

An Interactive Educational Platform for E-Sports: Development and Future Perspectives

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Abstract—The large growth of e-sports has defined it as an important cultural and economic phenomenon. Millions compete with each other, while millions view them worldwide. Despite the importance of this topic, educational materials about e-sports history and culture are still scarce. Therefore, this study presents the development of EsportLingo as an innovative gamified educational platform designed with the goal of bridging this gap. This application is a progressive web application, and it offers accessibility, interactivity, as well as scalability. It includes theoretical modules, quizzes, and leaderboards to increase user engagement and help learning. The results show that EsportLingo has the potential to combine gamification and education to help the e-sports community and inform the next generation of enthusiasts.

Keywords—computer games, education, e-sports, learning

I. INTRODUCTION

Recently, competitive gaming has grown exponentially. It established itself as a cultural and economic phenomenon on a global scale, [1], [2]. Various e-sports activities are actively done by millions of players, while their audience also increases drastically. This increase in both player base and audience shows the importance of understanding player experience, [3]. Not to mention, players worldwide compete against each other for prestige and even for monetary rewards. This also enhances the significance of this field, [4].

As can be observed, e-sports itself is an important topic, and it contains multiple video game genres, including first-person shooters (FPS), third-person shooters (TPS), fighting games, real-time strategy (RTS) games, multiplayer online battle arena (MOBA) games, and traditional sports games. It is important to distinguish between casual gaming and e-sports. While casual gaming refers to playing video games, for example, recreationally, e-sports involve structured

competition, professional teams, and organized leagues with monetary prizes. The skill set required for e-sports includes strategic thinking, teamwork, and game-specific knowledge etc., making it a field that benefits from specialized education. MOBA games can be considered one of the most popular e-sports video game genres in terms of participation and viewership, [5].

In academia, the number of studies of e-sports is growing. For instance, a study of FPS games has created a taxonomy of game mechanics, [6]. Its author has categorized elements such as space, time, objectives, action, rules, skill, and chance. Such studies can show the evolution of FPS games within e-sports, and they can define a transition from basic arena shooters to complex team-based strategies and chaotic battle royale formats. These types of results show how e-sports adapt to players and the audience.

However, despite the growth of e-sports, a gap exists in accessible resources that educate users about its history and culture. In Hungary, interest in e-sports has grown significantly over the past decade: studies indicate a rise in familiarity and participation rates in the population, [7].

However, most platforms only emphasize news, cover live events, or host trivia games. Therefore, the lack of an integrated, user-friendly educational platform customized to the Hungarian e-sports audience motivated the creation of our application, EsportLingo. Existing educational platforms, such as Coursera, Udemy, or Duolingo, provide general learning experiences but are not optimized for e-sports education.

Unlike traditional subjects, e-sports learning requires an interactive and competitive environment that mirrors the real-world dynamics of gaming. EsportLingo is designed to meet this need by integrating gamification elements, such as progress tracking, leaderboards, and real-time quizzes, to engage learners in a manner that aligns with e-sports culture. Furthermore, traditional platforms do not offer structured content specifically to e-sports history, team strategies, or tournament ecosystems, which are essential for understanding this field.

Thus, this paper aims to contribute to the field of e-sports research by presenting the development and evaluation of

EsportLingo. It is a progressive web application that is designed to educate users on the history and culture of e-sports through an interactive and gamified approach. The primary objective of EsportLingo is to provide structured learning materials specifically designed for e-sports enthusiasts. While some existing content on e-sports history and game mechanics is available in fragmented sources such as blogs and Wikipedia, these resources lack pedagogical structuring.

EsportLingo fills this gap by offering a well-organized curriculum that combines original educational content with interactive quizzes and gamified progression. The platform does not merely transfer existing materials but enhances the learning process through interactivity and engagement. Thus, the main contribution of this paper lies in the design, implementation, and evaluation of a gamified educational platform. EsportLingo is grounded in principles of instructional design and gamification theory that emphasize user engagement and knowledge acquisition. This application takes inspiration from systems like Duolingo. Similarly, EsportLingo is a platform that applies behavioral learning mechanics such as feedback loops, competition, and rewards to the context of e-sports education. By addressing a lack of structured e-sports curricula, the goal of this platform is to create a bridge between informal learning and formalized educational tools.

This paper is structured as follows. Section II presents the state of the art. Next, Section III details the development of EsportLingo. The application itself is presented in Section IV. Section V shows its current limitations and future perspectives. Lastly, conclusions are drawn in Section VI.

II. LITERATURE REVIEW

The e-sports industry shares similarities with traditional sports, such as structured competition systems, professional players, and an international governing board that facilitates its growth. In Hungary, the business potential and broad appeal of e-sports are gaining recognition, which may contribute to the increasing development of digital sports in the country, [8].

Data collected in 2017 shows that a significant amount of the Hungarian population engages in gaming, with 94% of internet users playing some kind of video game, [9]. This demonstrates that gaming is far from a niche hobby and has become a widespread phenomenon. The study highlights key motivations for gaming, with entertainment being the leading factor (80%), followed by boredom relief (50%).

Additional motivations include creativity, excitement, skill development, and social interaction. The paper also examined the e-sports community in Hungary in 2017-2018, estimating that approximately 425,000 individuals participated in e-sports, with many expressing interests in professional gaming strategies and industry trends.

In [10], it is highlighted that a substantial majority of young people engage with video games daily, with over 70% playing regularly. The findings suggest that many young gamers consider video games valuable for learning and skill development, citing improvements in strategic thinking,

communication, and teamwork.

Moreover, it is highlighted that young gamers perceive e-sports as a career path, emphasizing the need for structured education on topics such as game history, tournament structures, and professional team management. Thus, EsportLingo addresses this demand by providing an accessible and engaging platform for structured e-sports education.

This highlights the need for educators and parents to acknowledge gaming as a widespread activity among youth that can impact their social interactions and use of leisure time.

According to the literature, studies show that incorporating game mechanics – such as point systems, rewards, and competitive elements – can substantially enhance motivation, engagement, and retention, [11]. Similarly, some authors examined nine scientific articles published between 2016 and 2022 that focused on gamification, [12]. Through this examination, the study addressed several important questions.

One focus was on the tools that teachers use for gamification. According to the previous study, applications like Kahoot and Quizziz were frequently used, [13], [14]. The study also investigated the effects of gamification on student motivation.

56% of the reviewed articles reported that integrating gamification enhanced students' focus, participation, and collaborative efforts. Additionally, 22% of the results indicated improvements in students' behavior, sense of responsibility, and creativity. Furthermore, 33% of the studies highlighted a positive impact on students' academic performance. Overall, gamification of the learning process was found to positively affect: motivation; academic performance; engagement; participation; feedback; interaction and teamwork; cognitive performance; mental functions, knowledge, skills, and abilities.

All in all, gamification not only provided an engaging environment but also made learning more effective.

Duolingo has similar principles to language education as it utilizes features such as levels, streaks, and leaderboards to sustain user interest, [15], [16]. It employs gamified features like rewards, competitions, and streak counts to enhance user engagement and motivation. These elements, along with real-time notifications, contribute to a productive learning experience by encouraging consistent usage and improving vocabulary and grammar skills, [17]. Its methodology shows how structured challenges and instant feedback can create an addictive yet productive learning experience. These successes helped the design of EsportLingo, mainly its use of leaderboards and chapter-based progression.

As previously mentioned, gamification in educational platforms has been shown to positively influence motivation, performance, and long-term knowledge retention across disciplines. However, education of e-sports requires a specific approach that combines strategic thinking, rapid feedback, and scenario-based learning. These are aspects that are not fully addressed in traditional learning management systems. Therefore, EsportLingo builds upon previous works in gamified systems and adapts them to the competitive nature of

digital gaming culture. Unlike language learning apps, e-sports education requires contextual understanding of in-game decision-making.

In the field of e-sports, platforms like Liquipedia Esports Trivia Game and Esport1.hu serve specific purposes but do not offer educational experiences. Liquipedia focuses on game-specific trivia, and it appeals primarily to existing enthusiasts, while Esport1.hu provides news and coverage of events without incorporating interactivity or structured learning. These gaps showed the need for an application that mixes the dissemination of knowledge with engagement strategies to appeal to a wider audience.

Overall, it can be stated that EsportLingo draws from these results in the state of the art to offer a platform that integrates gamification principles with e-sports education, mainly customized to the Hungarian audience. While similar tools such as Kahoot and Quizizz are effective in classroom engagement, they do not have the depth and personalization that are required for specialized fields like e-sports. EsportLingo addresses this by integrating multi-chapter theoretical content with adaptive quizzes and a cumulative scoring system that mimics the logic of ranked games. This alignment between game-based learning structure and gaming culture not only increases user engagement but also ensures conceptual understanding through applied decision-making tasks.

III. DEVELOPMENT OF ESPORTLINGO

A Progressive Web Application (PWA) is a web-based application that offers a user experience similar to native apps, using a single codebase built with HTML, CSS, and JavaScript. PWAs combine the benefits of websites and native apps, such as cross-platform compatibility, installability, and offline functionality.

One of their key advantages is their unified codebase, which runs seamlessly across platforms like Windows, Mac, Android, iOS, and Linux, significantly reducing development time and cost. This eliminates the need to develop a native application for each platform. Users can install PWAs directly from their browser onto their devices. Once installed, PWAs open in a standalone interface, resembling native apps. They also support offline use via cached data and enable push notifications.

While PWAs may not match native apps in performance or advanced features, they are an ideal solution for simpler applications or smaller projects due to their efficiency, cost-effectiveness, and ease of development. For these reasons, we have chosen to develop a PWA. This choice ensured maximum accessibility across platforms without the overhead of developing multiple native applications. By using modern web technologies, EsportLingo was built in a cost-effective and maintainable manner, which is crucial for academic or limited-budget development environments.

The development process was iterative. The project began by configuring the development environment using Create React App. In the meantime, Firebase was configured to handle hosting and backend services. Firebase Hosting

provided a secure and accessible platform for users. A unique subdomain (esportlingo.web.app) was created. This enables users to access the application directly or install it as a progressive web application for offline use. Additionally, Bootstrap 5 was used with the goal of creating a responsive user interface. This allows the platform to be effectively accessed on various devices with different screen resolutions without compromising usability or aesthetics.

The initial phase involved developing the main functionalities such as user authentication, data storage, and quiz mechanics. The Fisher-Yates Shuffle algorithm, [18], was implemented to randomize quiz questions and answer options. This algorithm is used to shuffle a finite sequence. It starts with a list containing all elements and selects the next item for the shuffled order by randomly picking from the remaining elements until no more are left, ensuring an unbiased permutation (i.e., every possible arrangement has an equal probability of occurring). This helped to enhance challenge and engagement. The Fisher-Yates Shuffle was chosen over simpler randomization methods due to its ability to generate unbiased permutations. Its time complexity is $O(n)$ and it guarantees uniform distribution over all possible arrangements. This is important in education to avoid predictability in quizzes.

Regular testing sessions were also conducted to identify bugs and gather feedback. This was done individually and with a small user group (18 people). Early testing revealed issues like inconsistent navigation and limited progress visibility during quizzes. Naturally, these were addressed during development. Furthermore, in the early versions of the application, a functional browser back button was missing. This limited navigation flexibility, although this was mitigated by refining the React Router implementation and adding more navigational elements within the user interface.

The design philosophy of the application focuses on interactivity and ease of use. The user interface was designed to be intuitive. It has labeled buttons and navigational cues. For example, the main page provides quick access to educational materials and quizzes, while a navigation bar enables seamless movement between the sections. Furthermore, gamification elements were used to sustain user interest.

The PWA contains progress indicators, badges, and dynamic scoring systems. These were created to have a rewarding learning environment. The color-coded score display also offers visual cues for user performance. This ranges from Red (low scores) to gold (perfect scores).

Overall, the development process prioritized modularity and scalability. By using the real-time database and authentication of Firebase, the application ensures secure data handling while having the main functionalities like user tracking and content progression.

The implemented features were selected not only for feasibility but also for their pedagogical relevance to the target user group.

IV. FEATURES OF ESPORTLINGO

The features of EsportLingo were designed to offer a comprehensive and gamified learning experience while prioritizing user engagement.

A. User Management

A robust user management system was implemented using Firebase Authentication. This module enables users to register, log in, and securely track their progress. Authentication was further enhanced with encrypted password storage, ensuring compliance with modern security standards.

The authentication process ensures that users are uniquely identifiable and protects against unauthorized access. When the user opens the application, it checks if they are already authenticated. If so, they are redirected to the homepage. Otherwise, the user can log in, register, or request a password reset from the login screen (Fig. 1.a).



Fig. 1. Login (a) and Registration (b) screens of the application
 Source: created by the authors

To log in, users should enter their email and password and click the “Bejelentkezés” or “Login” button. Upon successful authentication, they are redirected to the homepage; otherwise, an error message from the Firebase Authentication API is displayed. If a user forgets their password, they can request a reset. Firebase sends an email with a link to set a new password, and the user is redirected back to the login screen after a few seconds.

For registration, users must provide an email address, a username, and a password (Fig. 1.b). Upon success, Firebase Authentication creates a unique user entry, and a corresponding record is added to the Firebase Realtime Database. If registration fails, an error message appears, similar to the login process.

The user model is designed for flexibility. It allows each quiz section to store a numeric score (0–100), a completion flag, and a timestamp of the last update. This structure enables efficient progress tracking, personalized feedback, and easy extension if more quiz metadata is needed later. All user-specific data access is scoped through Firebase’s user authentication tokens, which ensures privacy and prevents unauthorized data retrieval.

B. Educational Modules

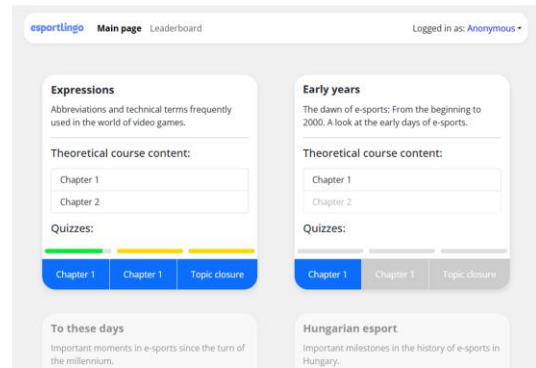


Fig. 2. Main page of the application
 Source: created by the authors

After successful authentication, the user is redirected to the homepage (Fig. 2). At the top of the homepage is a navigation bar, followed by quiz sections grouped into cards. Each card displays the topic title, a brief description, theoretical materials, and quiz games. Each topic is divided into two parts: theoretical content covering the chapter and a “Témazáró” (Final Quiz) that tests knowledge using questions from the previous two chapters.

Users can choose to attempt the quizzes immediately or review the theoretical material first. If they opt for the material, it replaces the cards on the screen with the relevant chapter content (see an example in Fig. 3).

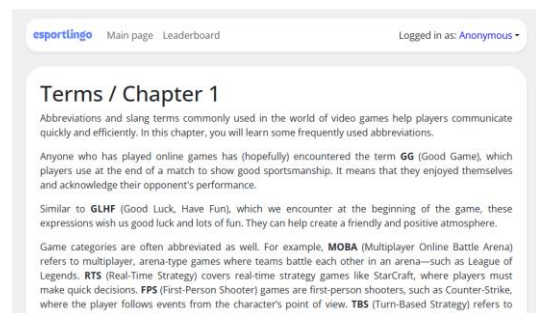


Fig. 3. Example for theoretical material
 Source: created by the authors

Theoretical content was organized into chapters covering various aspects of e-sports, such as its history, culture, and prominent milestones. This content provides users with a foundational understanding before testing their knowledge through quizzes. Theoretical content is structured similarly to e-learning curricula with an emphasis on clarity, modularity, and scaffolded knowledge progression. Each chapter builds upon previous ones by using a combination of textual material and embedded examples that reflect real-world scenarios from professional e-sports. This format allows users to first gain contextual understanding, then apply it in quizzes that simulate decision-making under pressure, which is a key skill in competitive gaming.

C. Gamified Quizzes

Each chapter is accompanied by a quiz, featuring multiple-choice questions with randomized options. Both correct and

incorrect answers trigger immediate feedback, including explanations for the right answers, reinforcing learning. Unlike generic quiz applications, EsportLingo quizzes are tailored to reflect the decision-making and strategic depth required in competitive e-sports. For example, instead of simply testing recall, the quizzes simulate real-world tournament scenarios where users must analyze in-game situations and select the optimal strategies. Additionally, the leaderboard system mimics ranked matchmaking used in games like League of Legends and Dota 2, fostering competition and engagement. These features are designed to ensure that users not only acquire theoretical knowledge but also develop critical thinking skills relevant to competitive gaming. The use of a progress tracker displayed the highest scores achieved, with color-coded indicators to reward high performance.

To quantify performance and foster competition, a scoring model was implemented that aggregates results across quizzes. The total score S is defined as in Equation (1):

$$S = \sum_{i=1}^n (q_i \cdot w_i + b_i) \quad (1)$$

where:

- q_i is the score (0-100) of quiz i ,
- w_i is the difficulty weight of quiz i (default = 1),
- b_i denotes the optional bonus points (e.g. streaks, 100% completions).

This function ensures fairness and consistency in leaderboard rankings. Bonus elements (like perfect streaks or first-time completions) are only added when earned. It makes the system both motivating and transparent.

After reviewing the theoretical material, the player can return to the homepage to select the quiz for the chapter. The quiz presents multiple-choice questions in a randomized order, along with shuffled answer options. Once the user selects an answer, the app provides feedback. Correct answers are highlighted with a green background, while incorrect ones are marked red, with the correct answer also displayed in green.

Below the options, a brief explanation related to the correct answer appears, similar to the theoretical content. Fig. 4 shows an example of selecting the correct answer.

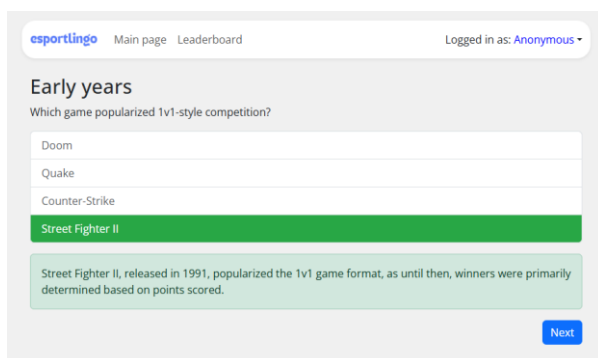


Fig. 4. Quiz interface with the correct answer and a brief explanation

Once the user has answered all the questions, their results are displayed, showing the number and percentage of correct answers, along with a message indicating whether they have completed the chapter. This requires a score of 80% or higher (Fig. 5).

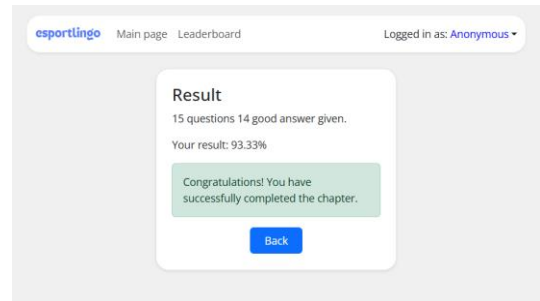


Fig. 5. Results of the answered quiz
 Source: created by the authors

Back on the homepage, the progress bar for the chapter updates with the highest score achieved. The color of the bar reflects the result: red for below 40%, yellow for 40-80%, green for 80-99%, and gold for 100%. Once a chapter is completed, the button for the next chapter and its theoretical material becomes clickable. Chapters and topics must be unlocked sequentially by completing previous ones, including final quizzes.

D. Leaderboard System

A competitive leaderboard ranks users based on their overall quiz scores (Fig. 6). This score is made up of scores achieved in all chapters and topics. This feature fosters a sense of competition and encourages repeated engagement with the platform.

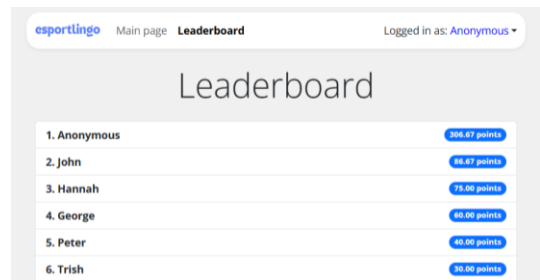


Fig. 6. Leaderboard
 Source: created by the authors

To avoid performance distortion due to the number of quizzes or the difficulty level of the varying topics, rankings are based on weighted averages rather than raw scores. This prevents users who simply complete more quizzes from automatically outranking those who perform with greater accuracy in fewer topics. In addition, scores are recalculated in real time when a new quiz is completed, ensuring that the rankings reflect the most recent performance.

V. LIMITATIONS AND FUTURE PERSPECTIVES

This section is split into two subsections. Subsection V-A presents the limitations of the EsportLingo application, while

the future perspectives are detailed in Subsection V-B.

A. Current limitations of EsportLingo

Firstly, during quizzes, the users are not provided with information about the total number of questions or their current progress. This may lead to frustration, mainly for those who prefer knowing how far along they are in completing a section since progression feedback is often a key motivator.

Secondly, all quiz content must be entered manually into the Firebase database. This can pose scalability challenges. As the platform expands to include more topics, quizzes, and educational materials, the manual process can become inefficient in the future.

Lastly, while the application includes leaderboards and progress indicators, other gamification elements could be added. These could be personalized achievements, daily challenges, or community-based competitions.

While these limitations highlight potential areas of growth, it is important to note that the current version of EsportLingo already offers a complete educational experience. This includes theoretical content, structured quizzes, real-time feedback, progress tracking, and leaderboards. These features make the platform fully functional for its primary educational goals.

B. Future perspectives

While several enhancement ideas have been identified, such as real-time question counters, more multilingual interfaces, and advanced analytics, these are currently beyond the scope of this version. Their implementation depends on available resources and user adoption in the pilot phase.

Still, user feedback has already been collected regarding progress visibility and navigation clarity. These insights are informing design considerations for potential future releases.

In terms of content management, the current approach (manual database entry) is sustainable for small-scale usage. Future scaling could benefit from a content management interface, but this is contingent on long-term project support.

As for gamification, while features such as streak bonuses, progress bars, and leaderboard rankings are already implemented, additional elements like achievements or daily goals are under consideration, pending feasibility studies.

In summary, while EsportLingo remains focused on core features in its current stage, it has been designed with scalability and modular expansion in mind, ensuring that it can evolve based on user needs and institutional support. During development, the technical foundations (such as modular content storage) were set in order to enable such extensions in the future.

VI. CONCLUSIONS

This paper presented the design and implementation of EsportLingo, a gamified progressive web application created to support e-sports education. By combining structured theoretical modules, interactive quizzes, and a dynamic leaderboard system, the platform provides an engaging learning environment tailored to the needs of both casual

learners and aspiring professional players.

From a technical perspective, EsportLingo applies well-established web technologies (React, Firebase) and educational strategies (feedback, progression tracking, motivation loops), making it a scalable and pedagogically grounded tool.

While no complex mathematical model was required for this work, the system design and functionality are underpinned by principles of cognitive science, instructional design, and gamification theory.

This framework was sufficient to deliver measurable user engagement in early pilot testing. While the current version supports Hungarian and English languages, the modular architecture ensures that future enhancements, such as larger multilingual support, advanced analytics, and content automation, can be considered if demand and resources allow.

In conclusion, EsportLingo represents a significant first step toward structured e-sports education, providing a working, accessible, and extendable learning platform. It demonstrates how digital education and gamification can successfully intersect in emerging cultural fields such as competitive gaming.

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Contribution of individual authors to the creation of a scientific article (ghostwriting policy)

We confirm that all Authors equally contributed to the present research, at all stages from the formulation of the problem to the final findings and solution.

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Conflicts of Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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