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THE ROLE OF DIGITAL GAMIFICATION IN THE PROFESSIONAL TRAINING OF FUTURE SPECIALISTS IN LIBRARY, INFORMATION, AND ARCHIVAL STUDIES AT TECHNICAL UNIVERSITIES

This article explores the role of digital gamification as an innovative pedagogical technology in the professional training of future specialists in library, information, and archival studies at technical universities. The study responds to the increasing need for modern didactic approaches that align with the digital transformation of education and the evolving demands of the information society. The authors conduct a comprehensive review of national and international research, identifying the integrative potential of gamification to develop professional, cognitive, and digital competencies. The methodological framework combines theoretical analysis, synthesis of empirical findings, and practical evaluation of digital platforms and simulations. The article highlights how gamification supports motivation, emotional involvement, and critical thinking through immersive, scenario-based learning that reflects real professional contexts. It also addresses concerns about superficial implementation, emphasising the need for conceptually coherent and context-sensitive integration. Key findings show that digital gamification facilitates deep learning and professional identity formation when embedded within structured, competence-oriented curricula. Its effectiveness is influenced by variables such as learning format (online/blended), student characteristics, and educational funding model. Gamification emerges not merely as a motivational tool but as a multidimensional pedagogical strategy that enhances didactic interaction, promotes reflective learning, and supports adaptive thinking. The authors conclude that digital gamification should be seen as a core component of an evolving educational paradigm. Further research is recommended to refine adaptive models of gamification and to develop scalable digital ecosystems tailored to the specific needs of the library and information sciences sector.

Key words: professional training, future specialists, library, information and archival studies, technical universities, gamification, digital platforms, higher education.

Relevance of the Research Problem. In the context of the ongoing transformation of the educational landscape driven by the rapid development of digital technologies, there is an urgent need to enhance approaches to the professional training of specialists, particularly in the fields of library, information, and archival studies. Special attention should be given to the organisation of the educational process in higher technical education institutions, where digital culture constitutes an integral component of the learning environment. In this regard, the integration of innovative educational technologies, especially digital gamification, gains

particular significance as an effective tool for stimulating students' cognitive activity, developing their professional competencies, motivating engagement, and fostering digital literacy.

Digital gamification, as a pedagogical phenomenon, involves the incorporation of game mechanics into non-game educational contexts. This approach facilitates personalised learning, enhances students' engagement with professional tasks, and enables the application of acquired knowledge in virtually simulated scenarios that closely resemble real-life professional situations. It is particularly relevant for the training of information and communication professionals, as it aligns with the digitalisation of educational and professional pathways and responds to the challenges of managing large volumes of data, operating information systems, and utilising e-government technologies and digital archives. At the same time, within the framework of higher technical education institutions, the challenge of adapting gamification methods to the specific requirements of training future librarians, archivists, and information analysts is becoming increasingly pressing. This necessitates scientific validation and the development of suitable didactic models. The limited number of systematic studies in this area and the absence of methodologically grounded concepts of digital gamification in this particular field underscore the need for a comprehensive theoretical and methodological analysis of gamified educational practices, as well as the identification of principles, forms, methods, and tools for their effective implementation in technical universities.

Analysis of relevant research. Digital gamification is increasingly integrated into the professional training of future library, information, and archival specialists in higher education. Amid digitalisation and evolving educational formats, it addresses the need for methods that support theoretical learning while boosting student motivation, engagement, and emotional involvement. H. Skaskiv (2021) rightly notes that digital gamification, applying game mechanics such as badges, points, and rankings in non-game learning, effectively enhances pedagogical interaction, particularly in the humanities, where learning often involves abstraction and extensive information processing. In the context of the information society, the library and information sector increasingly demands digitally competent specialists adaptable to technological change. Once linked to entertainment, gamification is now recognised as a pedagogical tool that fosters cognitive, informational, and professional competencies, as well as critical thinking, digital literacy, teamwork, and self-reflection.

According to research by A. Klock et al. (2020), a gamified educational environment can cultivate a learning atmosphere grounded in principles of competition, individualisation, goal-setting, and continuous progress. We concur with existing research suggesting that the digital transformation of higher education necessitates rethinking traditional approaches to training future specialists in library, information, and archival studies. In response to global trends and technological advances, there is a growing need for innovative practices such as digital gamification, adaptive learning, content intellectualisation, and interdisciplinary formats.

Comprehensive literature reviews are essential to address gaps in professional training and to reveal the integrative potential of digital tools in librarianship. While some studies examine aspects of the learning environment, such as students' cognitive, emotional, and digital needs, these factors are rarely analysed in combination, resulting in a fragmented understanding of digital educational practices. Given the limited national focus on this issue, there is a clear need to establish a scientific basis for an effective digital ecosystem in the training of library and information professionals.

S. Tolochko (2023) underscores the imperative of digital transformation in the educational space, arguing that it demands not only the integration of information and communication technologies (ICTs), but also a rethinking of the didactic framework. Within this framework, digital competence should be viewed not as an isolated skill set, but as a cross-cutting attribute of the new generation of professionals. Similarly, V. Blinov (2019) advocates for a conceptual renewal of didactics through digital education. He emphasises a shift in the teacher-student dynamic from a traditional, transmission-based model of knowledge dissemination to one that prioritises interactive, project-oriented, and gamified forms of learning.

Gamification tools, which are increasingly being integrated into educational platforms, particularly within online and blended learning environments, offer new opportunities for enhancing students' cognitive engagement. O. Zhernovnykova et al. (2020) highlights that game mechanics such as points, rankings, badges, and competition not only foster increased motivation but also stimulate the development of cognitive activity, critical thinking, and competencies that are essential for professionals in the fields of library, information, and archival studies.

M. Shlenova's research (2021) further underscores the relevance of gamified practices as effective tools for cultivating emotional intelligence, which is particularly important in professions centred on social

communication, user services, and the organisation of information environments.

Recent literature defines digital competence as a multifaceted construct extending beyond technical skills to include self-regulation, reflection, critical thinking, and strategic planning, key for future library, information, and archival specialists. This integrative view is crucial amid crisis-driven changes, including social disruptions and shifts to hybrid or remote education.

I. Potiuk (2020) argues digital competence should be a strategic resource for personal growth, not just a reaction to challenges, with digital awareness central to 21st-century pedagogy. We agree, emphasizing that social communications specialists must master information management, source evaluation, and ethics, using digital didactics and educational psychology to foster learner autonomy and responsibility.

Ye. Antonov (2024) emphasizes digital competence's systematic nature, outlining a hierarchy of skills from basic technical literacy to managing complex information processes. He stresses digital security and rational risk management, advocating for formalized digital competencies through assessment matrices, contributing to standardized training in the information sector.

N. Vyshnivska et al. (2023) views digital transformation as sparking a new pedagogical ethics, stressing that effective digital interaction requires emotional intelligence, empathy, and respect for diversity. Her research focuses on students' adaptation to digital learning environments under stress, like war, proposing a pedagogy of care to ensure psychological well-being and resilience.

N. Kaidan & H. Taranenko (2023) view gamification as a powerful pedagogical technology with motivational potential, transforming learning into an emotionally engaging experience. It fosters not only knowledge acquisition but also reflection, self-assessment, social responsibility, and collaboration.

V. Khodunova (2023) explores gamified learning in distance and blended education, focusing on a student-centered, competency-based model. She analyzes digital platforms like Kahoot, Classcraft, and Moodle plug-ins, integrating game mechanics throughout the educational process. Gamification fosters sustained interest, particularly in training library, information, and archival studies specialists.

Digital gamification, combined with augmented and virtual reality, boosts cognitive activity and develops professional, communicative, and creative skills. I. Nicolaescu & V. Shynkariova (2022) stress that effective use requires pedagogical understanding, adaptation to professional contexts, and alignment with students' learning styles. Key factors for librarians and archivists include motivation, personalization, feedback quality, and simulation of real-world scenarios.

Previous studies on digital technologies in professional training often emphasize technology, neglecting cultural context, information ecology, and professional identity in library, information, and archival studies, limiting comprehensive digital transformation strategies. However, L. Daghestani et al. (2020) highlight adaptive gamified environments that tailor learning to individual student needs and professional goals.

Drawing on these findings, we conclude that, in the context of distance learning for future specialists in library, information, and archival studies, it is especially critical to develop digital infrastructures such as electronic archives, digital library collections, metadata analysis systems, and information flow management platforms, all grounded in artificial intelligence and blockchain technologies.

Thus, the current stage in the evolution of library and information education necessitates a systematic approach to designing digital learning environments that reflect the multidimensional nature of the educational process, encompassing cognitive, practical, emotional, and gamified components. Such an approach must integrate scientific, analytical, and practice-oriented elements to foster the development of competent, adaptable, and digitally literate professionals capable of operating effectively within a rapidly transforming information society.

Aim of the study. The article aims to substantiate the theoretical and methodological foundations for integrating digital gamification into the professional training of future specialists in library, information, and archival studies within technical universities. It seeks to develop a pedagogically grounded model for the application of gamification as a transformative educational strategy that enhances cognitive engagement, fosters digital competence, and aligns professional training with the realities of a rapidly digitalising information society

Results. Under the present conditions of educational digitalisation, the integration of gamification strategies into the training of future specialists in library, information, and archival studies at higher technical education

institutions has become particularly pertinent. Digital gamification is emerging as an innovative didactic paradigm that facilitates a synergistic combination of motivational, cognitive, practical, and communicative factors aimed at enhancing students' professional competencies. This paradigm is founded on a comprehensive set of pedagogical principles, including interactivity, personalisation of educational pathways, intensification of cognitive engagement, collaborative learning, and structured feedback within digital environments.

However, within the modern educational landscape, especially in the humanities, where information interaction, text centrism, archival analytics, and e-governance prevail, digital gamification should not be perceived merely as entertainment. Rather, it can serve as a tool for structured interaction between the learner and educational content. In this context, gamification assumes a new paradigm, not merely as a superficial overlay, but as a form of deep motivational architectonics that integrates cognitive engagement, emotional involvement, and immersive simulation of professionally relevant scenarios.

The use of digital platforms such as *Classcraft*, *EdApp*, the *Moodle Gamification Plug-in*, and educational simulations like *Digital Archivist* and *Library Tycoon* enables not only the formalisation of game-based scenarios into micro-practices, but also the multidimensional assessment of professional competencies, from information retrieval and processing to digital cataloguing strategies and the analytical description of documentary collections. Moreover, digital educational ecosystems such as *Google Workspace for Education*, *Microsoft Teams* with *Class Notebook*, and *Blackboard Learn* with integrated gamification features do not trivialise the learning process. On the contrary, they introduce elements of multilevel complexity, reflective learning, collaborative communication, and dynamic self-regulation.

Critique of gamification as a form of superficial entertainment is valid only when it is applied in a shallow manner, when game elements serve merely as external stimuli with no alignment to educational objectives. However, in well-structured, professionally oriented curricula where each gamified component adheres to a coherent didactic logic, gamification fosters a pedagogically relevant environment conducive to the development of complex cognitive constructs. Deep learning emerges not from the entertainment value alone but from the capacity of gamification to simulate authentic, multifaceted professional activities, thus enabling learners to internalise processes rather than simply engaging with content at a surface level.

Digital gamification in higher technical education involves not merely the mechanical incorporation of game elements into the learning process, but rather a profound transformation of didactic approaches, learning formats, pedagogical methods, and modes of interaction. Its effectiveness lies in the use of adaptive educational platforms (e.g., *Moodle*, *Google Workspace for Education*, *Classcraft*, *Kahoot*, *Quizizz*), simulation and training environments (e.g., *Simformer*, *EduSim*, *Learnis*), and flexible virtual learning resources that enable the modelling of professional situations and provide context-sensitive learning experiences. Digital resources such as electronic library platforms (*LibGuides*, *JSTOR*, *EBSCOhost*), open-access archival systems (*Europeana*, *OpenArchives*), interactive reference databases, and document repositories (*Archivematica*, *DSpace*) are integrated into gamified learning content, thus enhancing the informational and cognitive richness of the educational process.

The integration of digital gamification into the professional training of future specialists in library, information, and archival studies is implemented through a combination of active learning methods, including the case method, problem-based learning, digital storytelling, situational modelling, project-based learning, and collaborative problem-solving of professionally significant tasks. A crucial didactic vector is the development of virtual simulation environments that immerse students in modelled scenarios reflective of librarian, archivist, and information analyst roles. Within platforms such as *LibraryGame* or *DigitalArchivist Simulator*, students develop critical thinking, information literacy, digital resource management skills, and competence in digital communication formats.

In the context of digital gamification, motivational support systems, such as ranking structures, point accumulation, badges, levels, and dynamic achievement tracking, play a key role in sustaining cognitive engagement, fostering intrinsic learning motivation, and promoting accountability for learning outcomes. As O. Tkachenko (2015) aptly observes, however, the reward systems inherent in gamified education may risk cultivating a narrowly instrumental form of motivation, where the pursuit of game-related objectives supersedes the deeper assimilation of knowledge. In such cases, the acquired knowledge may remain at the level of situational application within the game context, without undergoing full internalisation or transfer to real-world professional contexts.

This phenomenon underscores the issue of superficial educational experiences, where, rather than fostering an internal cognitive drive to

master professional competencies, students perceive educational content merely as a component of a scenario, rather than as a means of personal and professional growth. Such criticism is particularly relevant in the context of training future professionals in the fields of information science, library science, and archival studies, where not only technical proficiency with digital systems is required, but also a deep understanding of information processing, data analysis, documentation, and communication within a virtual environment.

At the same time, the potential of digital gamification should not be overlooked as a means of stimulating creative thinking, fostering non-standard solutions, and developing cognitive flexibility. In this regard, it can be viewed as a form of post-non-classical pedagogy, in which knowledge is constructed by the learner as a result of their own activities within a context of simulated interaction. Game mechanics, especially when implemented on digital platforms such as *Kahoot!*, *Classcraft*, *Quizlet*, *Mentimeter*, as well as interactive simulations of professional activities (e.g., *LibraryGame*, *Archivist Quest*, *EduSim*), enable the simulation of situations closely aligned with real-world professional environments, thereby encouraging the adaptation of knowledge to practical experiences.

Within the structure of higher technical education, where emphasis is placed on algorithmization, logical thinking, and precision, gamification can serve to humanize the educational process. It creates conditions conducive to self-expression, collaboration, and emotional involvement, while simultaneously cultivating students' ability to analyze issues from multiple perspectives, an essential skill when working with information flows, digital collections, metadata databases, and digital document storage systems.

In our view, O. Tkachenko's (2015) arguments are well-founded, particularly in highlighting that gamification requires a measured and conceptually sound integration into educational practice. The primary goal is not to mechanically insert game elements into the content, but to design a pedagogical environment in which these elements function as instruments for fostering deep, meaningful, and transferable knowledge. In this regard, digital gamification should not be seen as an alternative to traditional educational forms, but rather as an integrative component that transforms pedagogical interaction in line with the principles of intellectual engagement, reflective thinking, and professional relevance.

Such mechanisms, implemented through platforms like *ClassDojo*, *Edmodo*, or *Socrative*, support the activation of students' subjectivity, encouraging independent, inquiry-based, and reflective learning.

Despite its evident potential to enhance motivational engagement, stimulate cognitive activity, and foster the development of soft skills and critical thinking, gamification's effectiveness cannot be universally standardised. It is contingent upon numerous factors that require rigorous scientific analysis, critical reflection, and deliberate pedagogical design.

In particular, one of the key parameters determining the appropriateness of gamified practices is the interplay between students' predominant individual cognitive characteristics and the systemic features of the educational environment. Gamification is not a one-size-fits-all solution; however, it holds promise as a valuable component of pedagogical design, especially in learning contexts characterised by the dominance of visual and analytical thinking, fragmented attention spans, and the pervasive influence of digital culture on educational communication.

The specific nature of the library, information, and archival studies necessitates a balanced integration of analytical approaches to information processing with well-developed critical thinking, information ethics, systems analysis, and digital literacy skills. In this context, gamification, particularly in the form of microgames, simulations, gamified case studies, and interactive quizzes, can serve effectively as a motivational trigger, especially at the early stages of studying disciplines that require contextualisation or interdisciplinary integration. However, the key to its success lies not in the quantitative expansion of game mechanics but in their qualitative, purposeful integration into the didactic architecture of the curriculum.

For first- and second-year students, who are just beginning their professional journey and are in the process of forming their professional identity, gamified elements can function as cognitive mediators. These elements stimulate cognitive activity and foster positive emotional associations with the learning process. Conversely, for senior students focused on the practical application of knowledge, gamification should be reframed from an entertaining format to one that emphasises problem-solving and analytical depth. This may include, for example, scenario-based simulations of database search strategies, interactive modules for describing archival units, or digital quests related to cataloguing.

The form of educational funding also influences the appropriateness of gamified approaches. Students enrolled on a fee-paying basis often

exhibit a greater need for emotional support, visualisation of complex information, and structured content—all of which can be effectively addressed through gamification technologies. For state-funded students, particularly those with high academic performance, gamification tends to serve a supplementary role, supporting material review, knowledge reinforcement, and sustaining cognitive engagement during periods of increased academic stress (e.g., exams, coursework deadlines).

Moreover, the organisation of the educational process significantly affects the effectiveness of gamified practices. In the context of distance or asynchronous learning, gamification is best implemented through elements of autonomous activity, such as interactive tests, thematic puzzles, or adaptive digital quests. In contrast, face-to-face or blended learning formats are better suited to team-based games, narrative simulations, and integrated platforms like *Classcraft* or *Genially*, which promote competition and collaborative interaction.

Conclusions and prospects for further research. In our view, gamification in the training of library, information, and archival specialists should not be regarded as an eclectic addition of game elements to the educational process, but rather as a strategically designed and methodologically balanced intervention. It must align with both the didactic objectives and the professional and applied contexts of the future activities of learners. When integrated into the educational structure of a technical university, digital gamification transcends its motivational and entertainment functions to become a powerful pedagogical instrument for shaping the professional identity of future specialists. Through the systematic application of digital game technologies, students achieve deeper assimilation of professional content, engage actively with digital information resources, develop competencies in managing information flows, enhance their ability to apply criterion-based assessment, and cultivate adaptive thinking and digital communication skills. Consequently, the didactic model of digital gamification in the training of future professionals in library, information, and archival studies represents a multi-level construct. It integrates contemporary digital technologies, game mechanics, psychological and pedagogical principles, methodological approaches, and resource frameworks. The goal is to create a digital educational environment capable of delivering effective professional training tailored to the needs of a new generation of specialists. This model

forms part of an innovative paradigm aimed at enhancing the quality of higher technical education in the broader context of digital transformation.

Future research should focus on developing adaptive gamification models that consider learners' cognitive styles and motivation, along with evaluating their long-term impact on digital competence and professional identity. The integration of AI for personalised feedback and engagement, as well as the creation of simulations that reflect real-world tasks in librarianship and archiving, offers promising directions. Ethical and cultural aspects of gamification, including data privacy and digital well-being, also warrant further study. Comparative analysis across educational formats and investigations into the development of soft skills through gamification will help refine its role in professional training within the digital information environment.

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АНОТАЦІЯ

Шленьова Марина. Роль цифрової гейміфікації у професійній підготовці майбутніх фахівців бібліотечної, інформаційної та архівної справи в закладах вищої технічної освіти.

У цій статті досліджується роль цифрової гейміфікації як інноваційної педагогічної технології у професійній підготовці майбутніх фахівців у галузі бібліотечної, інформаційної та архівної справи в закладах вищої технічної освіти. Дослідження є відповіддю на зростаючу потребу в сучасних дидактичних підходах, які відповідають цифровій трансформації освіти та мінливим вимогам інформаційного суспільства. Автори проводять комплексний огляд національних та міжнародних досліджень, визначаючи інтеграційний потенціал гейміфікації для розвитку професійних, когнітивних та цифрових компетентностей. Методологічна основа поєднує теоретичний аналіз, синтез емпіричних даних та практичну оцінку цифрових платформ і симуляцій. У статті підкреслюється, як гейміфікація сприяє мотивації, емоційній залученості та критичному мисленню завдяки імерсивному, сценарієвому навчанню, що відображає реальні професійні контексти. У ній також розглядаються питання щодо поверхневого впровадження, підкреслюючи необхідність концептуально узгодженої та контекстно-чутливої інтеграції. Ключові висновки показують, що цифрова гейміфікація сприяє глибокому навчанню та формуванню професійної ідентичності, коли вона вбудована в структуровані, орієнтовані на компетенції навчальні програми. На її ефективність впливають такі змінні, як форма навчання (онлайн/змішана), характеристики студентів та модель фінансування освіти. Гейміфікація постає не лише як мотиваційний інструмент, а як багатовимірна педагогічна стратегія, яка покращує дидактичну взаємодію, сприяє рефлексивному навчанню та підтримує адаптивне мислення. Автори роблять висновок, що цифрова гейміфікація повинна розглядатися як основний компонент еволюційної освітньої парадигми. Рекомендується провести подальші дослідження для вдосконалення адаптивних моделей гейміфікації та розробки масштабованих цифрових екосистем, адаптованих до конкретних потреб сектору бібліотечних та інформаційних наук.

Ключові слова: професійна підготовка, майбутні фахівці, бібліотечна, інформаційна та архівна справа, технічні університети, гейміфікація, цифрові платформи, вища освіта