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THE USE OF GAMIFICATION AS A DIGITAL EDUCATIONAL TECHNOLOGY IN SECONDARY EDUCATION IN EUROPEAN COUNTRIES

This article presents the results of a systematic review of 10 international research studies (2015–2023) focusing on the use of digital gamification technologies in general secondary education institutions (GSEIs) in European countries. The relevance of this study stems from the digital transformation of education, recognized as a strategic priority within the EU Action Plan on Digital Education (2021), as well as the underrepresentation of the secondary school level in the existing scientific literature, where the vast majority of studies focus on higher education institutions, leaving a significant research gap.

The aim of this article is to analyze best practices in the application of gamification in secondary education in European countries, as well as to formulate recommendations for their adaptation in Ukraine. The study is based on a number of theoretical methods: systematic content analysis, comparative analysis, generalization, and systematization. In the first stage, 120 scientific publications and abstracts were analyzed, after which, through the consistent application of quality criteria, 10 key sources were identified that represent the main trends in the application of digital gamification technologies in secondary schools in European countries.

Based on the results of the analysis, eight specific case studies from the United Kingdom, Croatia, Sweden, Portugal, and Germany were selected and described. Each case was examined according to nine parameters: technology name, type, country, educational level, subject, format of use, description of the practice, results, and effectiveness. Among the technologies analyzed were motivation management platforms (ClassDojo), interactive polling tools (Kahoot!, Quizlet, Plickers), role-playing environments (Classcraft), and immersive game installations. It was found that gamified technologies have a consistently positive impact on student motivation and engagement, although effectiveness varies depending on gender, the presence of special educational needs, and the teacher's pedagogical approach. The accumulated international experience is viewed as a promising foundation for improving practices in domestic general secondary schools in the context of implementing the New Ukrainian School (NUS).



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Keywords: gamification, digital technologies, secondary schools, ClassDojo, Kahoot, immersive learning, motivation, student engagement, case study.

Лунячек В. Е., Рогинський С. В. Використання гейміфікації як дидактичної цифрової технології у закладах середньої освіти країн Європи. У статті представлено результати систематичного аналізу 10 міжнародних наукових досліджень (2015–2023), присвячених використанню цифрових технологій гейміфікації у закладах загальної середньої освіти (ЗЗСО) в країнах Європи. Актуальність дослідження зумовлена цифровою трансформацією освіти, визнаною стратегічним пріоритетом у рамках Плану дій ЄС у сфері цифрової освіти (2021), а також недостатньою представленістю шкільного рівня в наявній науковій літературі, де переважна більшість досліджень сфокусована на закладах вищої освіти, що залишає значний дослідницький пробіл.

Метою статті є аналіз кращих практик застосування гейміфікації у середній освіті країн Європи, а також формулювання рекомендацій для їх адаптації в Україні. Дослідження засноване на низці теоретичних методів: систематичний контент-аналіз, порівняльний аналіз, узагальнення та систематизація. На першому етапі було проаналізовано 120 наукових публікацій і тез, після чого шляхом послідовного застосування критеріїв якості виокремлено 10 ключових джерел, що репрезентують основні тенденції у застосуванні технологій цифрової гейміфікації у ЗЗСО країн Європи.

На основі результатів аналізу, було відібрано та описано вісім конкретних тематичних досліджень з Великої Британії, Хорватії, Швеції, Португалії та Німеччини. Кожен кейс розглядався за дев'ятьма параметрами: назва технології, тип, країна, рівень освіти, навчальний предмет, формат використання, опис практики, результати та ефективність. Серед аналізованих технологій – платформи управління мотивацією (ClassDojo), інструменти інтерактивного опитування (Kahoot, Quizlet, Plickers), рольові середовища (Classcraft) та іммерсивні ігрові інсталяції. Було встановлено, що гейміфіковані технології мають стабільно позитивний вплив на мотивацію та залученість учнів, хоча ефективність варіюється залежно від гендеру, наявності особливих освітніх потреб та педагогічного підходу вчителя. Накопичений міжнародний досвід розглядається як перспективна основа для вдосконалення практики у українських ЗЗСО в контексті впровадження Нової Української Школи (НУШ).

Ключові слова: гейміфікація, цифрові технології, заклади загальної середньої освіти, ClassDojo, Kahoot, іммерсивне навчання, мотивація, навчальна залученість, кейс-аналіз.

Introduction. The digital transformation of society is inevitably changing the approach to educational practices, and simply upgrading school technology is not



enough. With the growing popularity of game mechanics in everyday life, teachers' interest in using these mechanics in educational activities has surged. Gamification is the application of game design elements in a non-game context. It is currently applied at various educational levels, but researchers' attention is focused primarily on higher education, while at the school level this issue remains largely under-researched (Vrcelj et al., 2023; Dichev, Dicheva, 2017).

This topic is particularly relevant for European countries. The digital transformation of education has been recognized as a strategic priority (Digital Education Action Plan, European Commission, 2021). Therefore, the implementation of gamified solutions in general secondary education takes on not only pedagogical but also political significance. Despite this, there is a critical shortage of verified cases of digital gamification technologies being applied in general secondary education.

Researchers from around the world, and particularly from Europe, have already turned their attention to the topic of gamification in the educational process. Hamari, Koivisto, and Sarsa (2014) conducted a meta-analysis of empirical studies and identified a general increase in motivation, although the academic results in the analyzed study remain insufficiently specific. Dichev and Dicheva (2017) confirmed in their critical review that most studies focus on higher education institutions, which remains a significant methodological limitation. A more systematic study for the school level is that of

Vrcelj, Hoić-Božić, and Holenko Dlab (2023): their review of the Web of Science and Scopus databases (2017–2023) confirmed the positive impact of gamification on student engagement, while highlighting the lack of controlled empirical studies on the topic. In analyzing digital technologies in physical education, Jastrow et al. (2022) identified gamification as one of the leading trends. Buck (2017), in turn, noted that the careless use of gamified rewards can undermine the reflective potential of education.

Thus, despite the existing theoretical framework, the specific applications of gamified technologies in general secondary education in European countries remain under-researched, particularly in terms of systematic analysis with clear analytical generalizations.

Aim and tasks. The purpose of this article is to analyze best practices in the use of digital gamification technologies in European countries and to formulate recommendations for their successful application in Ukraine.

Research methods. The study is based on a combination of theoretical methods. At the first stage, a Python script was used to conduct a contextual analysis of 120



academic articles and abstracts on the use of digital gamification technologies in education. The initial corpus was identified through a keyword-based search (*digital gamification, gamification in education, gamification in secondary school, GBL in education*) in the following databases: Semantic Scholar, CrossRef, OpenAlex, Google Scholar, ResearchGate, and CORE. This search yielded 296 sources. Subsequently, only open-access journal articles and conference proceedings were retained, reducing the dataset to 120 publications. Sources containing keywords such as *non-digital gamification, college, university, and higher education* were then excluded, resulting in a corpus of 44 articles. The dataset was further refined by excluding non-European studies, which reduced the number of articles to 24. At the final stage, a manual title and abstract screening was conducted against predefined eligibility criteria. This process resulted in the selection of 10 key sources that reflect the main trends in the use of gamification in general secondary education in European countries.

The analytical procedure consisted of five sequential steps: an initial review of 10 sources; a description of each case according to nine parameters (technology name, type, country, education level, subject, format of use, description, results, and effectiveness); comparative analysis and thematic grouping; formulation of analytical generalizations. Publications containing exclusively theoretical material were included in the analysis only in the overview section.

A systematic content analysis of the aforementioned ten publications served as the methodological foundation for this study. The analysis and synthesis of scholarly and pedagogical sources allowed us to outline the theoretical foundation of the study. A comparative analysis was used to compare case studies from European countries based on standardized parameters. The generalization and systematization of scientific approaches enabled the identification of leading trends and patterns. The criterion-based selection method allowed us to identify only relevant examples in which specific instances of digital gamification technology implementation were documented.

Research results. Based on the analysis of ten international scientific studies, it was established that the application of digital gamification technologies in general secondary education is a pedagogically significant and practically necessary direction for the development of modern education. Eight specific cases, grouped by country, were selected and described.

Cases from the United Kingdom. Benton et al. (2016) described the use of the ClassDojo platform in two specialized support centers for children with dyslexia. Two teachers used the platform over the course of one semester in individual and group sessions with students aged 9–12 with special educational needs. ClassDojo functions



as a platform for managing student behavior and motivation: the teacher rewards students with points for various behavioral and academic actions, flexibly adapting the system to the students' needs. The results showed improved motivation: earning points was perceived by students as positive feedback and stimulated engagement.

Colvert et al. (2016) studied an immersive theatrical installation titled Prospero's Island. The project was implemented in two phases: in the fall of 2014, the immersive installation was set up in a school, and in the spring of 2015, teachers conducted follow-up activities in their classrooms. The participants were 7th-grade students aged 11–12 who were studying Shakespeare's play *The Tempest*. Students moved between locations, completed tasks, and solved puzzles under the supervision of the Game Master and assistants in a role-playing format. As a result of this experiment, there was an increase in engagement and motivation in learning English, an improvement in the quality of written work, a deeper understanding of Shakespeare's texts, as well as a transformation in teachers' pedagogical practices.

Bacon, Osunde, and Mackinnon (2018) studied the motivational impact of two specially designed digital educational games on students aged 11–14 in schools in southeastern England. The subject of the study was basic concepts in computer science. Based on preliminary qualitative research, two games with contrasting characteristics were developed: one focused on features appealing to girls (cooperation, narrative, aesthetic appeal), and the other on features appealing to boys (competition, goal achievement). Both groups, consisting of 152 students of each gender, played both games during a lesson, after which they completed an online survey. The study convincingly demonstrated that a single game cannot be equally motivating for all students.

A case from Croatia. Šiptar (2019) described the implementation of digital gamification tools in two elementary schools in Croatia as part of library sessions and information literacy lessons. The school librarian used several tools: Kahoot!—to reinforce knowledge through competitive quizzes; Quizlet—for individual review of vocabulary and terminology; Plickers—for polling using QR cards without gadgets; and Classcraft—for team-based role-playing and behavior management. All tools are web-based resources and were used sporadically in an in-person setting. The results showed increased student interest in library sessions, more active participation in the educational process, and improved social skills.

A case from Sweden. Mårell-Olsson (2021) investigated the use of gamified online lessons to develop 21st-century skills among upper-level students in Sweden (high school, ages 16–19). The project was implemented remotely in the spring of 2020



during the COVID-19 pandemic as part of a design-based research project. Master's students at Umeå University, in collaboration with two teachers, developed gamified online activities on virology and immunology for 26 high school students. The activities included game scenarios, team tasks, and online quizzes with leaderboard and level-up elements. The study identified three main themes: principles of instructional design, student experiences, and teacher experiences. Teachers viewed gamification as a catalyst for motivation, and students rated this interactive format more positively than traditional online lectures.

A case from Portugal. Araújo, Zagalo, and Carvalho (2015) described a research project by the Universities of Coimbra and Minho, in which a large-scale survey was conducted in 2013 among 697 students in grades 10–12 (aged 15–18) regarding their preferences for games on mobile devices. Based on an analysis of the most popular games using the principles of James G. (2003) and the mechanics of Karl Kapp (2012), a framework was developed for creating gamified mobile activities in high school. It was found that the most popular games are shooters, sports simulators, role-playing games, and puzzles; gender preferences in games were also observed. The proposed framework was based on game mechanics appropriate for the target age group.

Systematic review (Germany). Jastrow et al. (2022) conducted a systematic review of the international literature (BISP-Surf: 413 sources, FIS: 898 sources) to investigate the role and forms of digital technologies in school physical education between 2009 and 2020. Four main areas were identified: health and physical activity, gamification, wearable technologies, and cooperative learning. In the context of gamification, the following technologies were highlighted: video recording and self-analysis of movements, geolocation games, sports gaming (Just Dance, Wii Sports), and augmented reality elements in the gym. The results showed that gamification increases motivation for physical activity and allows for the engagement of less active students through sports gaming.

Based on an analysis of the selected case studies, their common characteristics can be identified across several levels. By educational level: elementary, middle, and high school. By type of technology, three main categories were identified: student motivation management (ClassDojo), quizzes and interactive tools (Kahoot!, Quizlet, Plickers), and comprehensive gaming environments (Classcraft, immersive installations, digital educational games). The range of educational subjects is quite broad: from English language and literature to computer science, biology, and physical education. Regarding the format, the majority of implementations were conducted in-person, with one taking place remotely.



Discussion. Recommendations for Ukraine. Based on a systematic analysis of eight European case studies, a series of recommendations was formulated for the implementation of digital gamification technologies within the framework of the New Ukrainian School (NUS) Concept.

1. Phased implementation of gamified tools. The experience of Croatia and the United Kingdom demonstrates the advisability of a gradual implementation of digital tools. In the first stage, it is recommended to introduce accessible quiz platforms (Kahoot!, Quizlet, Plickers) that do not require significant resources and can be easily integrated into regular lessons. Subsequently, as teachers' digital competence grows, more complex solutions can be applied (ClassDojo, Classcraft).

2. Ensuring professional development for teachers. Research by Benton et al. (2016) convincingly demonstrates that the effectiveness of gamified technologies directly depends on the teacher's pedagogical approach. The Ukrainian general secondary education system requires a comprehensive system for training teachers in the design of educational programs for gamified lessons, especially within the framework of the New Ukrainian School (NUS) concept.

3. Addressing gender differences and special educational needs. The findings of Bacon et al. (2018) and Benton et al. (2016) emphasize the need for differentiated approaches to the development of game-based solutions. It is important to avoid standardized scenarios and provide for variability in mechanisms for different groups of students. The implementation of adaptive and inclusive gamified tools aligns with the principles of NUS.

4. Adaptation to the conditions of distance and blended learning. The Swedish experience (Mårell-Olsson, 2021), gained during the COVID-19 pandemic, is particularly important for Ukraine, where a significant portion of students are learning remotely or in a blended format due to the full-scale invasion by the Russian Federation. Gamified online tasks can effectively counteract the monotony of online classes, increase student motivation and engagement in the educational process, and foster the development of social and digital skills.

5. Building an evidence base and conducting pilot studies. Since the systematic Ukrainian evidence base regarding the effectiveness of gamification in general secondary education remains limited, it is recommended to organize pilot studies and experimental implementations of gamified tools with mandatory pedagogical monitoring and evaluation of results. This will allow for the formation of a domestic evidence base and the determination of conditions and effectiveness within the context of Ukrainian education.



Conclusions. Based on the conducted study, the following generalizations have been formulated that can be used to improve the quality of educational services in Ukraine's secondary education system:

1. Gamification is an effective tool for increasing student motivation and engagement regardless of the country or subject. At the same time, its impact on academic outcomes varies depending on the conditions of application, which necessitates further research in the domestic context.

2. The effectiveness of gamification as a digital instructional technology depends to a significant extent on students' individual characteristics, the teacher's pedagogical approach, and the level of their professional training. Gender differences, the presence of special educational needs, and the quality of instructional design are also important factors.

3. In European countries, gamification is used in various forms (digital platforms, quizzes, game environments) and at all levels of secondary education, which demonstrates its versatility and high adaptability. This points to the further expansion of its use in educational practice.

4. International experience with gamification can be effectively implemented in Ukraine provided it is introduced in phases. Teacher professional development is of particular importance, requiring theoretical justification and the development of appropriate pedagogical technologies.

Prospects for further research are linked to the creation of a national evidence base through the conduct of pilot studies in this field. Another important area is the assessment of teachers' information and digital literacy to determine priorities in the development of professional development programs.

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