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Article

Enhancing Sustainable E-Learning Motivation Through Gamification

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Abstract

This study analyses the application of games and gamification to increase student motivation and ensure an effective and sustainable learning process in the modern sustainable environment of digitalisation and e-learning. Recent changes have revealed that traditional teaching methods do not always sufficiently engage students, increasing the risk of decreased motivation to learn and poorer achievement. Gamification, which is based on the integration of game design elements – points, levels, badges, challenges – into learning activities, can help reduce these risks by promoting student autonomy, a sense of competence and social engagement. The study presents the application of a gamification system based on case analysis using an educational platform that allows the creation of educational games and the assessment of student engagement in real time. The results show that gamification methods significantly increase student activity and motivation to learn, while integrated game elements improve student's motivation and learning experience. Based on the analysis, the paper presents conclusions and recommendations for the effective, high-quality, and sustainable organisation of the modern education process based on gamification.

Keywords: gamification; educational efficiency; information system

1. Introduction

In today's educational environment, the rapidly increasing scale of digitisation and the post-pandemic surge in demand for distance learning have revealed that traditional teaching methods do not always ensure sufficient student engagement and motivation. As a result, educators are looking for new ways to improve the learning experience and increase student engagement in virtual and blended learning environments. One of the most effective tools for addressing this challenge is gamification – the application of game design elements to non-game activities in order to increase student interest and encourage them to participate more actively in the learning process. Gamification allows teaching content to be supplemented with elements such as points, levels, badges, or progress tracking, which help to create a clearer engagement mechanism and provide students with tangible feedback.

The effectiveness of gamification is based on contemporary educational theories, the most important of which is self-determination theory. According to this theory, student engagement is enhanced by satisfying their needs for autonomy, competence and social connection. Gamification elements such as clearly visible progress, choice and collaborative activities help to meet these needs and create more favourable learning conditions. Research shows that such elements can have a positive effect on students' cognitive, motivational and behavioural indicators, as well as contribute to more active participation in the educational process.

In modern practice, specialised online platforms are increasingly being used, allowing teachers to easily and quickly integrate gamification mechanics into their lessons. Such platforms allow teachers to create various tasks and activities, monitor students' progress and personalize teaching content according to students' needs. Their use increases student activity, engagement and long-term

motivation to learn, while giving teachers more opportunities to manage the learning process and ensure its effectiveness.

However, educators also face challenges when applying gamification: lack of time, lack of suitable platforms and lack of methodological knowledge are obstacles to the wider implementation of gamification solutions in the education process. These problems reveal the need to create specialised tools that would simplify the integration of gamification and be adapted to the Lithuanian educational context. With this in mind, this study presents the informational gamification platform, created to help teachers easily use gamification elements in their lessons and systematically evaluate their impact on student motivation.

Moreover, we present empirical research on the application of gamification, which allows us to assess how gamification elements contribute to strengthening students' motivation to learn and improving the quality of the educational process.

Gamification, as a method and set of principles, is becoming an increasingly important tool in modern society. Initially applied in the field of entertainment and leisure, today it is widely used in education, business, healthcare and many other areas. When defining gamification, the definition provided by Deterding et al. is most often used, which states that gamification is "the use of game design elements in non-game contexts" [1]. This definition highlights two key aspects: the identification of game elements and their transfer to contexts that are not traditionally associated with games.

The effectiveness of gamification in education is based on theoretical models. One of the main ones is the theory of self-determination, formulated by Edward Deci and Richard Ryan. This theory states that student engagement is encouraged by satisfying the needs for autonomy, competence and social connection. By applying gamification elements, such as levels or badges that clearly reflect progress, students are given the opportunity to experience progress (competence), choose the sequence of tasks or methods of activity (autonomy), and communicate and collaborate with classmates to achieve common goals (social connection) [2]. Csikszentmihalyi's flow theory states that optimal learning experiences occur when the level of challenge matches the learner's abilities [3]. Gamification facilitates the structuring of a level-based, progressive learning system that enables learners to access new learning opportunities upon reaching a certain level. According to the user-centered model proposed by Scott Nicholson, students' critical introspection allows them to analyse and reinterpret their experiences and beliefs, thereby strengthening their intrinsic motivation [4]. In Marczewski's RAMP model of intrinsic motivation, used in gamification, purpose is a key element together with mastery (developed through progressively overcoming challenges suited to students' abilities), relatedness (the social and emotional connections among learners), and autonomy (freedom of choice) [5]. Purpose can be altruistic (the opportunity to help others) or meaningful (understanding why certain actions matter). The relative importance of these factors is determined by the learner's individual characteristics. Reinforcement theory, which is closely associated with behaviourism, emphasizes the importance of external learning motivators. Rewards and leaderboards function as external motivators [6]. Zichermann and Cunningham classify a broader set of elements under extrinsic motivation, including a person's position relative to others (status), expressed through achievements (badges), levels, and visibility on leaderboards; new opportunities to access specific resources; authority or power over others; as well as rewards and prizes [7]. Coelho and Abreu recommend focusing not on isolated gamification elements, but on the principles of integration (the interconnections among elements), emergence (recognition of the unique properties that arise when elements function as a system), synergy (the combined effect of elements producing better outcomes than when used individually), and context (consideration of situational, cultural, and other relevant factors) [8].

Scientific research confirms the effectiveness of these theories in practice. The organising of learning based on the structural gamification framework in the Moodle environment—implemented through staged learning activities (Activities), feedback design (Points), progressive learning through levels (Achievements), and reinforcement design (Rewards)—improved students' engagement and

academic outcomes [9]. Janakiraman and Koehler determined that implementing gamification within virtually mediated team activities encouraged learner dialogue, open communication, and collaboration in learning tasks [10]. Point and reward systems allow teachers to award points for completed tasks, active participation, and other achievements. Such recognition stimulates students' intrinsic motivation and increases their engagement in learning activities [11]. Badges and achievement mechanisms act as visual signs of recognition and achievement that reflect the student's progress. A study by Abramovich et al. reveals that properly designed badges can have a positive effect on student motivation and learning outcomes, especially when linked to clear learning goals [12]. A large-scale review conducted by J. Hamari, J. Koivisto and H. Sarsa shows that in most cases gamification has a positive effect on student motivation and learning outcomes, although effectiveness is highly dependent on the context of the specific activity [13]. Meta-analyses also confirm that gamification statistically significantly improves students' cognitive, motivational and behavioural indicators [14,15]. Recent studies have revealed that the greatest impact is observed in primary school classes and contact teaching environments [16,17]. Nevertheless, gamification is applied across numerous educational contexts, extending to higher education, employee training, and e-learning environments [18,19]. These theoretical aspects form the basis for technological solutions that allow gamification to be integrated more effectively into modern education.

Various levels of gamification can be implemented, ranging from the most basic—such as game interface design patterns that incorporate badges, leaderboards, levels, and other elements—to more advanced game design patterns and mechanics that introduce time and resource constraints, game design principles and heuristics that support sustained engagement, and ultimately the application of comprehensive game models and game design methods [20].

In modern education, the implementation of gamification elements is becoming increasingly accessible due to the development of specialised gamification platforms. These platforms provide educators with tools that allow them to easily integrate gamification elements into the teaching process without in-depth programming knowledge or significant time investment. The use of gamification platforms in education reveals new ways of increasing motivation in education, while addressing the traditional barriers faced by educators seeking to implement gamification elements in their practice [21].

Gamification platforms used in education can be divided into several main categories according to their functionality and application possibilities. One such category is integrated learning management systems with gamification elements, such as Moodle with gamification plugins, Canvas, and Blackboard with gamification features. A study by Dicheva et al. found that these systems allow gamification elements to be incorporated into existing learning management infrastructure, enabling tracking of student progress, creating achievement systems and leaderboards, thereby increasing student engagement in the learning process [22]. Lampropoulos et al., having conducted a systematic literature review and examined 139 studies related to gamified LMSs in the period from 2013 to 2025, found that the most frequently used elements are badges (62,4%), points and scores (61,3%), leaderboards and rankings (52,7%), as well as quests, challenges, tasks and gamified activities (44,1%), stages and levels (37,6%), rewards, awards, achievements, and others [23]. Gamification platforms allow for the creation of a progressive learning path that continuously adapts to the learner's progress and abilities. However, the effectiveness of using gamification elements strongly depends on careful design and proper alignment with the context [23].

Abbes et al. highlight that students demonstrate greater engagement, curiosity, and self-confidence when learning is personalized to their needs using generative artificial intelligence (AI) [24]. The authors argue that generative AI can further enhance gamification-based learning by providing individualized tasks and games. Many studies suggest combining AI and gamification to automatically generate learning content, assess tasks, and adapt them to learners' needs. AI enables more flexible adjustment of task difficulty, personalization of rewards, and the creation of tailored learning experiences [25]. This not only enhances learning effectiveness but also saves teachers' time.

Teachers can devote more time to motivating learners, initiating discussions, and fostering critical thinking [26].

Bennani et al., Rana and Chicone, and others emphasize that integrating AI with gamification in ways that accommodate diverse contexts and player needs can dynamically engage learners and sustain their involvement over longer periods of time [27–29].

2. Materials and Methods

3.1. Research Design

Based on theoretical and practical analysis, as well as research into the needs of educators, a specialised gamification platform prototype was developed for integration into the Moodle educational environment.

The research is focused on two research questions:

RQ1 – how to ensure e-learning motivation through gamification?

RQ2 – how to make interoperable and effective educational platform for games design and gamification.

The development process followed a structured methodology consisting of several key stages: concept formation, definition of functional and non-functional requirements, system design, programming, testing, and implementation (see Figure 1).

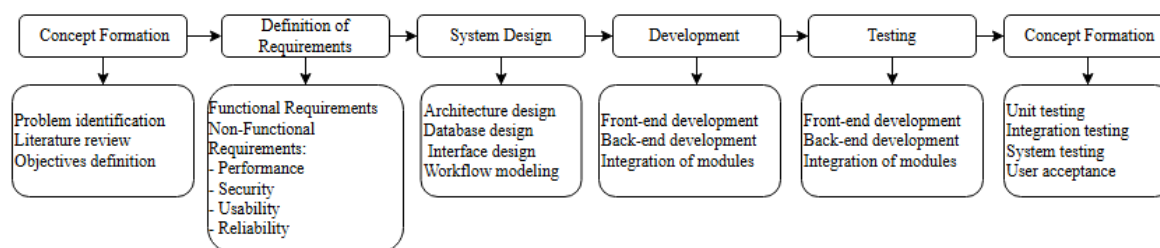


Figure 1. Research methodology framework.

Particular emphasis was placed on user experience to ensure that the platform would be intuitive, accessible, and efficient for both teachers and students. This focus was critical in promoting long-term engagement and supporting sustainable e-learning practices.

The conceptual phase involved identifying pedagogical challenges in digital learning and aligning gamification strategies with educational objectives. Drawing on principles from Educational Technology and Self-Determination Theory, the prototype integrated elements such as points, badges, levels, and progress tracking to enhance learner motivation. Functional requirements included user authentication, activity tracking, adaptive feedback, and integration with Moodle course structures. Non-functional requirements addressed system usability, scalability, performance, and data security.

During the design and programming stages, iterative development practices were applied to refine system architecture and interface components. Continuous testing was conducted to identify usability issues and ensure system reliability. The implementation phase involved deploying the prototype within a controlled educational setting, allowing real users to interact with the system and provide feedback.

3.2. Ethics

This research did not require special approval of ethical services. GDPR data is protected and is not provided for open distribution. The teachers experts also were registered users in the multifunctional educational platform. All participants who completed the evaluation survey were experts in e-learning having over the 10 years' experience in technologies enhanced learning and have been informed of the purpose of the survey via the website.

3.3. Data Collection

Data collection took place in 2025.

3.4. Survey

The online survey was developed using google sheets and it took approximately 15 minutes to complete. Multiple questions and open questions were used in the evaluation process. The qualitative data focused on the overall impression, knowledge change and the effectiveness of the educational platform. The data of the survey was analysed according to the Likert scale.

3.5. Focus Group

In total, 18 teachers experts were invited to evaluate the developed prototype. An expert report is the summary of the opinion of the expert group. The involved 18 teachers who tested the platform in their teaching activities. On average, the games created by one teacher were tested by about 16-20 students, which shows the considerable scope of the platform's application and its potential to reach a wider audience

3.6. Main Findings

The findings highlighted the uniqueness of the proposed solution, particularly its deep integration with Moodle, its alignment with formal educational curricula, and its focus on long-term motivation rather than short-term engagement. Unlike general-purpose gamification tools, the developed prototype offers a tailored approach specifically designed for educational contexts, enabling educators to seamlessly incorporate gamified elements into their teaching workflows while maintaining pedagogical integrity.

To evaluate the competitive advantage of the developed platform, a comparative analysis was conducted with other popular gamification platforms used by educators in Lithuania. These included tools such as Kahoot!, Quizizz, and Classcraft. The comparison (see Table 1) examined features such as integration capabilities, customization, pedagogical alignment, and support for sustained engagement.

Table 1. Comparison of existing gamification platforms.

Functionality	Gamifie.io	Kahoot!	Quizizz	Wordwall
Game collection feature	+	-	-	-
Artificial intelligence integration for content generation	+	+	+	-
Full mobile device support	+	?	?	?
Feedback system for students	+	+	+	+
Student progress tracking tools	+	+	+	-
QR code system for sharing games	+	+	+	-
Alignment with the curriculum	+	-	-	-
Community-based content sharing	+	+	+	+

Particularly valuable features include the integration of artificial intelligence for content generation, game sets and adaptation to the education programme. These features give the platform a competitive advantage over international gamification platforms, although in some areas (e.g., variety of game types) international platforms still have an advantage due to their longer

development period. Quantitative research methods are used for gathering information via numerical data. This type is used to measure behavior, personal views, preferences, and other variables.

Data gathered from quantitative studies was analyzed to address the empirical questions. Some of the commonly used quantitative methods are polls, surveys, and longitudinal or cohort studies.

3. Results

3.1. Purpose of the System Prototype and Characteristics of Participants

An analysis of the results of a sociological survey revealed a clear need to create a specialised gamification platform tailored to the educational context. Based on this data, the informational gamification system prototype was created, whose main purpose is to increase students' motivation to learn by integrating gamification elements into the educational process. The system is designed as a modern educational platform whose core purpose is to enhance learning through interactive and engaging digital experiences. One of its key characteristics is a strong focus on educational games that are specifically adapted to the education programme, ensuring alignment with national curricula, learning objectives, and assessment standards. This adaptation allows the platform to be effectively integrated into formal education processes while maintaining pedagogical relevance and academic rigor.

A major emphasis is placed on usability. The system features an intuitive and user-friendly interface that is accessible to both students and teachers, regardless of their level of technical expertise. Clear navigation, visually consistent design elements, and logical workflows ensure that users can easily access content, participate in activities, and manage learning tasks without unnecessary complexity. This ease of use supports wider adoption of the platform in everyday teaching and learning contexts. The platform also incorporates reliable assessment mechanisms that enable continuous and effective monitoring of student progress. These mechanisms allow educators to track learning outcomes, identify knowledge gaps, and evaluate skill development over time. At the same time, students receive timely feedback on their performance, which supports self-reflection, motivation, and independent learning. The assessment functionality is designed to complement game-based learning by integrating evaluation seamlessly into the learning process. An important innovative aspect of the system is its ability to integrate artificial intelligence technologies. These technologies can be used to generate game content dynamically, adapt tasks to different learning levels, and support personalized learning experiences. The use of artificial intelligence reduces the time required to prepare educational materials while expanding the variety and depth of available content. From a technical perspective, the platform is built using a two-tier architecture that supports different user levels. The user subsystem is primarily intended for students and focuses on participation in educational games that reinforce knowledge and develop skills in an interactive environment. Its main objective is to transform learning into an engaging experience that stimulates curiosity, encourages active participation, and supports sustained interest in the subject matter. The educator subsystem is designed for teachers and provides comprehensive tools for creating, managing, and sharing educational games with students. Teachers can develop content manually or leverage artificial intelligence features to generate materials efficiently, ensuring thorough topic coverage while reducing workload and supporting innovative teaching practices.

3.2. System Processes and Their Subsystem Interability

The system consists of two main subsystems designed to support gamified learning for students and educators. The user (student) subsystem enables easy access to learning games through registration, login, and password recovery (see Figure 1). Students can join games using generated codes, QR codes, or shared links, complete various game-based tasks, receive results, and monitor their learning progress through achievements and statistics. This supports motivation, engagement, and self-reflection.

The educator subsystem provides comprehensive tools for managing educational games (see Figure 2). Educators can create new games manually or with AI assistance, edit and improve existing content, and organise games into thematic sets aligned with teaching goals. The system also allows educators to share games with students via access codes or links and to track and analyse student performance, progress, and learning effectiveness.

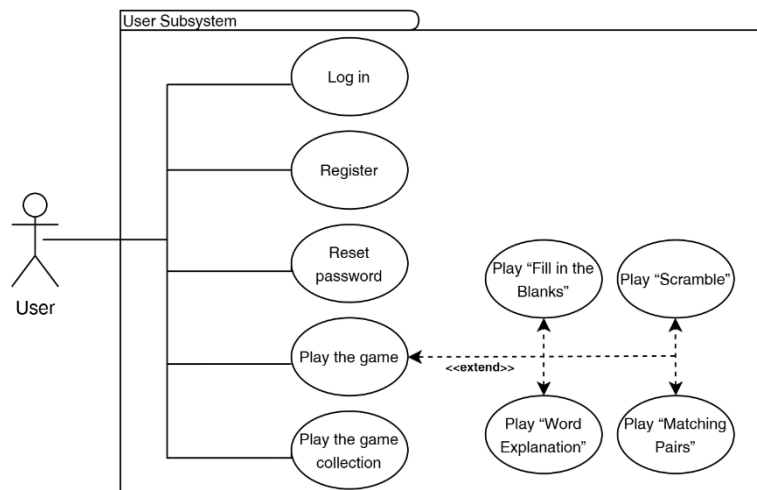


Figure 2. Diagram of use cases for the user subsystem.

The user subsystem implements functionality that allows students to easily access and complete gamified learning tasks. The main processes include: (1) access management: registration, login and password recovery; (2) game access: via generated codes, QR codes, or direct sharing, (3) game performance: solving various types of games and obtaining results; (4) progress tracking: viewing personal achievements and statistics.

The educator subsystem includes comprehensive game management functionality that allows educators to: (1) create new games: both manually and with the help of artificial intelligence; (2) edit existing content: update, supplement and improve existing games, (3) organise games into sets: create thematic game packages according to teaching objectives; (4) share content: generate access codes and links for students; (5) track student progress: analyse results and learning effectiveness.

The interaction of all subsystems is ensured by centralised data exchange, which allows for the efficient exchange of information between different parts of the platform. The subsystem is designed to ensure smooth data synchronisation between the content created by the educator and the user interface, rapid processing of results, feedback, and system integrity and data security at all points of interaction (see Figure 2).

The UML use-case model (Figure 2) of the *User Subsystem*, showing how a user interacts with the system. The stick figure denotes the *User actor*, who initiates all actions. *Core use* cases include *Log in*, *Register*, and *Reset password*, which handle authentication and account management. After accessing the system, the user can *Play the game* or explore a *Play the game* collection feature.

The *Play the game* use case is extended by several specific game modes, indicating optional or specialized behaviors. These include *Fill in the Blanks*, *Scramble*, *Word Explanation*, and *Matching Pairs*. The <<extend>> relationship suggests that these modes enhance or customize the main gameplay experience rather than functioning independently.

Moreover, the diagram highlights the system's structure by separating basic account functions from interactive gameplay features, while emphasizing flexibility through multiple game variations.

The user subsystem defines the functionality through which the end user of the system accesses the game-based learning objects, manages access to the system, and authenticates themselves. Below are formal explanations of each use case and the logic of their interrelationships.

User – a physical user and /or student of the system who does not have content editing rights. Their privileges are limited to registration, login and the completion of assigned games or sets of games.

The system provides core user functions that enable secure access and participation in learning activities. Logging in initiates the authentication process by verifying user credentials and is a required step to access all available learning services and perform any further actions. Registration allows new users to create an account, during which a unique identifier is assigned and a basic set of access rights is granted upon the first login. The password recovery function supports users who have forgotten their credentials by generating and sending a password reset link to their registered email address, ensuring continued access to the system. Once authenticated, users can engage in the primary learning activity by solving educational games, which represents the main interaction with the platform and supports the learning process through game-based tasks, i.e., (1) log in – by entering their login details, the user initiates the authentication process, after which they gain access to all available learning services. This is a necessary prerequisite for other functional actions; (2) register – allows the creation of a new user account. Successful registration assigns a unique identifier and grants a minimum set of rights during the first subsequent login; (3) reset password – an alternative scenario for cases where the user forgets their authentication credentials. Includes generating and sending a password reset link to the registered email address, (4) solving the game – a general case of performing an educational game.

Each of the listed specialised scenarios inherits the general logic (presentation of tasks, checking of answers, recording of results) and supplements it with the mechanics of the respective game. The scenario for solving a set of games allows you to conduct an educational session consisting of several games performed in a specific sequence. When solving a set, the system engine sequentially invites you to solve the game scenario until all planned components are completed. At the subsystem level, this ensures consistent results for both individual games and the entire set (see Figure 3).

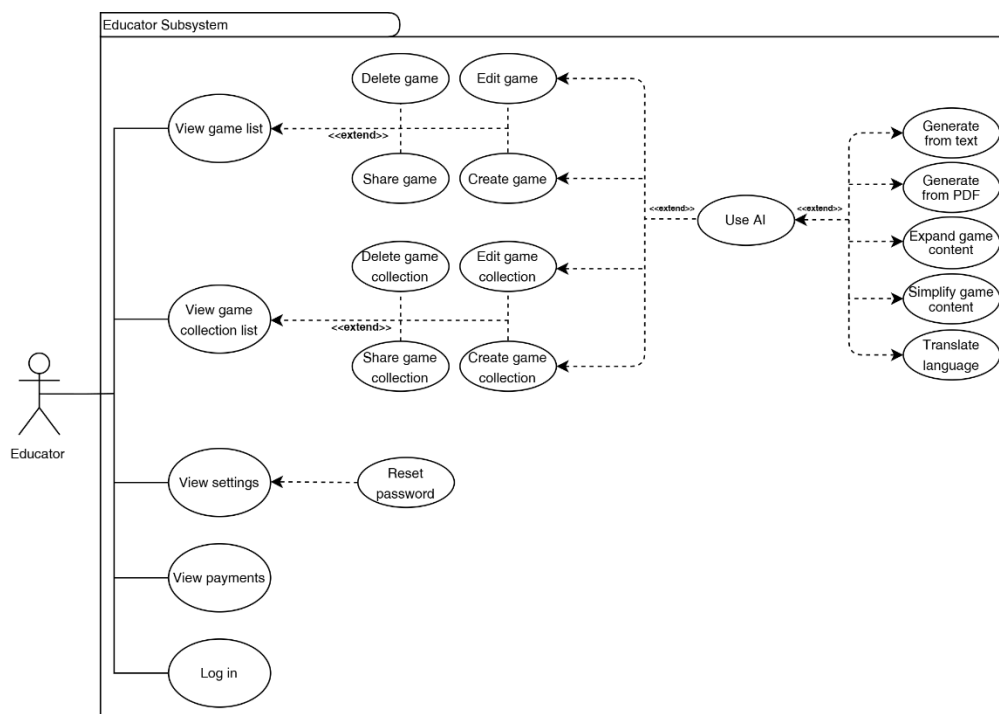


Figure 3. Diagram of use cases for the educator subsystem.

The educator subsystem includes all the functions necessary for teachers to create, manage and distribute game-based learning resources, administer their collections and manage personal settings and accounts. Below is a formal explanation of each use case and the relationships between them.

Educator – a validated system user who has teaching rights and can independently create games and their collections, edit them, share them, delete them, as well as change account settings and manage payments.

3.2.1. Game Management

The “View game list” function serves as the main entry point to the game catalogue, providing users with an overview of all available games in the system. From this view, users can browse, search, and select games for further actions. If needed, users may initiate the “Create game” function, which starts the process of adding a new game by opening a dedicated creation form. This process can be supported by artificial intelligence to assist with content generation, structure, or suggestions. The “Edit game” function allows users to modify an existing game by opening its editing form, where AI support can also be applied in the same manner to refine or update game elements. The “Delete game” function enables the permanent removal of a selected game from the system, ensuring outdated or unnecessary content is eliminated. Finally, the “Share game” function allows users to distribute a game by generating a shareable link or a QR code, facilitating easy access and reuse by other users or participants.

Thus, the creation, modification, deletion, and publication of the game are performed only when the selected game card is in the list, and each of these actions is inevitably based on the basic list viewing scenario.

3.2.2. Artificial Intelligence (AI) Functions

The “Use AI” function is integrated into the game creation and editing processes and can be applied whenever additional support is needed. This use case always involves selecting one specific AI operation tailored to the user’s goal. The “Generate from text” option allows users to create game content based on written descriptions or prompts, automatically structuring tasks, questions, or narratives. The “Generate from PDF” option enables content extraction and transformation from uploaded documents, converting existing materials into interactive game elements. The “Expand game content” operation enriches an existing game by adding new levels, questions, or explanations while preserving its original logic. The “Simplify game content” operation adapts materials to a lower complexity level, improving clarity and accessibility for different learner groups. Finally, the “Translate language” operation supports multilingual use by accurately converting game content into a selected target language, ensuring broader accessibility and reuse.

3.2.3. Game Set Management

The “View game collection list” function provides users with an overview of all existing game collections and serves as the central place for managing them. From this list, users can review available collections, examine their contents, and select specific management actions. The “Create game collection” function opens a creation dialog in which a new collection is formed by combining several individual games into a single structured package. During this process, users can define the collection’s title, description, and other relevant metadata. The “Edit game collection” function enables users to modify an existing collection by changing its composition, updating included games, or adjusting descriptive information. The “Delete game collection” function allows the complete removal of a selected collection from the system. Finally, the “Share game collection” function generates a dedicated sharing link, enabling easy distribution and access for other users or groups.

3.2.4. Account Administration

The “View settings” function allows the Educator to access and review personal account parameters, including profile information and security-related options. Within this function, an extended action “Reset password” is available, which is initiated only when the Educator deliberately chooses to update their password, ensuring conscious control over account security. The “View

payments” function provides access to financial information related to the account, including active subscriptions, associated accounts, and payment history, enabling transparent monitoring of services and usage. Authentication is a core requirement for secure system access and underpins all Educator subsystem functions. The “Log in” function supports general user identification and verification, ensuring that only authorized users can access protected features and data. Successful authentication is mandatory before any Educator-specific functionality becomes available, thereby safeguarding personal information, educational content, and system integrity.

3.3. Implementation of an Online Gaming Prototype

The diagram visualises the structure of the gaming platform, which is designed based on a clear hierarchical organisation and grouping of functions (see Figure 4).

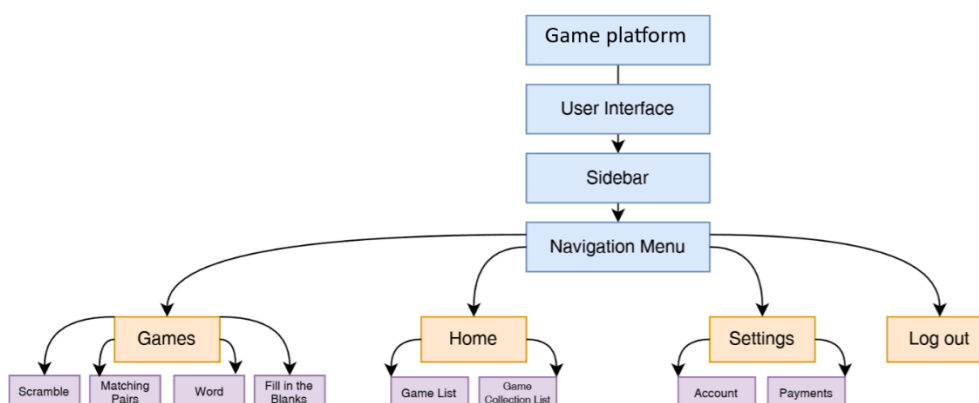


Figure 4. Structure of the game platform.

The diagram visualises the structure of the gaming platform, which is designed based on a clear hierarchical organisation and grouping of functions. The diagram shows that the platform structure starts from the main entry point domain, which leads to the general user interface and then moves to the sidebar. These three top-level sections form the main navigation framework, which is oriented towards convenient use of the platform and intuitive navigation.

The sidebar leads to the navigation menu, which is the central structural element, hierarchically connecting four main functional categories (see Figure 5). The first category, “Games”, is dedicated to educational game elements, which form the core of the platform’s content. This category is further divided into four main types of games: *Scramble* (a game involving rearranging scrambled words or phrases), *Matching Pairs* (a game involving matching pairs, a game involving explaining or translating words), and *Fill in The Blanks* (a game of filling in the blanks in texts). The second category, “Help”, is an information section divided into two main parts: a list of games and a list of game sets. The third category, “Settings”, includes user profile and system configuration functions. The fourth category, “Logout”, is a separate function that allows the user to safely finish their work on the platform.

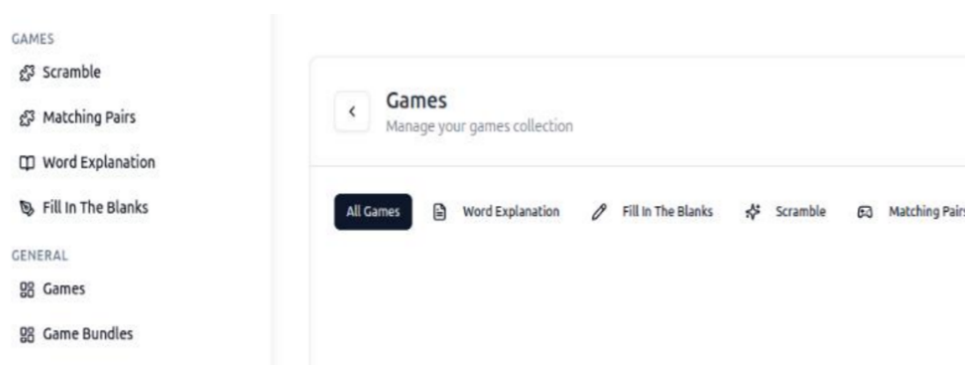


Figure 5. Main window of the prototype.

The platform structure is characterised by a clear hierarchical organisation, where elements transition sequentially from the most general to the most specific functions. In addition, the structure is based on functional grouping, where elements with similar purposes are grouped together, thus facilitating user navigation and system use (see Figure 4).

The system is designed to create and manage educational games. It allows the user to create various types of interactive games that can be used in the learning process, e.g., in language teaching or other educational activities.

On the left side, there is a navigation menu that allows you to quickly switch between different game types and settings. Game types: (1) Scramble – a game in which words are scrambled and the player must restore them to their correct order, (2) Matching Pairs – a game in which you have to match corresponding pairs, (3) Word Explanation – most likely related to explaining the meaning of words or searching for synonyms, (4) Fill In The Blanks – a classic educational format in which the player must fill in the missing words.

The main game control window is visible in the centre: (1) the user currently has no games created (“No games found”), (2) games can be filtered by type, (3) there is also a search field and filtering options, (4) buttons allow you to instantly create new games of each type (e.g., “+ New Scramble”).

In the lower right corner, there is a main button “+ Create Game” that allows you to start creating a new game. The game creation process is structured and clear. Game creation takes place in steps – first, the content is entered, empty spaces are selected, and then the game is previewed to see how it will look to the user. This consistency is based on the system design – each stage has separate functions and information fields. The system allows you not only to create games, but also to share them effectively. One of the unique features of the system is the ability to share a game via a generated link or QR code. This proves that the system is suitable for individual, group, or remote use.

The user can monitor game results and analyze student progress. The system provides information on how many tasks were completed correctly, what answers were selected, and provides a visual assessment. The system automatically evaluates the answers and provides clear feedback on correct and incorrect choices. A visual progress bar is shown next to the result, indicating the number of correct answers.

3.4. Testing and Suitability Assessment of the Gamification System

In order to assess the suitability and effectiveness of the developed gamification platform for increasing motivation to learn, a two-stage study was conducted. The study took place on 28-30 April 2025, involving teachers. The study was structured in two stages in order to obtain detailed data on the effectiveness and impact of the platform. The first stage, “The application of gamification in education and its impact on increasing motivation,” focused on the more general aspects of the application of gamification in the educational process. This survey sought to identify teachers’ attitudes towards gamification methods, their frequency of use, the main challenges and the observed

impact on student motivation. The survey was conducted using the Google Forms platform, ensuring the anonymity of respondents and the confidentiality of data. The second stage of the study, “The gamification system, and its impact on increasing motivation in education,” was more specific in nature, focusing on evaluating the effectiveness and usefulness of the created platform. At this stage, respondents who were already familiar with the platform or had tried it out provided detailed feedback on the platform’s functionality, user interface convenience, pedagogical value and the observed impact on student learning motivation. The collected data were analysed using quantitative and qualitative methods. Quantitative analysis allowed us to identify general trends and statistical indicators, while qualitative analysis provided a deeper understanding of teachers’ experiences using the platform and its impact on the educational process. The results of the data analysis were used not only to evaluate the effectiveness of the platform but also to identify areas for improvement that could be addressed in the further development of the platform.

In order to thoroughly investigate the practices of gamification in Lithuanian educational institutions and their impact on student motivation, a survey of teachers was conducted. The survey was carried out using a structured questionnaire in an electronic environment. The survey link was distributed in the teachers Facebook, as well as by contacting teachers directly via private messages. Twenty-five teachers from various educational institutions participated in the study, gamification platform was later implemented and tested. The results of the study clearly show that a lack of motivation among students is a significant problem that educators regularly encounter. As many as 92% of respondents indicated that they often or very often notice a lack of motivation among students in the educational process. This confirms the conclusions of previous theoretical and practical studies that traditional teaching methods do not always meet the needs and expectations of modern students. When asked about the reasons why students may not be interested in learning, teachers most often mentioned a lack of active, engaging teaching methods (72%), excessive workload and fatigue (64%), content that is not adapted to different levels (64%) and a lack of technology or playful elements (56%). These results confirm that there is a need for innovative teaching methods in the education system that could more effectively engage students and increase their intrinsic motivation to learn (see Figure 6).

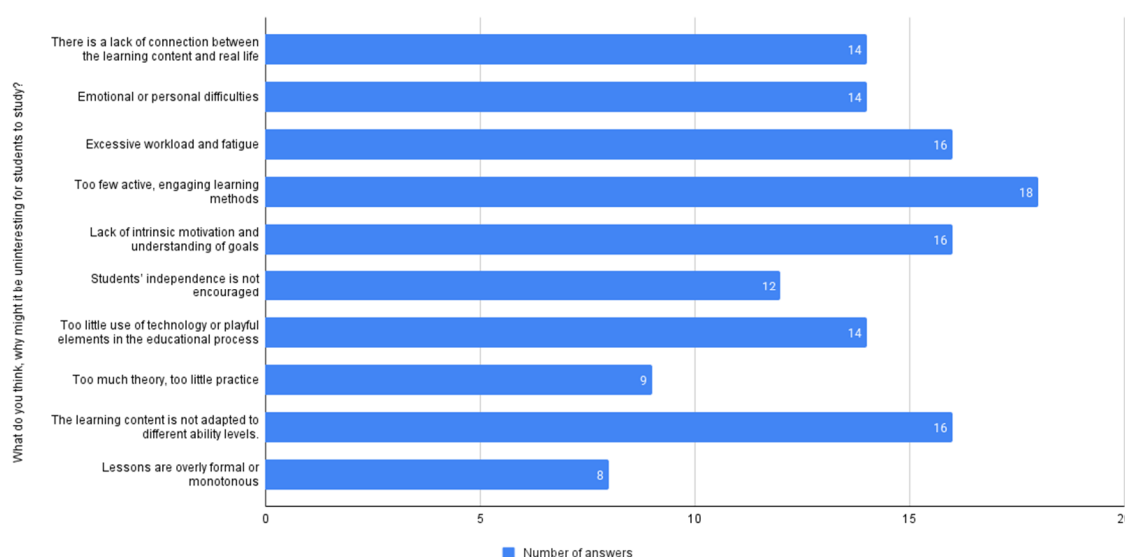


Figure 6. Students’ engagement.

An analysis of teachers’ responses regarding the frequency of gamification in lessons revealed that although the majority of respondents (92%) recognise the importance of gamification, its intensity varies. 32% of the teachers surveyed indicated that they use gamification 1-2 times a week, 28% – 3-4 times a week, 24% – every day, and 16% – less than once a week. Among the main reasons

why teachers use gamification in their lessons, the most common are encouraging student engagement and activity (76%), diversifying the learning process (84%), and increasing student participation in the learning process (72%). These data show that teachers perceive gamification as a multifunctional tool that can solve various pedagogical problems and meet different educational needs (see Figure 7).

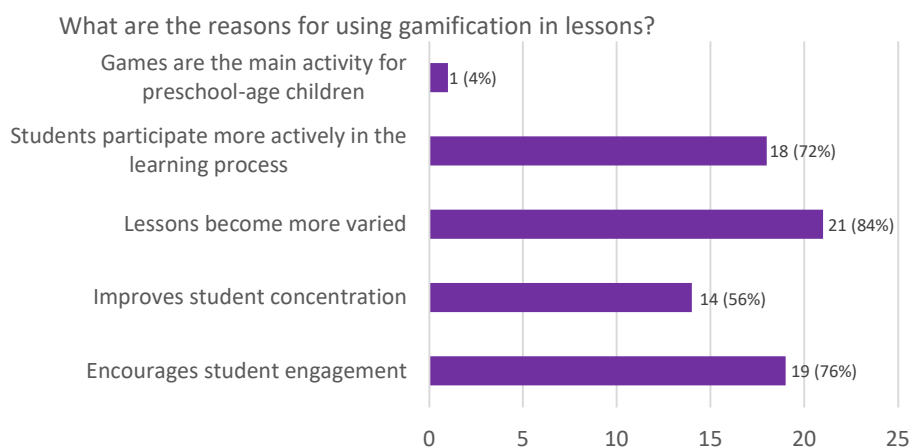


Figure 7. Using gamification in the learning process.

Although educators recognise the benefits of gamification, they also identify a number of challenges they face when trying to integrate gamification into the educational process. The main challenges identified by survey participants are a lack of time for preparation, a lack of suitable gamification platforms and tools, a lack of technological skills, technical infrastructure limitations, and a lack of administrative support. Teachers indicated that they most often use gamification platforms such as Kahoot!, Quizizz, Wordwall, and Quizlet. Although these platforms are popular, teachers noted that they often do not fully meet their needs, especially in terms of adaptation to the Lithuanian educational context, flexibility in content creation, and possibilities for integration with other educational systems. This mismatch between the existing supply and the needs of educators reveals a clear market demand for localised gamification platforms specifically adapted to the Lithuanian education system (see Figure 7).

The second stage of the study was devoted to examining teachers' experiences using the new gamification platform and its impact on student motivation in the educational process. The study took place on 28-30 April 2025 and involved 18 teachers who tested the platform in their teaching activities. The aim of this stage of the study was to assess the suitability of the platform for the Lithuanian educational context, its functionality, user experience and effectiveness in increasing student motivation. The study revealed that the platform reached an impressive audience of students – teachers reported that their games were tested by anywhere from a dozen to several hundred students. On average, the games created by one teacher were tested by about 16-20 students, which shows the considerable scope of the platform's application and its potential to reach a wider audience (see Figure 48). It is important to note that as many as 72% of teachers said that the platform itself encourages them to use gamification elements more often in the educational process. When analysing which games created in the system proved most successful, clear leaders emerge. The most popular were Fill in the blanks (94%) and Matching Pairs (83%) – they were indicated as the most successful by 17 and 15 respondents, respectively. Word explanation (17%) and Scramble (11%) were also well rated. These results allow us to identify the types of games that are most effective and most appreciated by teachers, which will be useful for further improving the platform (see Figure 8).

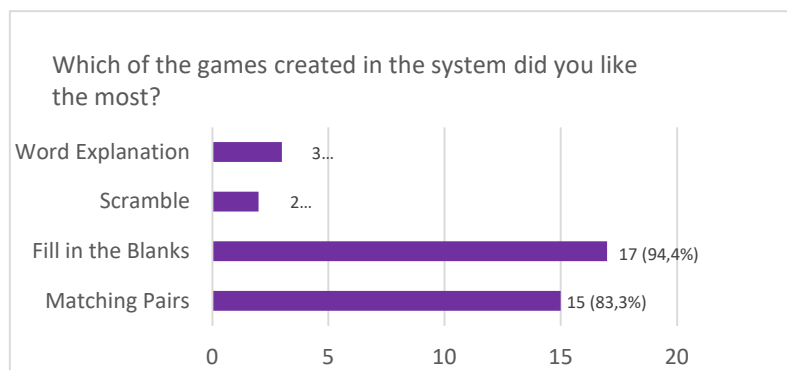


Figure 8. Most preferred systems for gamification design.

The teachers' answers to the question of what signs of increased student motivation were observed when using the platform provided very valuable insights. The signs assessed were "greater student involvement in activities", "positive emotions displayed after completing a task" and "students' willingness to continue or repeat similar types of activities". This clearly shows that the platform creates a positive learning experience and encourages intrinsic motivation. High ratings were also given to "more active participation in discussions and responses" and "increased student confidence in their abilities," confirming the platform's positive impact not only on motivation but also on broader student engagement and confidence. The results clearly show that the platform has great potential – as many as 83% of respondents said they plan to use the platform in the future, and 94% would recommend it to their colleagues. These high indicators testify to the success of the platform and its value to the teaching community (see Figure 9).

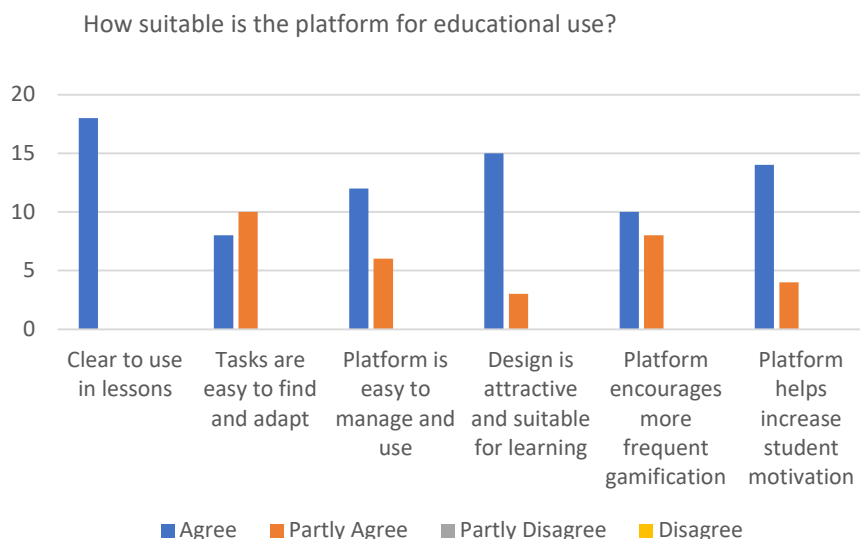


Figure 9. Platform effectiveness and usability.

The gamification platform successfully achieves its main goal – to increase student motivation in the learning process by offering teachers a convenient, functional gamification platform adapted to the Lithuanian educational environment. Although there are areas for improvement, the overall assessment of the platform is very positive, and the willingness of teachers to use it in the future and recommend it to their colleagues demonstrates the platform's potential to establish itself in the Lithuanian education system.

5. Conclusions

The study allowed for a detailed analysis of gamification practices and an assessment of the effectiveness of the gamification platform. The study showed that a lack of motivation among students is a pressing issue, confirming the need for innovative methods that increase student engagement, while teachers identify various factors that influence the learning process. The results of the study confirmed that gamification elements have a positive impact on student learning, but teachers face challenges related to the complexity of preparation, the lack of suitable platforms and technological limitations. The analysis showed that existing tools do not always meet educational needs, so solutions tailored to the specific context are required.

The study showed that the gamification platform successfully solves the identified problems by offering an intuitive, easy-to-use system adapted to the educational context. Teachers appreciated the user-friendliness of the interface, the clarity of the design and the adaptability of the game content. It was found that the platform has a positive impact on students' learning experience, helping to increase their engagement, create positive emotions and encourage them to continue their activities. It also encourages teachers to use gamification more often, as it simplifies content creation and the adaptation of games for lessons. The study revealed areas for improvement, such as expanding the variety of games, improving artificial intelligence functionality, and strengthening the analysis of student progress, which form the basis for further development of the platform.

In summary, we can declare that interoperable gamification platform contributes to the application of innovative teaching methods, provides opportunities to increase student motivation, and creates a basis for further improvement of the system and continuity of activities.

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