepreneurship curricula at ULM have demonstrated positive impacts on students' self-efficacy and entrepreneurial intentions [2], their influence on fostering student independence and applicative entrepreneurial behavior remains limited [3,4]. The tangible contribution of historiopreneurship lies in its ability to bridge the past and the present through creative economic innovation. By elevating historical values and local wisdom, this approach not only creates new business opportunities in sectors such as tourism, culinary arts, fashion, and digital media, but also plays an active role in cultural preservation and

strengthening national identity. In other words, historiopreneurship proves that history is not merely a memory, but a valuable asset that can be managed productively for the welfare of society and future generations. This gap underscores the need for pedagogical innovations that not only deliver knowledge but also cultivate entrepreneurial character and practical competencies [3,4].

One such pedagogical innovation is historiopreneurship, a learning model that integrates historical literacy with entrepreneurship education. Initially conceptualized to enhance creativity and commercialization of historically themed products [41], historiopreneurship has been expanded to foster nationalism and entrepreneurial spirit among students [5]. This approach leverages local historical assets and wisdom as learning resources, aiming to build entrepreneurial literacy and creativity rooted in contextual and cultural relevance [6,8,9,10]. Although developed in the form of monographs, project-based textbooks, and curriculum frameworks [5,6,7,8], historiopreneurship has not been widely implemented in practice, particularly in ULM's entrepreneurship

courses. A significant barrier to its adoption is the lack of interactive and technology-enhanced learning tools that can actively and enjoyably engage students [11,12,13,14].

The integration of technology in education, particularly through *gamification*, has gained considerable attention for its potential to increase student motivation, participation, and learning outcomes. Gamification incorporates game-design elements—such as points, levels, badges, challenges, and leaderboards—into non-game contexts to stimulate intrinsic motivation and sustained engagement [15,16,17]. Its effectiveness has been documented in corporate training environments, such as at SAP and Microsoft [19,20], and across various educational domains including science, mathematics, and programming [21,22,23,24,25,26]. However, the application of gamification in humanities-based entrepreneurship education, specifically in historiopreneurship, remains unexplored. Moreover, existing studies report contradictory outcomes regarding gamification's impact, indicating instances of decreased motivation, negative perceptions of learning outcomes, and ethical concerns such as gaming the system [18,34,35,36]. These mixed results highlight the importance of context-specific design and careful evaluation of gamified interventions [27,34,37,38].

Previous research on historiopreneurship remains largely conceptual and limited to the identification of learning resources and curriculum development [5,6,7,8,9,10]. Concurrently, studies on educational gamification have predominantly focused on STEM fields, with limited exploration in social sciences and humanities [21,22,23,24,25,26]. This creates a dual research gap: (1) the absence of interactive technological tools for historiopreneurship learning, and (2) the lack of gamification frameworks tailored to historical and entrepreneurial education. Consequently, there is a pressing need to develop and validate a gamified learning medium that can bridge pedagogical innovation with technological engagement in the context of historiopreneurship.

In response, this study introduces a novel integration of gamification with historiopreneurship through the development of a bilingual website-based learning platform. The research is guided by three key novelties: (1) the dual integration of gamification with historiopreneurship, bridging pedagogical and technological innovations; (2) a context-specific design using the MDA (Mechanics, Dynamics, Aesthetics) framework tailored to history-based entrepreneurship; and (3) a holistic validation approach that assesses not only motivation but also entrepreneurial character development and historical literacy [27,38].

The study addresses the following research questions: 1) How can gamification be designed for a bilingual website-based historiopreneurship learning

tool at ULM? 2) What is the validity, practicality, and effectiveness of the developed gamified historiopreneurship learning tool?. The research employs Design Science Research Methodology (DSRM) [42], involving expert validation, student testing, and pre-test/post-test measurements. By developing and evaluating this gamified bilingual platform, the study aims to contribute both a replicable instructional model and empirical evidence on the effectiveness of gamification in humanities-oriented entrepreneurship education. The findings are expected to support ULM's vision as an entrepreneurial university and provide insights into broader applications in higher education. The main weakness of a one-group pretest-posttest design is its inability to control for threats to internal validity, making it difficult to determine whether the observed changes are truly caused by the treatment or by other external factors.

2. Methods

This study was conducted using Design Science Research Methodology (DSRM) as outlined by Delpont et al. [42]. DSRM provides a structured, iterative framework ideally suited for creating and evaluating innovative educational artifacts, such as the gamified bilingual learning platform central to this research. The methodology's cyclical process of problem identification, solution design, development, demonstration, and evaluation ensured a rigorous approach to building a functional and pedagogically sound tool. The research was systematically organized into three main phases: the Design and Development Phase, where the initial prototype was conceived and constructed; the Demonstration Phase, where the prototype was implemented and tested in a real-world learning environment; and the Evaluation Phase, where the final artifact was comprehensively assessed for validity, practicality, and learning effectiveness. This phased structure guaranteed that the research contributed not only to a technological product but also empirical evidence of its impact and usability.

The strategic recruitment of participants across the research phases strengthens the validity of the study, as the purposive selection of nine experts with over five years of experience in gamification, entrepreneurship education, and learning technology ensures that the design and development phase is built upon a foundation of specialized and credible insights. Their primary role was to validate the instructional design, content accuracy, and technical implementation of the website. Additionally, a convenience sample of 20 undergraduate students from Lambung Mangkurat University (ULM), representing the target demographic, participated in preliminary usability testing to identify navigational and interface issues before wider deployment.

For the subsequent Demonstration and Evaluation phases, the main user group consisted of 50 undergraduate students enrolled in a compulsory entrepreneurship course at ULM. This ensured participants had a foundational interest in the subject matter. The sample included students from diverse academic disciplines (e.g., education, economics, social sciences, engineering) to capture a wide range of perspectives and learning styles. The cohort had an average age of 20.3 years ($SD = 1.5$), with a gender distribution of 60% female and 40% male. Furthermore, the two lecturers responsible for delivering the entrepreneurship course were involved to provide insights on curriculum integration and pedagogical utility. All participants received a detailed briefing on the study's objectives, and written informed consent was obtained prior to data collection. The study protocol received formal approval from the Research Ethics Committee of Lambung Mangkurat University (Protocol No: ULM/FKIP/2024/011), ensuring adherence to ethical standards for research involving human subjects.

The core material developed was a fully responsive, bilingual (Indonesian and English) website dedicated to historiopreneurship education. The website's instructional architecture was guided by the MDA (Mechanics, Dynamics, Aesthetics) framework [15,27], ensuring gamification was pedagogically integrated rather than superficially applied. From a technical standpoint, the frontend was constructed using HTML5 for semantic structure, Bootstrap CSS (version 5.0) for a mobile-first, responsive design, and vanilla JavaScript (ECMAScript 6) for implementing interactive features such as drag-and-drop quizzes and dynamic content updates. The backend was powered by the Laravel PHP framework (version 9.0), chosen for its robust ecosystem facilitating user authentication, session management, routing, and API development. Data persistence was managed through a MySQL (version 8.0) relational database, which stored structured data including user profiles, learning module progress, quiz results, point totals, badge awards, and leaderboard rankings. The entire application was deployed on a secure cloud server running Ubuntu 20.04 LTS with Nginx as the web server.

The gamification system was comprehensively designed using the MDA framework, incorporating Progress Tracking, Badges, Points, and a Leaderboard to visualize achievement and foster engagement, while the learning content was structured into History and Entrepreneurship streams with four modules each, featuring interactive and reflective elements, and supported by professionally translated bilingual content to maintain educational quality in both Indonesian and English.

Data collection employed a mixed-methods approach, utilizing multiple instruments to ensure

triangulation and depth of understanding. A custom Expert Validation Questionnaire was developed, featuring 15 items across four validated criteria: Presentation (4 items, e.g., logical concept sequencing), Content Design (3 items, e.g., variety in quiz formats), Media Design (5 items, e.g., motivational quality of gamification elements), and Ease of Use (3 items, e.g., clarity of menus). Experts rated each item on a 5-point Likert scale (1=Very Poor to 5=Excellent) and provided qualitative written feedback. The standardized System Usability Scale (SUS) [43], a reliable 10-item tool, was administered after the demonstration phase to measure the perceived usability of the website, yielding a single score between 0 and 100. To measure learning gains, parallel-form Pre-test and Post-test instruments were created, each containing 30 multiple-choice items evenly distributed across three domains: Historical Knowledge (10 items), Entrepreneurial Knowledge (10 items), and Integrated Historiopreneurship Knowledge (10 items). These tests underwent content validation by a separate panel of three subject-matter experts and demonstrated high reliability in a pilot test (Cronbach's $\alpha = 0.87$). Student motivation was gauged using a Motivation Questionnaire adapted from established scales in gamification research [15,38], measuring constructs like interest/enjoyment, perceived competence, and value/usefulness on a 5-point Likert scale. Qualitative insights were gathered through semi-structured Focus Group Discussion (FGD) Guides, with separate protocols for experts (focusing on design efficacy and scalability) and students (focusing on learning experience and engagement). All FGDs were audio-recorded and transcribed. Finally, objective behavioral data was extracted from detailed User Activity Logs automatically generated by the website, capturing timestamps, module accesses, quiz attempts, points earned, badges unlocked, and leaderboard views.

The procedural execution followed the DSRM phases meticulously. The Design and Development Phase (Months 1-3) began with a comprehensive needs analysis, synthesizing literature on historiopreneurship and gamification with ULM's curricular goals. Learning objectives were defined, and the MDA framework was operationalized through design documents mapping game mechanics to intended learning behaviors and emotional outcomes. An initial functional prototype was developed and subjected to internal testing. This prototype was then presented to the nine experts for validation. They completed the questionnaire independently, followed by a virtual FGD conducted via Zoom to discuss ratings and generate consensus on improvements. Thematic analysis of their feedback informed significant revisions to content, interface design, and gamification rules (e.g., adjusting point values, refining badge criteria). Concurrently, the 20 pilot students performed

a series of predefined tasks on the prototype while engaging in a "think-aloud" protocol. Their interactions were observed, and usability issues (e.g., ambiguous button labels, slow media loading) were documented and rectified.

During the Demonstration Phase (Month 4), the website was launched as a supplementary tool for the entrepreneurship course, with lecturer training and student orientation sessions conducted. Over four weeks, student engagement was monitored alongside system performance, the System Usability Scale (SUS) was administered mid-phase, and brief interviews with 10 randomly selected students captured immediate feedback. The Evaluation Phase (Months 5-6) involved a proctored pre-test, continued platform use, followed by a post-test and motivation questionnaire. Subsequently, two focus group discussions (FGDs) were held one with eight students stratified by engagement level and another with the expert panel—while all activity logs were exported for quantitative analysis.

Data analysis employed both quantitative and qualitative techniques. Expert validation scores were analyzed descriptively, calculating means and percentages for each criterion, with a pre-defined acceptability threshold of $\geq 75\%$. SUS scores were calculated using the standard method and interpreted against established benchmarks. Pre-test and post-test scores were checked for normality and subsequently analyzed using paired-sample t-tests to determine statistical significance in knowledge gains for each of the three domains (history, entrepreneurship, integrated). Effect sizes (Cohen's *d*) were calculated to assess the practical significance of these gains. Pearson correlation analyses explored relationships between motivation subscale scores and learning improvements. Qualitative data from open-ended survey responses and FGD transcripts were analyzed using thematic analysis. Two researchers independently coded the data, identifying recurring themes related to usability, engagement, perceived learning, and specific suggestions, which were then consolidated into a coherent thematic framework. User activity logs were processed to generate metrics such as average session duration, frequency of resource access, and patterns in badge acquisition, providing an objective complement to the self-reported data. All quantitative analyses were performed using SPSS, while qualitative data was managed and analyzed with descriptive techniques.

3. Results

3.1. Gamification Design and System Development

The primary outcome of the design phase was the development of a fully functional, bilingual website for historiopreneurship learning, structured around the MDA framework. The gamification elements were explicitly mapped to pedagogical goals, as detailed in

Table 1. The Mechanics layer defined the system rules, including point allocation (e.g., 50 points for module completion, 10-100 points for quizzes based on performance), badge award criteria (e.g., "Master Historiopreneurship" for completing all modules), and leaderboard ranking algorithms. The Dynamics described the resulting user behaviors, observed during the demonstration phase, such as students repeating quizzes to improve scores (point maximization) and actively monitoring the leaderboard to track their standing. The Aesthetics captured the emotional responses reported by users, including feelings of accomplishment upon receiving badges and a heightened sense of friendly competition.

The website's technical architecture was successfully implemented using a modern web stack: HTML5 and Bootstrap CSS ensured a responsive and accessible interface across desktop and mobile devices, while Laravel and MySQL provided a robust backend for data management and user progress tracking. Key interface features are illustrated in the figures: the bilingual language selector, the gamified dashboard displaying badges and points, and the interactive leaderboard. Initial expert feedback on the design confirmed that the integration of history and entrepreneurship content with gamification mechanics was logical and well-structured. The link of the website is <https://historiopreneurship.research-media.web.id>.

Table 1. Implementation of Gamification Elements Based on the MDA Framework (Source: author elaboration)

Element	Mechanics (Rules & Components)	Dynamics (User Behavior & Interaction)	Aesthetics (Emotional Response & Experience)
Progress	Visual progress bar; Module leveling system.	Self-monitoring of advancement; Increased focus on completion.	Sense of achievement; Satisfaction from visible progress.
Badge	Digital badges awarded for specific milestones (e.g., quiz mastery, fast completion).	Motivation to complete specific tasks; Collection behavior.	Pride; Recognition of accomplishment.
Points	Points awarded for all learning activities (modules, quizzes, reflections).	Strategic engagement to maximize points; Healthy competition.	Intrinsic and Extrinsic motivation; Competitive satisfaction.
Leader board	Public ranking based on cumulative points; Updated in real-time.	Comparative self-assessment; Efforts to climb rankings.	Competitive spirit; Social recognition.

3.2. Validity and Practicality of the Learning Tool

The validity of the website as a learning medium was assessed by a panel of six experts across four criteria. As presented in Table 2, the average scores for each criterion were high: Presentation (88%), Content Design (81%), Design (79%), and Ease of Use (84%). All criteria exceeded the 75% minimum validity threshold. Experts particularly praised the functionality of the bilingual feature (mean score 4.8/5) and the logical sequence of concepts. Suggested improvements primarily focused on enhancing visual appeal, such as color composition and adding more interactive animations.

Table 2. Expert Validation and Student Practicality Results (Source: Processed from research data (2025))

Aspect	Metric	Result
Expert Validity	Presentation Validity	88% (High)
	Content Design Validity	81% (High)
	Interface Design Validity	79% (High)
	Ease of Use Validity	84% (High)
Student Practicality	Overall Average Score (n=50)	86.3% (Positive)
	Highest-Rated Item: "Makes learning interesting"	91/100
	Primary Suggestion	Enhance mobile accessibility & interactivity

Practicality, measured through student responses (n=50), yielded an average final score of 86.3%, indicating the tool was highly practical for learning. As shown in Table 3, students strongly agreed that the application was interesting (mean score corresponding to 91/100) and sparked curiosity about historiopreneurship (90/100). The lowest, yet still positive, score was for the item "I look forward to the next learning session" (81/100). Qualitative feedback highlighted a few areas for improvement: (1) optimizing mobile device accessibility, (2) adding more animations to reduce a perceived rigidity, (3) incorporating more game-like activities to maintain engagement, and (4) refining specific feature interactions.

Table 3. Student Practicality Assessment Results (Source: Processed from research data (2025))

Questions	Likert scale					Total Value
	1	2	3	4	5	
I found the app easy to use.	0	0	3	9	8	85
My interaction with the app felt clear and easy to understand.	0	1	2	6	11	87
This app helped improve my learning outcomes.	0	0	3	9	8	85
This app makes my learning more effective.	0	0	3	11	6	83
This app makes learning feel more interesting.	0	0	2	5	13	91
I look forward to the next learning session using this app.	1	0	2	11	6	81
I enjoy the gaming (gamification) elements that are present in this app.	0	0	3	7	10	87
I feel good while using this app.	0	1	1	7	11	88
This app piqued my curiosity about Historiopreneurship material.	0	1	0	7	12	90
This app made me even more curious to learn more.	0	0	3	8	9	86
Average Final Result						86,3

3.3. Effectiveness in Enhancing Learning Outcomes

The effectiveness of the gamified website was measured by comparing pre-test and post-test scores across three knowledge domains. The results of the paired-sample t-tests, summarized in Table 4, reveal statistically significant improvements ($p < 0.001$) in all domains.

Table 4. Statistical Summary of Pre-test and Post-test Results Source: Processed from research data (2025)

Measurement Pair	Mean Diff.	t-value	df	p-value (2-tailed)
Post_History – Pre_History	10.02	8.799	49	.000
Post_Ent – Pre Entr	7.04	7.301	49	.000
Overall Posttest – Overall Pretest	17.06	11.257	49	.000

The largest mean increase was observed in the integrated Historiopreneurship score (17.06 points), followed by Historical knowledge (10.02 points) and Entrepreneurial knowledge (7.04 points). The strong positive correlations ($r = .651$ for entrepreneurship, $r = .626$ for overall) between pre-test and post-test scores indicate that students with higher

initial knowledge tended to achieve higher final scores, yet significant gains occurred across all proficiency levels.

Thematic analysis of student FGD transcripts and reflection data provided deeper insights. Two main themes emerged regarding content:

1. **Historical Content:** Reactions were more neutral, often described as "informative but conventional." Students appreciated learning about local historical sites but desired more immersive, narrative-driven exploration of historical contexts.
2. **Entrepreneurship & Tourism Content:** Responses were markedly more positive, described as "very satisfying," "applicable," and "relevant." Students expressed enthusiasm for practical topics like digital marketing and business feasibility analysis based on historical tourism.

Furthermore, students consistently reported that the gamification elements were key drivers of motivation. The point system and leaderboard created a "fun challenge," while badges provided a "sense of tangible reward." Several students noted that seeing their progress visually and competing with peers prevented procrastination. The bilingual feature was used by approximately 35% of students to toggle languages, primarily to understand specific business terminology in English, confirming its utility as a support tool rather than a primary content delivery mode for this cohort. The main suggestion for future development, aligning with the practicality feedback, was to enhance mobile responsiveness and increase the variety of interactive game formats.

4. Discussion

The development and implementation of the gamified bilingual historiopreneurship website represent a concrete response to the dual challenges identified in the introduction: the limited impact of traditional entrepreneurship curricula on student independence [3,4] and the lack of interactive, technology-driven pedagogies for historiopreneurship [11,12]. The findings of this study provide robust empirical evidence that a pedagogical model integrating gamification with historiopreneurship is not only feasible but also highly effective in enhancing learning outcomes, motivation, and engagement within the context of an entrepreneurial university. This discussion situates these findings within the broader academic discourse, critically examines their significance, addresses the study's limitations, and outlines pathways for future research and implementation.

The most compelling result is the statistically significant and substantively meaningful improvement in student learning across all three measured domains. The largest gain was observed in integrated historiopreneurship knowledge (mean increase of 17.06

points), a finding that directly validates the core theoretical premise of historiopreneurship as an integrative pedagogical innovation [5,6]. This synergy suggests that gamification acted as a catalytic scaffold, making the abstract connection between historical narrative and entrepreneurial opportunity more tangible and actionable for students. This aligns with Vygotskian social constructivism, where the structured challenges and immediate feedback of the gamification system served as scaffolding, enabling students to operate within and expand their "zone of proximal development" in mastering this complex interdisciplinary subject [17]. The significant improvement in historical knowledge (+10.02 points) compared to entrepreneurial knowledge (+7.04 points) offers a nuanced insight into the mechanics of gamified learning. It is plausible that the narrative, contextual, and progression-based nature of historical content is inherently more congruent with core game mechanics—such as unlocking levels (historical periods) or completing quests (exploring historical events)—as suggested by the MDA framework's emphasis on aesthetics like discovery and narrative [15,27]. In contrast, entrepreneurial concepts, often more abstract and principle-based, may require more sophisticated or varied gamification mechanics, such as simulation-based challenges or resource management games, to achieve equivalent gains. This interpretation is supported by literature indicating that the effectiveness of specific game elements is contingent on the learning content and context [27,34,37].

The high levels of validity and practicality reported by experts and students confirm that the developed website is a robust and user-accepted learning tool. Expert validation scores, all exceeding the 75% threshold, particularly in presentation (88%) and ease of use (84%), demonstrate that the integration of bilingual content and gamification elements was executed with a high degree of technical and pedagogical competency. This directly addresses the identified gap concerning the underutilization of interactive technology in historiopreneurship education [9,10]. The positive student reception (86.3% practicality), especially their reported enjoyment of gamification elements and increased curiosity, counters some of the negative findings in gamification literature, such as decreased intrinsic motivation or the emergence of negative competitive feelings [18,35,36]. A key factor in this success likely lies in the deliberate, pedagogy-first application of the MDA framework, which prevented a shallow "pointsification" of the learning experience. By designing mechanics (points, badges) to drive specific dynamics (repetition for mastery, social comparison) aimed at evoking desired aesthetics (accomplishment, competition), the study ensured gamification served the learning objectives, not the reverse [15,27]. This careful design may have

mitigated the "novelty effect" and potential ethical pitfalls like "gaming the system" that have been noted in other studies [18].

The qualitative data from student reflections and FGDs provide a deeper layer of understanding that complement the quantitative results. The divergent perceptions of historical versus entrepreneurial content—with the former seen as "informative" and the latter as "applicable and satisfying"—reflect a common challenge in interdisciplinary courses. However, the gamification framework appears to have bridged this perceptual gap by providing a unified, motivating environment where engagement with one domain fueled progress in the other, as evidenced by the high pursuit of the integrated "Master Historiopreneurship" badge. This finding strongly supports Atmono et al.'s [5] vision of historiopreneurship as a vehicle for building nationalism and entrepreneurial spirit simultaneously; the gamified platform made the local historical assets personally relevant and transformed them from static knowledge into dynamic resources for innovative thinking. Furthermore, the use of the bilingual feature, primarily for clarifying business terminology, highlights its role as a scaffold for academic literacy, an unexpected but valuable outcome that aligns with the university's global engagement goals.

This study successfully resolves its two primary research questions. First, it provides a detailed, reproducible blueprint for gamification design in historiopreneurship using the MDA framework, outlining how specific mechanics (progress, badges, points, leaderboards) can be mapped to learning dynamics and emotional outcomes. Second, it delivers conclusive evidence of the tool's validity, practicality, and, most importantly, its effectiveness in significantly improving student learning outcomes and motivation. The strong positive correlations between pre-test and post-test scores ($r = .651$ for entrepreneurship, $r = .626$ for overall) further indicate that the intervention benefited students across the spectrum of prior knowledge, enhancing the learning of both novices and those with stronger foundational understanding.

Despite these strengths, several limitations must be acknowledged to contextualize the findings and guide future work. First, the study was conducted within the specific cultural and institutional setting of ULM in Indonesia. Cultural dimensions, such as attitudes towards competition, collectivism, and authority, can significantly influence how gamification is perceived and its effectiveness [34,39]. The positive results related to the leaderboard, for instance, might manifest differently in a more individualistic or less competitively oriented cultural context. Second, the sample size, while adequate for the statistical analyses performed, remains moderate ($n=50$ for the main trial), and the absence of a control group limits the ability to

definitively isolate the effect of gamification from other variables, such as the quality of the historiopreneurship content itself or the instructor's influence. While pre-post design and qualitative data strengthen the causal inference, a randomized controlled trial would provide even more robust evidence. Third, the study measured outcomes immediately after the intervention. The long-term retention of historiopreneurship knowledge, the sustained impact on entrepreneurial self-efficacy and intention [2,4], and the ultimate translation of learning into entrepreneurial behavior remain critical unanswered questions. Finally, the research did not deeply analyze differential impacts based on player types or personality traits, factors known to moderate gamification outcomes [34,37,40]. Understanding whether "achievers" responded more to badges, "socializers" to the leaderboard, or "explorers" to the historical content would allow for more personalized and effective design in the future.

The implications of this research are multifaceted. For practice, it offers a validated, ready-to-implement model for universities like ULM that are pursuing an entrepreneurial university strategy. It demonstrates how technology can be leveraged not just for delivery, but to create deeply engaging, context-rich learning experiences that connect academic knowledge with local heritage and global perspectives. For theory, it extends the application of gamification research firmly into the humanities and social sciences, providing empirical support for its use in constructivist, interdisciplinary learning environments. It also reinforces the utility of design-based research frameworks like DSRM [42] and theoretical lenses like MDA for developing educational innovations.

Future research should build upon this foundation by: (1) Conducting longitudinal studies to assess knowledge retention and the long-term development of entrepreneurial mindsets and capabilities; (2) Replicating the study in different cultural and institutional settings to test the generalizability of the model and identify culturally sensitive design elements; (3) Employing experimental designs with control groups using non-gamified historiopreneurship content to precisely quantify the added value of gamification; and (4) Integrating learning analytics and player typology assessments to create adaptive gamification systems that personalize the experience based on individual learner profiles and real-time performance [34,37,39]. By addressing these avenues, the promising integration of gamification and historiopreneurship can be refined into an even more powerful tool for educating innovative, historically grounded, and entrepreneurial graduates.

This research offers a replicable model for integrating gamification and historiopreneurship into higher education. By demonstrating improved student

engagement and learning outcomes through a structured bilingual platform, the study provides empirical evidence that other universities can adapt. Its modular design and clearly documented phases enable institutions to customize the framework to their specific curricular goals and cultural contexts. Ultimately, this research supports the broader mission of fostering entrepreneurial mindsets rooted in historical awareness across diverse academic settings.

5. Conclusion

This study conclusively demonstrates that a gamified bilingual website, developed using the Design Science Research Methodology (DSRM) and structured via the MDA framework, serves as a highly valid, practical, and effective tool for historiopreneurship education at Lambung Mangkurat University. The research confirms that the dual integration of gamification with the interdisciplinary pedagogy of historiopreneurship significantly enhances student learning outcomes, with the most profound improvement observed in the integrated application of historical and entrepreneurial knowledge. Furthermore, the platform successfully garnered high acceptance from both subject-matter experts and students, who reported elevated levels of motivation, engagement, and contextual curiosity, thereby directly addressing identified gaps in interactive technology and applied learning within the curriculum.

The findings underscore two universal principles for educational design: first, that gamification's efficacy extends beyond STEM into humanities and social sciences when anchored in pedagogical frameworks like MDA, and second, that a synergistic innovation model merging pedagogical and technological advances yields greater educational impact. However, this research acknowledges limitations regarding its specific cultural and institutional context, the unexplored long-term impact on entrepreneurial behavior, and the nuanced finding that student engagement with purely historical content, while improved, was less dynamic than with applied modules. These limitations do not diminish the results but delineate the boundaries of the current study and highlight important considerations for implementation in other settings.

The theoretical significance of this work lies in its empirical validation of a structured design approach for complex interdisciplinary learning, while its practical value offers a replicable model for higher education institutions pursuing entrepreneurial university strategies. For future research, longitudinal studies to measure behavioral impact, cross-cultural replications to test generalizability, and investigations into personalized, adaptive gamification based on learner analytics are critical next steps. This research establishes a robust foundation for advancing engaged,

contextual, and technology-enhanced learning in entrepreneurship education.

The bilingual approach in the historiopreneurship system is essential because it develops students' historical literacy and entrepreneurial skills while simultaneously strengthening their English proficiency. By presenting content in both Indonesian and English, the system ensures wider accessibility and prepares learners for global competition. This integration fosters cognitive flexibility and enables students to connect local heritage with international entrepreneurial opportunities. Ultimately, this innovation equips graduates with the multidisciplinary competencies needed to thrive in the global creative economy.

Acknowledgments

This research was funded by the Directorate of Research and Community Service (DRPM) of the Indonesian Ministry of Higher Education, Science, and Technology, through the Fundamental Research Scheme of the 2025 Research and Community Service Program. The authors thank the experts and students of Lambung Mangkurat University for their essential participation and contributions to this study.

References

- [1] Anonymous. *Master Plan for the Development of Lambung Mangkurat University 2010–2027*. Lambung Mangkurat University, Banjarmasin, 2010.
- [2] Atmono D., Rahmattullah M., Setiawan A., Mustofa R.H., Pramudita D.A., Ulfatun T., Reza R., Mustofa A. The effect of entrepreneurial education on university student's entrepreneurial self-efficacy and entrepreneurial intention. *International Journal of Evaluation and Research in Education (IJERE)*, 2023, 12(1): 495. <https://doi.org/10.11591/ijere.v12i1.23547>
- [3] Adawiyaha R., Ratumbusang M.F., Hasanah M., Atmono D. The Nexus Between the Character of Independence and Entrepreneurship Learning Subject: Case Study Faculty Of Training And Education Lambung Mangkurat University. *Inovator*, 2023, 12(1): 82-93. <https://doi.org/10.32832/inovator.v12i1.1345>
- [4] Atmono D., Setiawan A., Rahmattullah M. The Effect of Risk Propensity, Entrepreneurial Intention and Entrepreneurial Self-Efficacy on Students' Entrepreneurial Behavior. *Dinamika Pendidikan*, 2023, 18(2): 193-205. <https://doi.org/10.15294/dp.v18i2.43210>
- [5] Atmono D., Putri R.F., Setiawan A., Rahmattullah M. Historiopreneurship: Building Nationalism Through Entrepreneurship Program in University. *Migration Letters*, 2023, 20(6): 336-342. <https://doi.org/10.59670/ml.v20i6.3712>
- [6] Atmono D., Rahmattullah M., Setiawan A., Mustofa R.H., Pramudita D.A., Ulfatun T., Reza R., Mustofa A. *Monograph of Historical Entrepreneurship*

- of *Banjarmasin City*. CV Banyubening Cipta Sejahtera, Banjarbaru, 2021.
- [7] Atmono D., Rahmattullah M., Setiawan A., Mustofa R.H., Pramudita D.A., Ulfatun T., Reza R., Mustofa A. *Historical Entrepreneurship (Historiopreneurship)*. Insight Mediatama, Mojokerto, 2023.
- [8] Reza R., Rahayu V.P., Piar C.S., Atmono D., Rahmatullah M., Nurliyana N. Historical Entrepreneurship Program Development (Historiopreneurship) in Samarinda City and Kutai Kartanegara. In: *Educational Studies: Conference Series*, 2022, 2(2): 328-334. <https://doi.org/10.31004/edus.v2i2.487>
- [9] Atmono D., Rahmattullah M., Putri R.F., Ratumbusang M.F., Nor B. Socialization of the Historical Entrepreneurship Program (Historiopreneurship) for Teachers of Productive Subjects at Banjarmasin City Vocational High School. *Bubungan Tinggi: Jurnal Pengabdian Masyarakat*, 2022, 4(4): 1351-1359. <https://doi.org/10.20527/btjpm.v4i4.6789>
- [10] Mustofa R.H., Pramudita D.A., Atmono D., Priyankara R., Asmawan M.C., Rahmattullah M., Mudrikah S., Pamungkas L.N. Exploring educational students' acceptance of using movies as economics learning media: PLS-SEM analysis. *International Review of Economics Education*, 2022, 39: 100236. <https://doi.org/10.1016/j.iree.2022.100236>
- [11] Atmono D., Rahmatullah M., Sarinang F.F. The Impact of Electronic Mind Map as Part of Learning. In: *2nd International Conference on Social Sciences Education (ICSSE 2020)*, 2021, pp. 53-56. Atlantis Press. <https://doi.org/10.2991/assehr.k.210222.010>
- [12] Deterding S., Dixon D., Khaled R., Nacke L. From game design elements to gamefulness. In: *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 2011, pp. 9-15. ACM, New York. <https://doi.org/10.1145/2181037.2181040>
- [13] Trinidad M., Calderon A., Ruiz M. GoRace: A Multi-Context and Narrative-Based Gamification Suite to Overcome Gamification Technological Challenges. *IEEE Access*, 2021, 9: 65882-65905. <https://doi.org/10.1109/ACCESS.2021.3076572>
- [14] Ramadhan A., Warnars H.L.H.S., Razak F.H.A. Combining intelligent tutoring systems and gamification: a systematic literature review. *Education and Information Technologies*, 2023, 28(9): 11687-11723. <https://doi.org/10.1007/s10639-023-12092-x>
- [15] Almeida C., Kalinowski M., Uchôa A., Feijó B. Negative effects of gamification in education software: Systematic mapping and practitioner perceptions. *Information and Software Technology*, 2023, 156: 107142. <https://doi.org/10.1016/j.infsof.2023.107142>
- [16] Purba H.S., Adini M.H., Sari D.P., Rosal N.P., Sukmawati R.A., Ichsan A. Implementation of Interactive Learning Media with Gamification Approach on Solar System Material. *International Journal of Innovative Science and Research Technology*, 2022, 7(10): 2025-2028. <https://doi.org/10.5281/zenodo.7363753>
- [17] Sukmawati R.A., Adini M.H., Pramita M., Rizqan A. Implementation of Gamification in the Development of Interactive Learning Multimedia with the Drill and Practice Method. *EDU-MAT: Jurnal Pendidikan Matematika*, 2021, 9(2): 163-181. <https://doi.org/10.20527/edumat.v9i2.11728>
- [18] Sahriza Daan Nur M.A., Purba H.S., Saputra N.A.B., Wiranda N., Adini M.H. Development of Web-Based Interactive Learning Media with a Gamification Approach to Basic CSS Materials. *Computer Education and Technology Journal*, 2023, 3(2): 48-59. <https://doi.org/10.20527/cetj.v3i2.10700>
- [19] Clark D.B., Hernández-Zavaleta J.E., Becker S. Academically meaningful play: Designing digital games for the classroom to support meaningful gameplay, meaningful learning, and meaningful access. *Computers & Education*, 2023, 194: 104704. <https://doi.org/10.1016/j.compedu.2022.104704>
- [20] Christopher L., Waworuntu A. Java Programming Language Learning Application Based on Octalysis Gamification Framework. *International Journal of New Media Technology (IJNMT)*, 2021, 8(1): 65-69. <https://doi.org/10.31937/ijnmt.v8i1.2049>
- [21] Wang C.C., Chang S.C., Yu Y.H. Using gamification to enhance learning: A college course case study. *Entertainment Computing*, 2025, 54: 100942. <https://doi.org/10.1016/j.entcom.2024.100942>
- [22] Boussaha K., Drissi S., Rahab A., Touhami K.K., Boudraa C.E.A.T. Towards a new generation of digital games designed with the basics of psychological theories to improve primary school pupils' psychological and technical skills in learning arithmetic. *Entertainment Computing*, 2025, 100927. <https://doi.org/10.1016/j.entcom.2024.100927>
- [23] Warden C.A., Chen J.F., Stanworth J.O. The role of social networks in digital learning gamification: Learner communication preferences and performance effects. *Learning and Instruction*, 2024, 92: 101911. <https://doi.org/10.1016/j.learninstruc.2024.101911>
- [24] Burguera-Bernalte D., Gil-Gómez J.A., Redolat R., Mesa-Gresa P. NeuroApp, serious games for enhancing neuroscience learning in undergraduate students: A pilot study. *Entertainment Computing*, 2025, 54: 100943. <https://doi.org/10.1016/j.entcom.2024.100943>
- [25] Ariya P., Wongwan N., Intawong K., Puritat K. Digital literacy through gaming: A comparative study of knowledge acquisition, social presence, and emotional reactions in digital and non-digital board

- games. *Social Sciences & Humanities Open*, 2025, 11: 101387. <https://doi.org/10.1016/j.ssaho.2024.101387>
- [26] Denden M., Tlili A., Essalmi F., Jemni M., Chen N.S., Burgos D. Effects of gender and personality differences on students' perception of game design elements in educational gamification. *International Journal of Human-Computer Studies*, 2021, 154: 102674. <https://doi.org/10.1016/j.ijhcs.2021.102674>
- [27] Grech E.M., Briguglio M., Said E. A field experiment on gamification of physical activity—Effects on motivation and steps. *International Journal of Human-Computer Studies*, 2024, 184: 103205. <https://doi.org/10.1016/j.ijhcs.2024.103205>
- [28] Romero-Rodríguez J.M., Martínez-Menéndez A., Alonso-García S., Victoria-Maldonado J.J. The reality of the gamification methodology in Primary Education: A systematic review. *International Journal of Educational Research*, 2024, 128: 102481. <https://doi.org/10.1016/j.ijer.2024.102481>
- [29] Wang J., Gong S., Cao Y., Guo X., Peng P. Personalization in educational gamification: Learners with different trait competitiveness benefit differently from rankings on leaderboards. *Computers & Education*, 2025, 225: 105196. <https://doi.org/10.1016/j.compedu.2024.105196>
- [30] Mohanty S., Christopher B.P. A study on role of gamification elements in training outcomes: comparing the mediating effect of intrinsic and extrinsic motivation. *The Learning Organization*, 2023, 30(4): 480-500. <https://doi.org/10.1108/TLO-09-2022-0104>
- [31] Unternährer C., Termine F., De Santo A. Enhancing Knowledge Transmission: The Perspective of Gamification User Profiles. *Procedia Computer Science*, 2024, 239: 1115-1123. <https://doi.org/10.1016/j.procs.2024.06.105>
- [32] Gini F., Roumelioti E., Schiavo G., Paladino M.P., Nyul B., Marconi A. Engaging youth in gender-based violence education through gamification: A user experience evaluation of different game modalities. *Entertainment Computing*, 2025, 52: 100919. <https://doi.org/10.1016/j.entcom.2024.100919>
- [33] Ahmad T.A., Susilowati N., Subkhan E., Amin S. Historiopreneurship and Commercialization of History Laboratory in Universitas Negeri Semarang. *KnE Social Sciences*, 2019, 3(10): 706-715. <https://doi.org/10.18502/kss.v3i10.3914>
- [34] Delpont P.M.J., Von Solms R., Gerber M. Methodological Guidelines for Design Science Research. *Procedia Computer Science*, 2024, 237: 195-203. <https://doi.org/10.1016/j.procs.2024.05.023>
- [35] Brooke J. SUS: A quick and dirty usability scale. In: Jordan P.W., Thomas B., Weerdmeester B.A., McClelland I.L. (eds.) *Usability Evaluation in Industry*, 1996, pp. 189-194. Taylor & Francis, London.
- [1] Anonymous. 《拉姆邦·曼库拉特大学2010–2027年发展总体规划》。印度尼西亚班贾尔马辛：拉姆邦·曼库拉特大学，2010年。
- [2] Atmono D., Rahmattullah M., Setiawan A., Mustofa R.H., Pramudita D.A., Ulfatun T., Reza R., Mustofa A. 创业教育对大学生创业自我效能与创业意向的影响。《国际教育评价与研究期刊》，2023年，12(1)：495. <https://doi.org/10.11591/ijere.v12i1.23547>
- [3] Adawiyaha R., Ratumbusang M.F., Hasanah M., Atmono D. 独立性人格与创业学习课程之间的关系：拉姆邦·曼库拉特大学教育学院案例研究。《Inovator》，2023年，12(1)：82-93. <https://doi.org/10.32832/inovator.v12i1.1345>
- [4] Atmono D., Setiawan A., Rahmattullah M. 风险倾向、创业意向与创业自我效能对学生创业行为的影响。《教育动态》，2023年，18(2)：193-205. <https://doi.org/10.15294/dp.v18i2.43210>
- [5] Atmono D., Putri R.F., Setiawan A., Rahmattullah M. 历史创业：通过大学创业项目培育民族主义。《Migration Letters》，2023年，20(6)：336-342. <https://doi.org/10.59670/ml.v20i6.3712>
- [6] Atmono D., Rahmattullah M., Setiawan A., Mustofa R.H., Pramudita D.A., Ulfatun T., Reza R., Mustofa A. 《班贾尔马辛城市历史创业专著》。Banjarbaru：C V Banyubening Cipta Sejahtera，2021年。
- [7] Atmono D., Rahmattullah M., Setiawan A., Mustofa R.H., Pramudita D.A., Ulfatun T., Reza R., Mustofa A. 《历史创业（Historiopreneurship）》。Mojokerto：Insight Mediatama，2023年。
- [8] Reza R., Rahayu V.P., Piar C.S., Atmono D., Rahmatullah M., Nurliyana N. 萨马林达市与库台卡塔内加拉地区历史创业项目发展。《教育研究会议论文集》，2022年，2(2)：328-334. <https://doi.org/10.31004/edus.v2i2.487>
- [9] Atmono D., Rahmattullah M., Putri R.F., Ratumbusang M.F., Nor B. 面向班贾尔马辛职业高中生产性课程教师的历史创业项目推广。《Bubungan Tinggi：社会服务期刊》，2022年，4(4)：1351-1359. <https://doi.org/10.20527/btjpm.v4i4.6789>
- [10] Mustofa R.H., Pramudita D.A., Atmono D., Priyankara R., Asmawan M.C., Rahmattullah M., Mudrikah S., Pamungkas L.N. 使用电影作为经济学学习媒介的接受度研究：PLS-SEM分析。《国际经济教育评论》，2022年，39：100236. <https://doi.org/10.1016/j.iree.2022.100236>
- [11] Atmono D., Rahmatullah M., Sarinang F.F. 电子思维导图在学习中的影响。《第二届社会科学

参考文献:

- 教育国际会议论文集》，2021年，第53-56页。 <https://doi.org/10.2991/assehr.k.210222.010>
- [12] Deterding S., Dixon D., Khaled R., Nacke L. 从游戏设计元素到游戏化体验。《第15届国际Mind Trek会议论文集》，2011年，第9-15页。 <https://doi.org/10.1145/2181037.2181040>
- [13] Trinidad M., Calderon A., Ruiz M. GoRace：多情境叙事型游戏化平台。《IEEE Access》，2021年，9：65882-65905。 <https://doi.org/10.1109/ACCESS.2021.3076572>
- [14] Ramadhan A., Warnars H.L.H.S., Razak F.H.A. 智能辅导系统与游戏化结合的系统综述。《教育信息技术》，2023年，28(9)：11687-11723。 <https://doi.org/10.1007/s10639-023-12092-x>
- [15] Almeida C., Kalinowski M., Uchôa A., Feijó B. 教育软件中游戏化的负面影响。《信息与软件技术》，2023年，156：107142。 <https://doi.org/10.1016/j.infsof.2023.107142>
- [16] Purba H.S. 等 互动学习媒体中游戏化的应用。《国际创新科学与研究技术期刊》，2022年，7(10)：2025-2028。 <https://doi.org/10.5281/zenodo.7363753>
- [17] Sukmawati R.A. 等 基于训练与实践方法的游戏化多媒体开发。《EDU-MAT》，2021年，9(2)：163-181。 <https://doi.org/10.20527/edumat.v9i2.11728>
- [18] Sahriza 等 基于网页的游戏化学习媒体开发。《计算机教育与技术期刊》，2023年，3(2)：48-59。 <https://doi.org/10.20527/cetj.v3i2.10700>
- [19] Clark D.B. 等 有意义的学习游戏设计。《Computers & Education》，2023年，194：104704。 <https://doi.org/10.1016/j.compedu.2022.104704>
- [20] Christopher L., Waworuntu A. 基于Octalysis框架的Java学习应用。《国际新媒体技术期刊》，2021年，8(1)：65-69。 <https://doi.org/10.31937/ijnmt.v8i1.2049>
- [21] Wang C.C. 等 游戏化促进学习的案例研究。《Entertainment Computing》，2025年，54：100942。 <https://doi.org/10.1016/j.entcom.2024.100942>
- [22] Boussaha K. 等 基于心理理论的教育游戏设计。《Entertainment Computing》，2025年，100927。 <https://doi.org/10.1016/j.entcom.2024.100927>
- [23] Warden C.A. 等 社交网络在游戏化学习中的作用。《Learning and Instruction》，2024年，92：101911。 <https://doi.org/10.1016/j.learninstruc.2024.101911>
- [24] Burguera-Bernalte D. 等 神经科学学习游戏研究。《Entertainment Computing》，2025年，54：100943。 <https://doi.org/10.1016/j.entcom.2024.100943>
- [25] Ariya P. 等 游戏促进数字素养研究。《Social Sciences & Humanities Open》，2025年，11：101387。 <https://doi.org/10.1016/j.ssaho.2024.101387>
- [26] Denden M. 等 性别与个性对游戏化感知的影响。《国际人机研究期刊》，2021年，154：102674。 <https://doi.org/10.1016/j.ijhcs.2021.102674>
- [27] Grech E.M. 等 游戏化对身体活动的影响。《国际人机研究期刊》，2024年，184：103205。 <https://doi.org/10.1016/j.ijhcs.2024.103205>
- [28] Romero-Rodríguez J.M. 等 小学游戏化教学综述。《国际教育研究期刊》，2024年，128：102481。 <https://doi.org/10.1016/j.ijer.2024.102481>
- [29] Wang J. 等 教育游戏化中的个性化研究。《Computers & Education》，2025年，225：105196。 <https://doi.org/10.1016/j.compedu.2024.105196>
- [30] Mohanty S., Christopher B.P. 游戏化在培训中的作用。《The Learning Organization》，2023年，30(4)：480-500。 <https://doi.org/10.1108/TLO-09-2022-0104>
- [31] Unternährer C. 等 游戏化用户模型研究。《Procedia Computer Science》，2024年，239：1115-1123。 <https://doi.org/10.1016/j.procs.2024.06.105>
- [32] Gini F. 等 游戏化在性别暴力教育中的应用。《Entertainment Computing》，2025年，52：100919。 <https://doi.org/10.1016/j.entcom.2024.100919>
- [33] Ahmad T.A. 等 历史创业与历史实验室商业化。《KnE Social Sciences》，2019年，3(10)：706-715。 <https://doi.org/10.18502/kss.v3i10.3914>
- [34] Delpont P.M.J. 等 设计科学研究方法指南。《Procedia Computer Science》，2024年，237：195-203。 <https://doi.org/10.1016/j.procs.2024.05.023>
- [35] Brooke J. SUS可用性量表。《可用性评估》，1996年，第189-194页。

Manuscript Information

Word count: 8,368 words (excluding references).

Peer-Review Record

Fast-track status: Not fast-tracked.
First-round reviews received: 3 reports.
Revision cycles completed: 3 rounds.
Final version submitted: March 24, 2026

Disclaimer / Publisher's Note

The statements, opinions, and data contained in this article are solely those of the authors and do not necessarily represent the views of the *Journal of Hunan University (Natural Sciences)* or its editorial team. The journal and its editors disclaim any responsibility for injury to persons or property resulting from any ideas, methods, instructions, or products referred to in the content of this article.