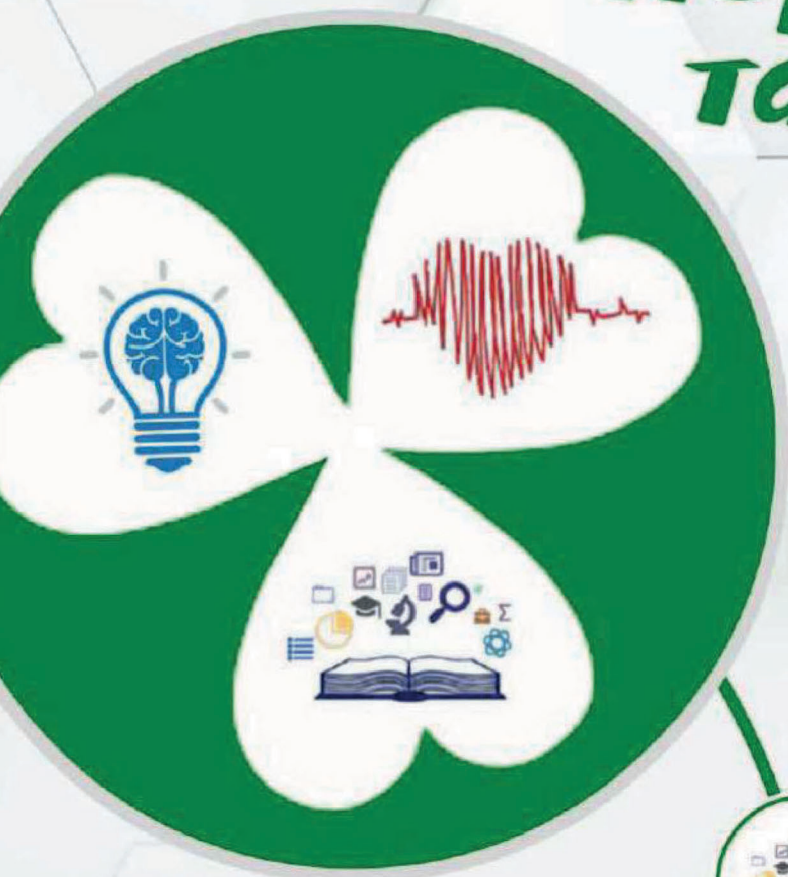




Наукові перспективи
Видавнича група

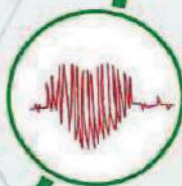
Перспективи та інновації науки



СЕРІЯ "ПЕДАГОГІКА"



СЕРІЯ "ПСИХОЛОГІЯ"



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**Згідно наказу Міністерства освіти і науки України від 27.09.2021
№ 1017 журналу присвоєно категорію "Б" із психології та педагогіки**

**Згідно наказу Міністерства освіти і науки України від 27.04.2023
№ 491 журналу присвоєно категорію "Б" із медицини: спеціальність 222**

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Журнал заснований з метою розвитку наукового потенціалу та реалізації кращих традицій науки в Україні, за кордоном. Журнал висвітлює історію, теорію, механізми формування та функціонування, а, також, інноваційні питання розвитку медицини, психології, педагогіки та. Видання розраховано на науковців, викладачів, педагогів-практиків, представників органів державної влади та місцевого самоврядування, здобувачів вищої освіти, громадсько-політичних діячів.

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Makhovych Inna Anatolyivna Senior Lecturer, Department of Philology and Translation, Kyiv National University of Technologies and Design, 2 Mala Shyianovska St., Kyiv, 01011 Kyiv, tel.: (044) 256-29-49, Postgraduate student, Institute of Pedagogy of NAES of Ukraine, 52-D Sichovykh Striltsiv St., Kyiv, 04053, tel.: (044) 481-37-10, <https://orcid.org/0000-0002-9804-9085>

GAMIFICATION: INDIVIDUALIZED LEARNING AIMED AT ENHANCING MOTIVATION AMONG COMPUTER SCIENCE STUDENTS IN THE ENGLISH LANGUAGE CLASSROOM

Abstract. In the context of modern trends, where computer technology is becoming an integral part of everyday life, education in computer science plays a key role in the development of key competences for lifelong learning. The growing need for highly skilled professionals in this field emphasises the importance of research aimed at increasing student motivation. The article discusses the concept of gamification in the context of higher education, focusing on popular educational platforms such as Kahoot!, Quizlet, Duolingo and Memrise. The author analyses the key elements of gamification presented on these platforms, such as leaderboards, badges, ratings, etc., and considers their impact on the motivation and cognitive interest of users in the learning process.

The main part of the article analyses the diversity of gamification used by learning platforms and highlights key aspects such as individualised learning, scoring systems, leaderboards, and social interaction. The author also highlights the effectiveness of gamification in education, noting that this approach can not only motivate students but also engage them in the learning process.

Additionally, the article examines the concept of gamification in a broader context, drawing attention to the innovative nature of this approach and its significance in the educational paradigm. By analysing different approaches to the definition of gamification in different fields of research, the article reveals general trends and benefits of using gamification in the educational process. This helps to establish a clear context and definition for further understanding of the role of gamification in higher education. The author emphasises that gamification can influence the quality of foreign languages training by providing students with a stimulating and individualised environment for learning foreign languages successfully.

All the conclusions presented in the article indicate that gamification in education is not limited to individual elements, but is a holistic system that improves the learning process by creating an effective environment for engaging students and achieving their learning goals.

Keywords: computer science students, English, English language classroom, gamification, games, individualisation of learning, motivation, higher education.

Махович Інна Анатоліївна старший викладач кафедри філології і перекладу, Київський національний університет технологій та дизайну, 01011, м. Київ, вул. Мала Шияновська, 2, тел.: (044) 256-29-49, аспірант Інституту педагогіки НАПН України, м.Київ, вул. Січових Стрільців, 52-Д, 04053, тел.: (044) 481-37-10, <https://orcid.org/0000-0002-9804-9085>

ГЕЙМІФІКАЦІЯ: ІНДИВІДУАЛІЗОВАНЕ НАВЧАННЯ, СПРЯМОВАНЕ НА ПОСИЛЕННЯ МОТИВАЦІЇ СТУДЕНТІВ КОМП'ЮТЕРНИХ СПЕЦІАЛЬНОСТЕЙ НА ЗАНЯТТЯХ З АНГЛІЙСЬКОЇ МОВИ

Анотація. У контексті сучасних тенденцій, де комп'ютерні технології стають невід'ємною частиною повсякденного життя, підготовка фахівців з комп'ютерних спеціальностей виконує ключову роль у розвитку ключових компетентностей для навчання впродовж життя. Зростаюча потреба у висококваліфікованих фахівцях у цій сфері підкреслює важливість дослідження, спрямованого на підвищення мотивації студентів комп'ютерних спеціальностей. Автор здійснює аналіз ключових елементів гейміфікації, представлених на цих платформах, таких як таблиці лідерів, бейджики, рейтинги та інші, та розглядає їх вплив на мотивацію та пізнавальний інтерес користувачів у навчальному процесі.

У статті проаналізовано різноманітність застосування гейміфікації шляхом застосування освітніх платформ і виокремлено ключові аспекти, такі як індивідуалізоване навчання, системи балів, таблиці лідерів та соціальна взаємодія. Автор також висвітлює ефективність гейміфікації в освіті, зазначаючи, що цей підхід може не лише мотивувати студентів, але й залучати їх до активної пізнавальної діяльності.

Додатково, у статті узагальнено підходи до розуміння змісту поняття «гейміфікація» у широкому контексті, звертаючи увагу на інноваційний характер цього підходу та його значущість в освітній парадигмі. Аналізуючи різні підходи до визначення гейміфікації в різних галузях досліджень, стаття розкриває загальні тенденції та переваги її застосування в освітньому процесі. Це допомагає встановити чіткий контекст і визначення для подальшого розуміння ролі гейміфікації у вищій освіті. Автор наголошує на тому, що гейміфікація може впливати на якість іншомовної підготовки студентів комп'ютерних спеціальностей, створюючи стимулювальне й індивідуалізоване середовище для успішного навчання іноземних мов.

Усі висновки, представлені в статті, свідчать про те, що гейміфікація в освіті не обмежується лише окремими елементами, але представляє собою

цілісну систему, яка вдосконалює навчальний процес і надає змогу залучити студентів до активної взаємодії та досягнення ними визначених освітніх цілей.

Ключові слова: студенти комп'ютерних спеціальностей, англійська мова, заняття з англійської мови, гейміфікація, ігри, індивідуалізація навчання, мотивація, вища освіта.

The relevance of the study. The importance of this study lies in the individualization of education which is increasingly crucial in modern education, particularly in the teaching of foreign languages to computer science students. This is influenced by several factors: 1) diverse individual characteristics such as different learning styles, learning paces, cognitive interests, and levels of proficiency in a foreign language among students [26]; 2) the dynamic nature of the computer science industry, which is constantly evolving with the emergence of new technologies and tools. Specialists need to stay updated and be able to adapt quickly to these changes [27]; 3) the necessity to develop flexible skills. Besides specialized knowledge, graduates must possess communication, critical thinking, analytical, and other skills required for success in the job market.

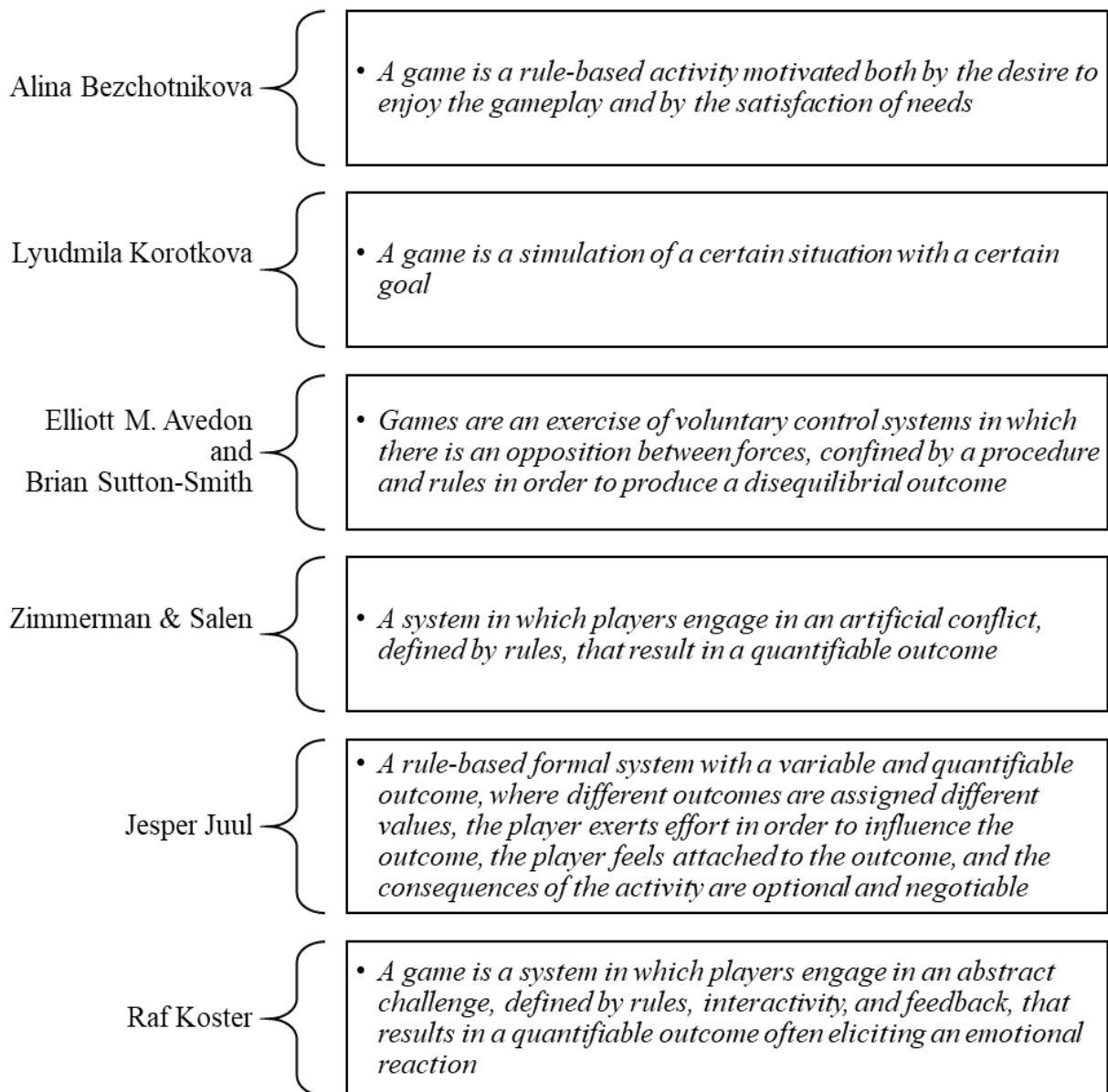
Traditional teaching methods may not always be sufficient for several reasons. Firstly, a personalized approach is required because focusing on the average level of the entire group may result in some students not receiving adequate knowledge, while others may not be able to achieve their full potential. Secondly, motivation and engagement are crucial as students who are not engaged may lose interest in their studies and struggle to attain desired results. Thirdly, learning effectiveness is compromised when the material does not cater to individual student needs and capabilities, which can lead to decreased academic performance.

The introduction of gamification into the learning process can be a powerful tool for solving the above problems.

Analysis of the latest research and publications. Game as an activity has always been considered a natural method of learning for people throughout history. Therefore, it is not surprising that the introduction of game elements into the learning process leads to student engagement and makes learning fun.

First of all, it is necessary to analyse the term “game”, from which the concept of “gamification” originated. Fig. 1 shows the definition of the term “game” by Ukrainian and foreign authors. Although the definitions differ in emphasis, they all include both a systemic component that defines how the game is constructed and an empirical component that describes human involvement in the game.

Raf Koster's definition is the most appropriate for our context, as it encompasses key aspects of a game, such as rules, interaction and feedback, as well as a measurable outcome that can trigger an emotional response. When combined, these different elements create a holistic phenomenon that is much more meaningful than any of them individually. The player is engrossed in the game through the instant feedback and –constant interaction that occurs as they overcome challenges within clearly defined rules.



*Fig. 1 Definitions of the term “game” by Ukrainian and foreign authors
Source: created by the author based on [2; 6; 9; 36; 20; 24]*

This interaction is aimed at evoking an emotional response and ultimately leads to a measurable outcome that fits into the abstract structure of a larger system [24].

All these elements, which are usually associated with games and “fun”, are used in gamification to improve learning, engagement and motivation of learners [22].

Thus, games and gamification have a powerful impact on modern society. Gamification, as a term, connects game elements and mechanics with real-life spheres for the purpose of engagement and motivation, as already identified by Nick Pelling [33].

Although Nick Pelling first coined the term “gamification”, the very definition of the term has evolved over time and there are now different interpretations and applications of this concept in different industries.

Fig. 2 shows the definitions of “gamification” in various fields of research by Ukrainian and international researchers.

Oleksandr Malykhin	<ul style="list-style-type: none"> •education • Gamification is the process of using game thinking and dynamics of games to attract the audience and solve tasks, turning anything into a game
Perejaslavska & Smahina	<ul style="list-style-type: none"> •education • Gamification – is the integration of game elements and game thinking into an activity other than game
Oksana Karabin	<ul style="list-style-type: none"> •education • Gamification – is the use of certain elements of games in non-game practices
Sebastian Deterding	<ul style="list-style-type: none"> •user interface design • Gamification is the use of game design elements in non game contexts
Kai Huotari & Juho Hamari	<ul style="list-style-type: none"> •marketing • Gamification refers to: a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation
Kevin Werbach & Dan Hunter	<ul style="list-style-type: none"> •business, marketing • Gamification – is the use of game elements and game design techniques in non game context
Karl Kapp	<ul style="list-style-type: none"> •education • Gamification is the utilization of game elements to engage individuals, motivate behaviour and solve problems
Christopher Pappas	<ul style="list-style-type: none"> •education • Gamification involves the use of game design, elements, and mechanics in activities that are non inherently game-based
Christopher Cunningham & Gabe Zichermann	<ul style="list-style-type: none"> •business, education • Gamification is the use of game design techniques, game mechanics, and game-like environments to engage and motivate people to achieve their goals

Fig. 2 Definitions of “gamification” in different fields of research by Ukrainian and international researchers

Source: created by the author based on [7; 29; 23; 16; 19; 34; 22; 28; 11]

This diversity of interpretations demonstrates the broad context and potential of gamification as a concept. Based on the analysis of definitions of gamification in various fields of research, several key aspects of gamification can be identified:

Use of game elements: All definitions emphasise the use of game elements such as points, badges, levels, competition, collaboration, story, feedback, rewards, etc. in non-game contexts.

Engagement and motivation: Gamification is used to engage and motivate people to complete certain tasks or achieve certain goals.

Behavioural change: Gamification can be used to change people's behaviour by making it more desirable or useful.

Non-gaming activities: gamification is applied to activities that are not inherently gaming, such as learning, work, marketing, etc.

The following scholars have studied the use of gamification in educational processes: J. P. Gee, K. Werbach, D. Hunter, K. M. Kapp, C. Pappas, G. Zickerman, O. Malykhin, S. Tolochko, and P. Savaryn. J. P. Gee emphasises the importance of motivation through rewards and the integration of game elements into learning to make it more engaging and effective [17]. K. Werbach and D. Hunter have developed a gamification course on the Coursera platform [34] and are exploring its application in education, business, and other industries [35]. K. M. Kapp focuses on the emotional intensity and interactivity of gamified learning, which contributes to better student engagement [22]. C. Pappas supports the use of gamification to increase learning efficiency and create an engaging learning environment [28]. G. Zichermann also argues that gamification can increase motivation and participation in the learning process [11]. S. Tolochko and P. Savaryn study the impact of gamification on motivation and attitudes towards learning mistakes [8, 4].

The purpose of the article is to study the possibilities of using gamification as a means of individualising the teaching of students of computer science, as well as to analyse the effectiveness of introducing gamification elements into the process of teaching English.

Presentation of the main material of the study. The impact of gamification on the motivation, efficiency and individualisation of learning for students of computer science is studied by H. Skaskiv, in particular, in the course of studying the courses “Multimedia Technologies”, “Fundamentals of Cybersecurity” and “3D Modelling”. Studies show that gamification increases students’ motivation, practical skills, digital competencies, and ability to analyse and solve problems, which contributes to improving the quality of education and the effectiveness of learning activities. For the effective organisation of the learning process using gamification technologies, H. M. Skaskiv emphasises the need to select methods and types of game activity that will optimally meet all the characteristics of students [32].

S. Tolochko emphasises the importance of introducing new approaches, such as gamification, into modern education, as they correspond to the increased use of digital technologies. Gamification in higher education institutions is aimed at motivating and engaging students in learning, developing game thinking, competition, collaboration and creativity, as well as combining intrinsic and

extrinsic motivation. This leads to increased requirements for the teaching and methodological competence of teachers in the use of gaming technologies. Preparation for gamification includes setting goals, planning, game design, student self-representation, thinking through the bonus system, collaboration for team spirit, and individualisation of work taking into account the specifics of student groups [8].

Today, there are a variety of innovative platforms that successfully implement gamification to engage and maximise students' involvement in the learning process. Among these platforms, popular tools such as Kahoot!, Quizlet, Duolingo and Memrise stand out.

Kahoot! is a gamified online platform with over 30 million users worldwide. It has gained popularity in higher education due to its user-centred methodology and use of gamification. Numerous studies have shown that students find Kahoot! useful in their higher education learning [30]. Educators use Kahoot! as an additional tool to increase classroom engagement by creating *Kahoots* – gamified quizzes, tests, and surveys [21].

There are four types of accounts on the Kahoot! platform: *Professional*, designed for users affiliated with commercial or non-profit organisations; *Teacher*, designed for teachers and faculty at schools, colleges or universities; *Student*, designed for students at schools, colleges or universities; and *Family and Friends*, designed for those who intend to use Kahoot! for personal or social use.

The teacher can create groups (Fig. 3), where he or she can communicate with students and assign tasks to the entire group at once, as well as view a report on the completion of this task.

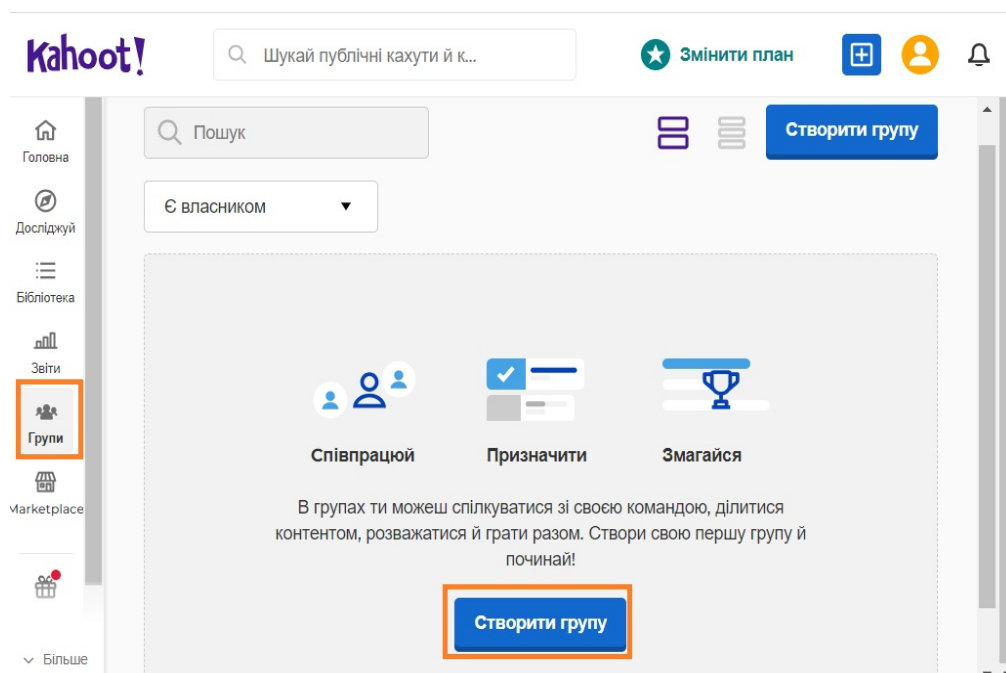


Fig. 3. Creating groups and managing tasks on Kahoot!
 Source: created by the author based on [21]

On the Kahoot! platform, the main type of tasks are tests – Kahoots – in which participants answer questions using their devices with Internet access. The Kahoot! platform is also distinguished by the ability to individualise learning content. Using the platform's tools, teachers can adapt the materials to meet the personal needs and learning levels of students (Fig. 4). This feature enables the creation of individualised and flexible learning scenarios, contributing to more effective learning and student engagement. In particular, you can choose the types of questions: for *knowledge testing* (Quiz, True or false, Written Answer, Slider, Puzzle), and for *polling* (Voting, Scale, Mark, Word Cloud, Open Question, Brainstorming); set a time limit for each question; set a different number of points for each question; choose the number of correct answers.

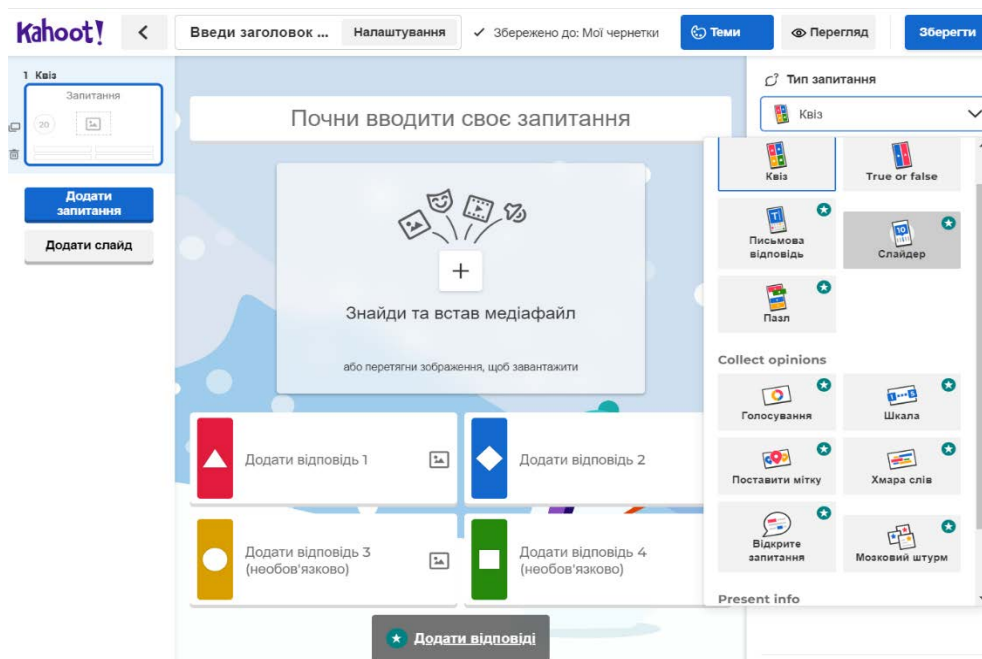


Fig. 4. Creating tests – Kahoots on Kahoot!
Source: created by the author based on [21]

Students can also choose different modes of test taking. This allows for individualised learning and allows each student to choose the pace and method of learning that suits their own requirements and speed of learning.

One of the main elements of gamification on Kahoot! is “*real-time competition*”, which supports two main modes: “*classic*” and “*team*”. During the competition, participants solve tasks and send their answers, and the results are displayed in real time on the screen. This creates a live game atmosphere where players can see their progress and the results of other participants instantly. To create an engaging learning environment where students actively play and compete, the Kahoot! platform incorporates audio (including musical accompaniment) and visuals. At the same time, the teacher takes on the role of a presenter, which helps to stimulate and maintain student interaction and engagement. Participants can see their scores and place in the standings in real time (Fig. 5).

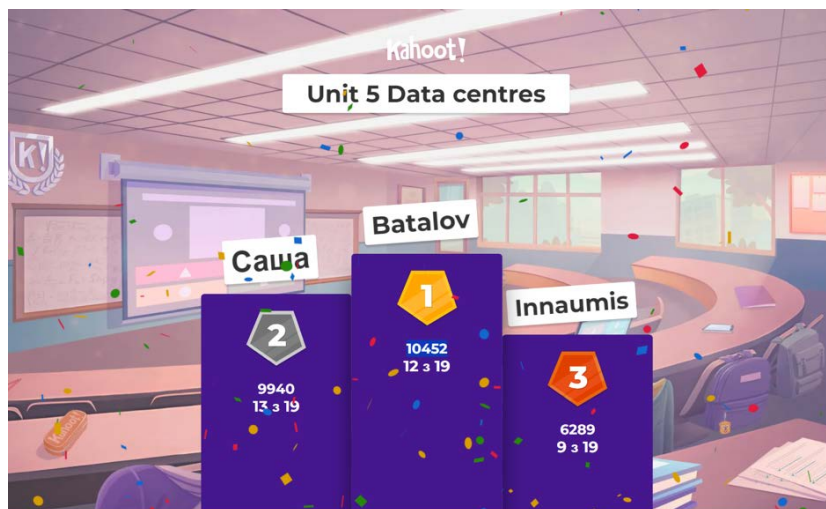


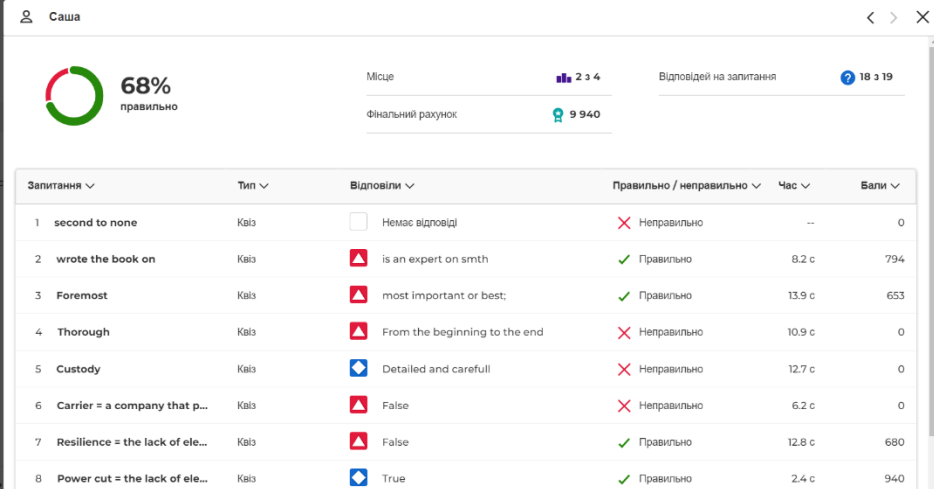
Fig. 5 Tournament table on Kahoot!
Source: created by the author based on [21]

A leaderboard with the top 5 students is displayed on screen after each question to increase competition and motivation among students. Kahoot!'s leaderboard only shows the top 5 students to avoid a “board of shame” effect for those who may be performing less well. This approach helps to maintain a positive experience for participants, as focusing on the top players stimulates their desire to compete and improve their results.

An important feature is that each student's personal result is displayed on their own devices, which facilitates individual tracking and allows each participant to assess their own progress without public comparison with others. This supports positive student learning and self-esteem. When the game is over, the teacher can export and save individual and team statistics. Visual graphs of student responses provide instant feedback to the teacher and students, allowing them to see if the class understands the topic or if more work is needed. The rating of the players is based on the speed of answering and their correctness (Fig. 6).

Upon successful completion of the game and a place on the leaderboard, the participant receives not only personal recognition, but also the opportunity to share their achievement on social media. This helps to publicise their success and may inspire others to join the game. In addition, the system offers the participant to take a training session with the questions they answered incorrectly, emphasising an individual approach and helping the participant to systematically improve their knowledge and skills.

When playing in “*team mode*”, team members choose one correct answer from all the options available to each team member. This creates an atmosphere of interaction and exchange of ideas, which contributes to deeper learning and critical thinking among students. By initiating discussions about the correctness of answers, the platform promotes not only students' self-esteem, but also mutual support in a team environment, which emphasises the importance of group dynamics in the learning process [21].



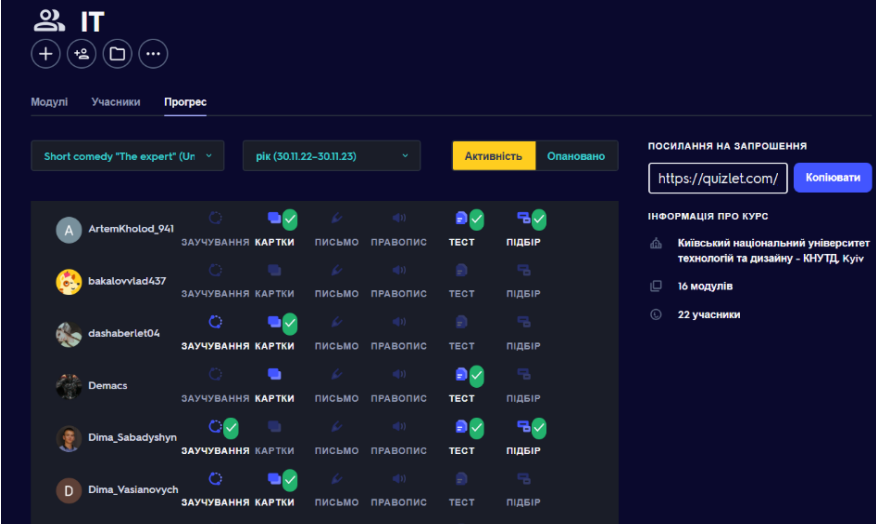
Запитання	Тип	Відповіді	Правильно / неправильно	Час	Бали
1 second to none	Kahz	<input type="checkbox"/> Немає відповіді	✗ Неправильно	--	0
2 wrote the book on	Kahz	<input checked="" type="checkbox"/> is an expert on smth	✓ Правильно	8.2 с	794
3 Foremost	Kahz	<input checked="" type="checkbox"/> most important or best;	✓ Правильно	13.9 с	653
4 Thorough	Kahz	<input checked="" type="checkbox"/> From the beginning to the end	✗ Неправильно	10.9 с	0
5 Custody	Kahz	<input checked="" type="checkbox"/> Detailed and carefull	✗ Неправильно	12.7 с	0
6 Carrier = a company that p...	Kahz	<input checked="" type="checkbox"/> False	✗ Неправильно	6.2 с	0
7 Resilience = the lack of ele...	Kahz	<input checked="" type="checkbox"/> False	✓ Правильно	12.8 с	680
8 Power cut = the lack of ele...	Kahz	<input checked="" type="checkbox"/> True	✓ Правильно	2.4 с	940

Fig. 6 User report on Kahoot!

Source: created by the author based on [21].

In order to participate in Kahoot! games, students do not need to register for an account on Kahoot! or download additional software. Participants only need to go to <https://kahoot.it/> and enter the game code provided by the teacher, which makes the registration process very simple and efficient [21].

Quizlet is an online service known as a tool for memorising various information using study cards. Users can create their own sets of cards, called “learning modules”, or use existing ones created by other users. There are two types of accounts on the platform: teacher and student. Teachers can create classes, add learning modules, and track the progress of each class member (Fig. 7) [31].



Учасник	ЗУЧУВАННЯ КАРТКИ	ПИСЬМО	ПРАВОПИС	ТЕСТ	ПІДБІР
ArtemKholod_941	✓	✓	✓	✓	✓
bakalovvlad437	✓	✓	✓	✓	✓
dashaberlet04	✓	✓	✓	✓	✓
Demacs	✓	✓	✓	✓	✓
Dima_Sabadashyn	✓	✓	✓	✓	✓
Dima_Vasianovych	✓	✓	✓	✓	✓

Fig. 7 Showing class progress on Quizlet

Source: created by the author based on [31]

Students can use the training modules to learn and review the material. There are a number of types of training on the platform: “memorisation”, “flashcards”,

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№ 7(41) 2024

“writing”, “spelling”, “test” and “matching”. For each achievement, they are awarded badges, which are a common element of gamification (Fig. 8). Students also have the opportunity to track their progress, what they have already learnt and what they still need to learn [31].



Fig. 8 Student profile on Quizlet, badges received for achievements
Source: created by the author based on [31]

Another aspect of gamification of this service includes the use of the *Top-10* leaderboard, which allows students to compare their achievements with other group members and encourages them to repeat the “Play Again” training and achieve better results. For example, Fig. 9 shows the best results of students in the “Selection” training in the “Protection against surveillance” module (Fig. 9).

The “Share the result” function (Fig. 10) allows students to share their achievements via social media and challenge their friends/classmates (Fig. 10).

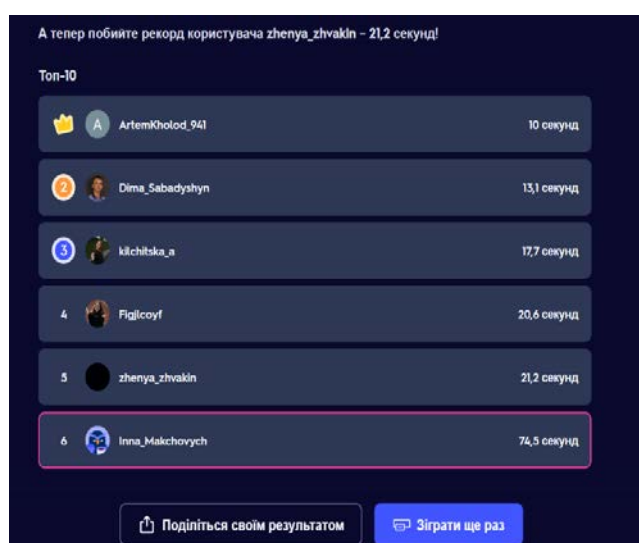


Fig. 9 The best results in the Matching exercise

Source: created by the author based on [31]

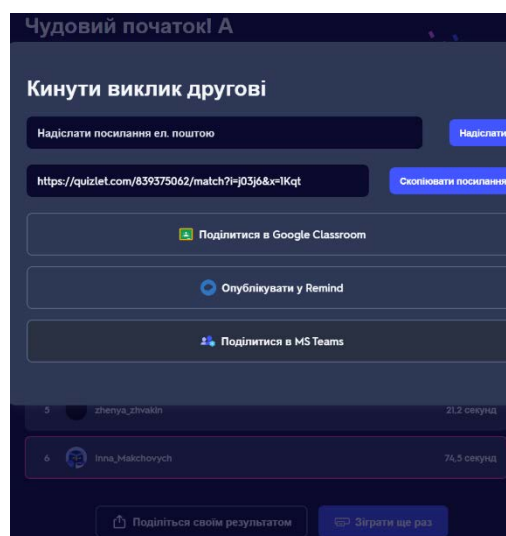


Fig. 10 The “Share the result” function in the “Selection” training session

Source: created by the author based on [31]

This not only encourages personal rewards, but also fosters healthy competition and interaction between students, which helps to increase participation, engagement and support for a common learning goal.

The Quizlet platform also features a “*real-time competition*” feature through the Quizlet Live tool. Teachers can create a Quizlet Live game for each module. The game automatically selects 12 cards from a set and automatically creates a multiple-choice test with 12 questions.

Students do not need to register for an account or install any additional software to participate in Quizlet Live. Students can join the game using a code provided by the teacher, which simplifies the registration process (Fig. 11). During a Quizlet Live game, each participant (in Players mode) or team (in Teams mode) is automatically assigned random avatars and nicknames in the form of different animals. This promotes anonymity for players, reducing the level of excitement as they don't care if they don't take the top spot on the leaderboard. This approach makes the game less stressful. Only the teacher can see who has which avatar when creating and setting up the game (Fig. 11).

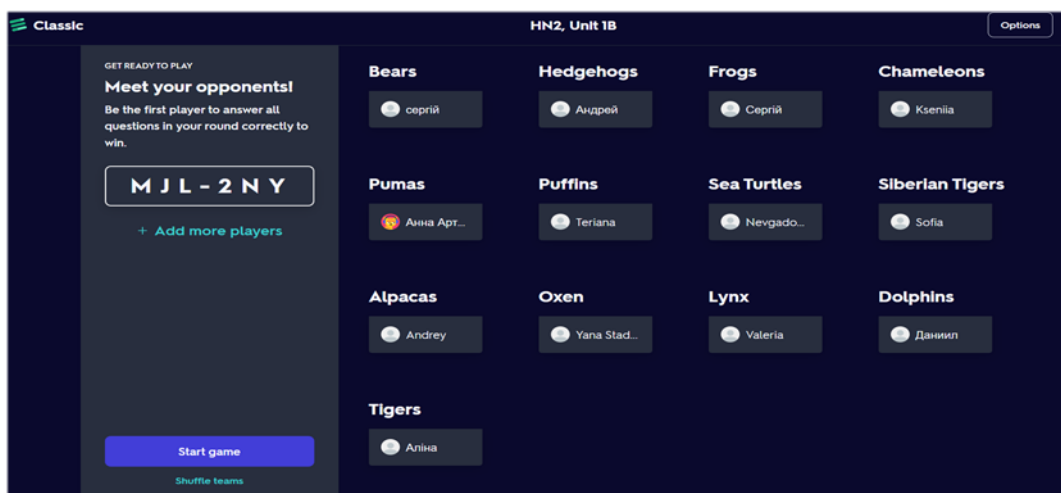


Fig. 11. Creating a Quizlet Live game
Source: created by the author based on [31]

Quizlet Live also uses audio and visual effects to create an exciting atmosphere. Each question is displayed on the screen, and players compete to select the correct answers from the options provided, trying to do so as quickly as possible.

In Quizlet Live, each wrong answer has significant consequences for participants. If a player chooses an incorrect answer, their progress is cancelled and they must start over from the first question. This creates an incentive for participants to study the material more carefully and choose the right answers. This element of gamification not only adds an emotional aspect to the learning experience, but also promotes active and responsible learning. Participants should be careful and cautious, as each mistake can affect their score and place in the player ranking.

Throughout the game, each participant has the opportunity to observe their progress and the progress of other players in real time, receiving instant feedback on the teacher's screen and on their own screen (Fig. 12). This provides a sense of competition and collaboration, making the learning process fun for participants. Gamification in this context enhances the effectiveness of learning by providing not only knowledge but also the development of participants' communication and strategic skills.



Fig. 1 Displaying player progress on the teacher's screen during a Quizlet Live game

Source: created by the author based on [31]

Quizlet Live has two game modes: *Players* and *Teams*. In Team mode, participants are randomly or teacher-selected divided into teams of equal size.

During the game, each team member sees the question and answer options on their screen, but only one team member has the correct answer. Therefore, in order to participate in team mode, all team members must be nearby to be able to compare their answers and determine the correct option. This approach to learning helps to develop critical thinking skills, quick decision-making and the ability to collaborate with a team. Participants learn not only how to absorb information, but also how to apply it effectively in a time-sensitive and competitive environment.

The game ends when any player or team (in team mode) gives the correct answer to all 12 questions, and the leaderboard with the three best results appears on the screen (Fig. 13). This is the moment when players feel their own success or team achievement, which increases their intrinsic motivation and enjoyment of the game. After the game is over, additional results and statistics can also be displayed, giving the teacher the opportunity to evaluate the effectiveness of the learning and make adjustments to future teaching. Viewing statistics and game results allows the teacher to identify students' weaknesses and strengths, individualise teaching approaches, and provide next steps to improve the learning process.

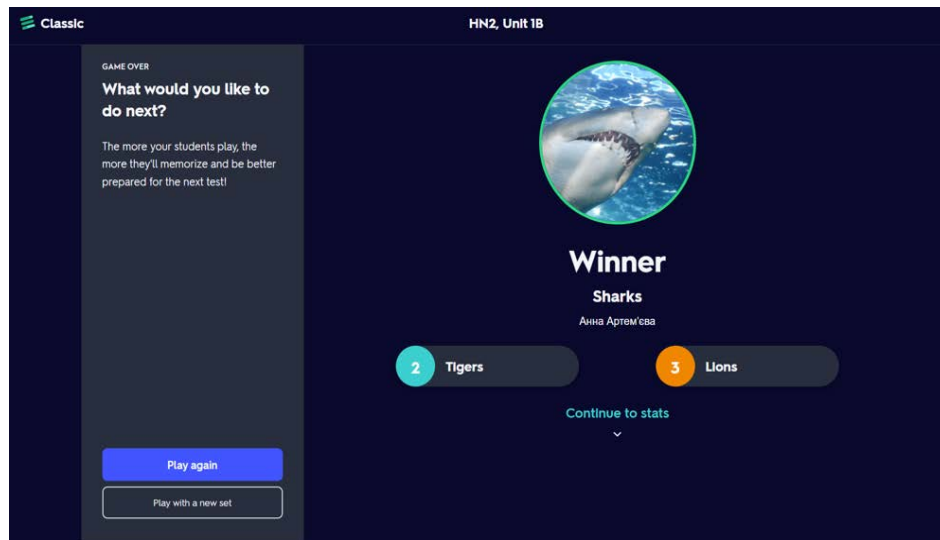


Fig. 2 Table of leaders with the three best results of the Quizlet Live game
Source: created by the author based on [31]

Thus, gamification in Quizlet Live not only provides a fun and engaging form of learning, but also opens up opportunities to improve the quality and individualisation of learning.

Duolingo is another example of innovative gamification in learning that has gained wide popularity among users. This online language learning resource offers a unique approach by combining grammar and vocabulary in the form of games. There are two types of accounts on the Duolingo platform: teacher accounts (Duolingo for schools) and student accounts. Teachers can create their own classes, add students to them, and assign tasks (Fig. 14).

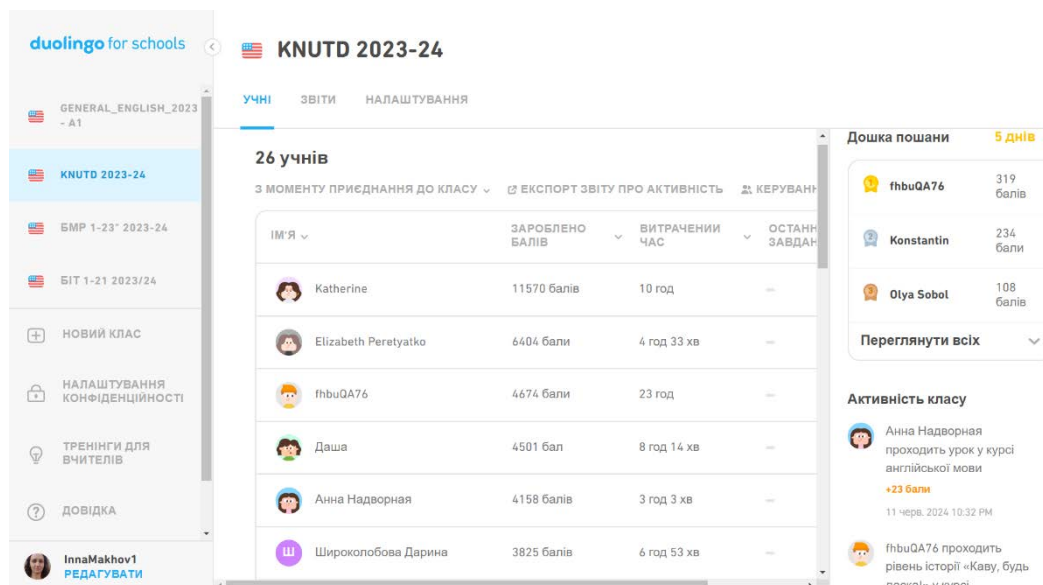


Fig. 14 Displaying the report on the achievements of students of the KNUTD 2023-24 group on Duolingo for schools
Source: created by the author based on [14]

The teacher chooses the number of points for each task and sets a deadline for completion. Unlike the classical system, where students are assigned a specific number of exercises as a task, Duolingo uses an innovative approach: to complete a task, a student must earn a certain number of points set by the teacher.

This approach emphasises not only the quantity of tasks, but also the quality of performance, contributing to a deeper understanding of the material and higher motivation. Duolingo provides individualised learning by automatically adapting tasks and exercises to the language level of each participant. By using machine learning algorithms, the platform provides users with learning materials tailored to their individual learning level. With a teacher account, the user can track the progress of each student in the class: how many points they have earned, the time spent, and which sections they have completed [14].

The main elements of gamification on Duolingo include the following:

- *Achievements*: Duolingo implements a variety of mechanisms to recognise user achievements. Among them are:

- *Leaderboard (Board of Honour)*: This gamification element displays the place of participants in real time, taking into account the number of points earned. It stimulates healthy competition and motivates users to be active and achieve better results.

- *Badges*: (Fig. 15) which have a system of levels that are automatically assigned to each user when specific goals are achieved. It marks and rewards each achievement, which increases the user's motivation to continue their efforts.

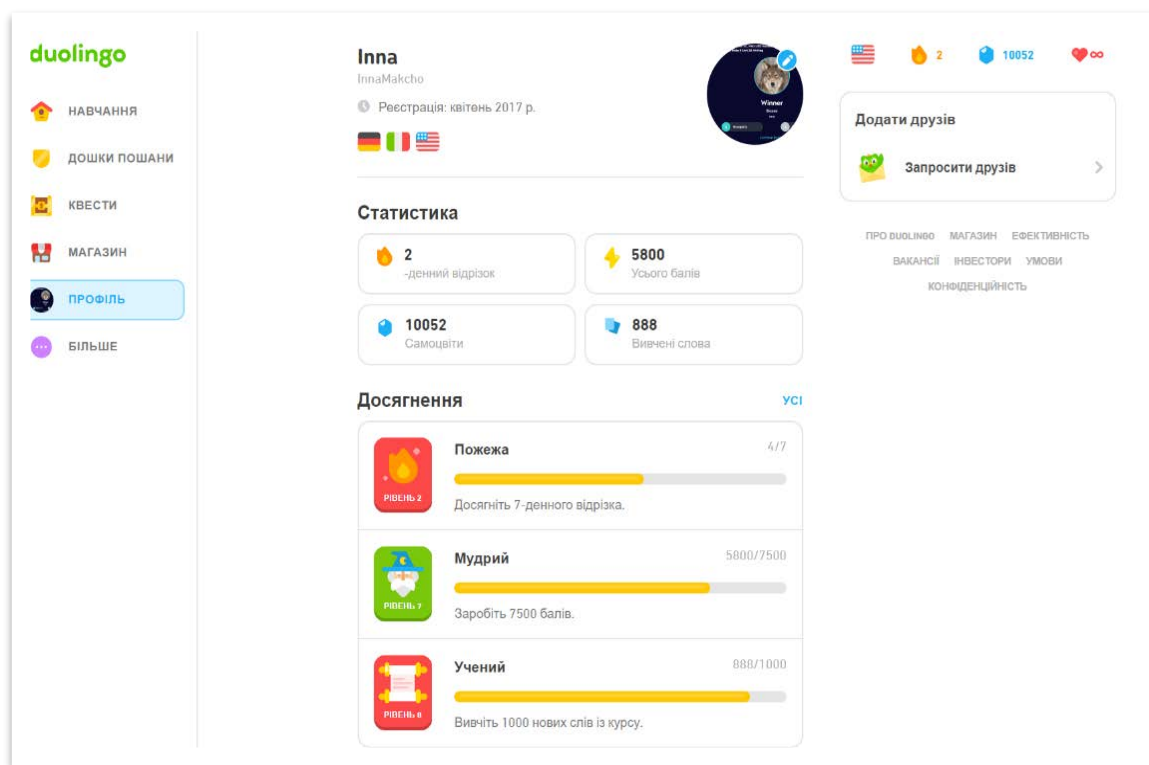


Fig. 15 User profile on Duolingo

Source: created by the author based on [14]

- *Statistics*: The platform provides users with detailed statistics, including the number of consecutive days they have completed the exercises on the platform, the total number of points, the number of gems and words learnt. This allows users to track their progress, feel a sense of achievement, and creates intrinsic motivation to continue.

- *Online games and tasks*: Learning is delivered in the form of games that provide interaction with the user through animated game characters. These characters ask questions during exercises and provide encouragement, creating a playful context for a more engaging language learning experience.

- *Next/More difficult level*: Duolingo automatically adapts the difficulty level of tasks and exercises according to the user's progress. After successful completion of tasks at a certain level, it is possible to move to a higher level. This encourages learners to reach new heights and continue learning.

- *Points System*: Duolingo uses a points system to reward learners for completing tasks. These points can be exchanged for the platform's local currency in the form of "Gems". Gems, in turn, unlock access to the store where learners can purchase various additional features, thus deepening their learning experience. This system provides an additional incentive for activity and development on the platform, promoting gamification and positive language learning.

Gamification in the Duolingo system proves to be an effective tool that promotes a positive language learning process by creating an engaging learning environment. Among the disadvantages is the lack of the ability of users to add their own content on the Duolingo platform. The system is aimed at interactive language learning with the help of ready-made exercises and tasks developed by the Duolingo team, which distinguishes it from other educational platforms where users can actively contribute their own content.

Memrise is a gamified learning platform that focuses on learning languages and other subjects. The platform allows users to explore existing courses, create their own, as well as form groups, add participants and select courses to learn together.

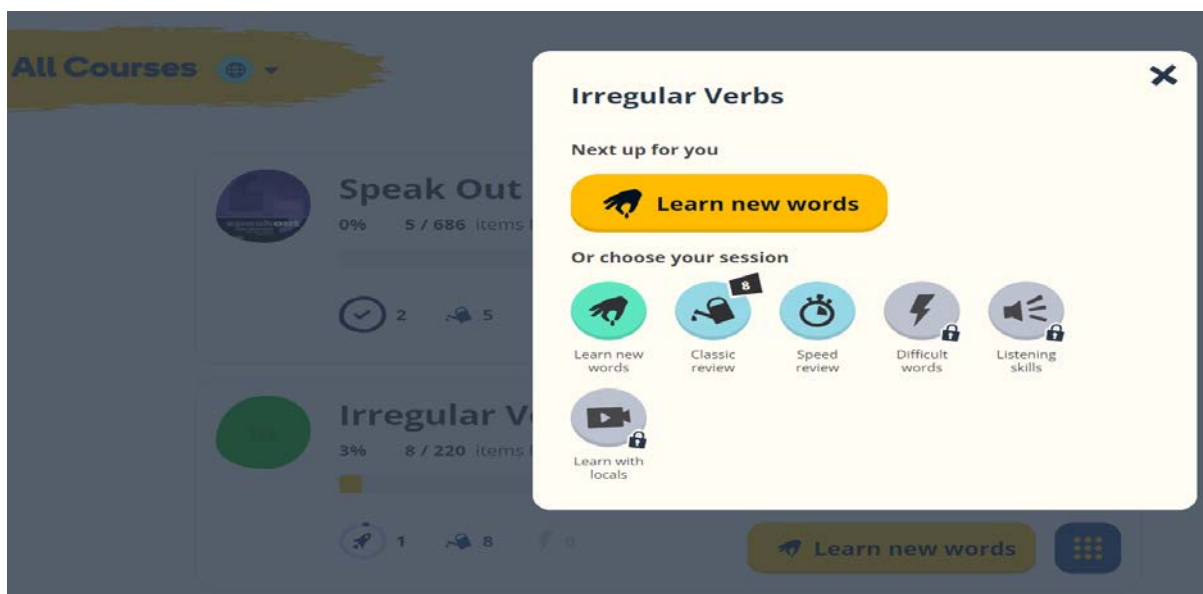
The course involves a variety of exercises that automatically adapt to the individual level of knowledge and pace of work of each user. This ensures a personalised approach to learning and an optimal pace of learning (Fig. 16).

Exercises on the Memrise platform contain a number of gamification elements:

- *Progress bar*: Users can track their progress through a progress bar that is displayed as they complete tasks.

- *Real-time scores*: Displaying real-time score accumulation adds dynamism and excitement to the tasks.

- *Next/More difficult level*: The system automatically adapts the level of difficulty of tasks and exercises according to the user's progress, facilitating a gradual transition to a higher level of training.



*Fig. 16 Exercises on the Memrise platform
 Source: created by the author based on [25]*

After each exercise, it is displayed (Fig. 17):

- **Progress bar:** Displayed after each exercise, showing the number of points earned for the corresponding exercise. It indicates how much is left to meet the daily requirement and how much is needed to complete the level. This provides users with constant feedback on their progress.
- **A list of the terms worked on and their stage of mastery:** After each activity, a list of the terms that have been practised is provided, along with their stage

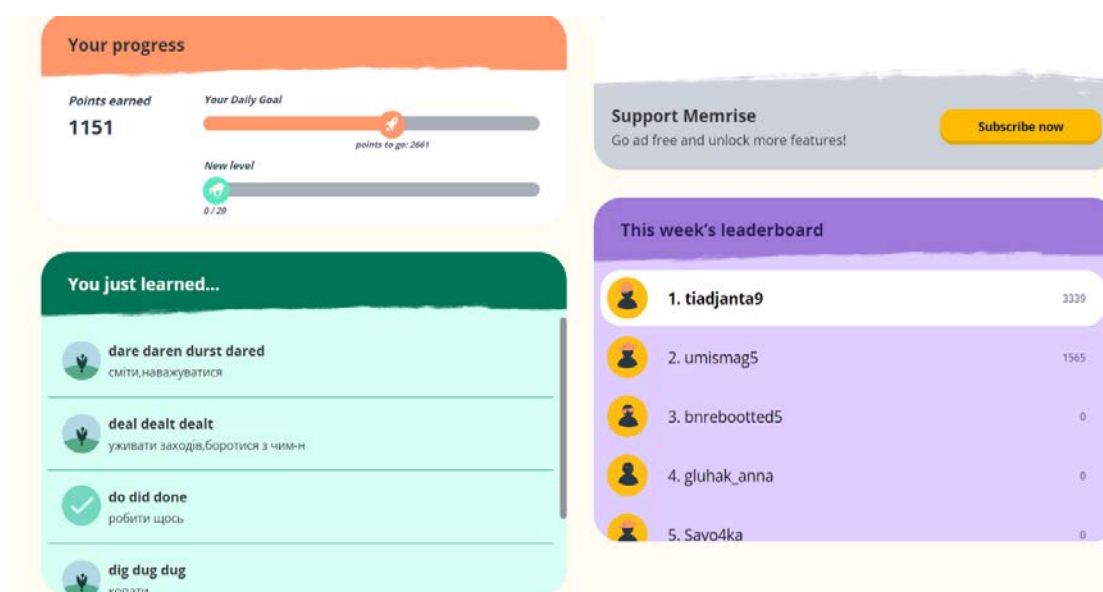


Fig. 17 Displaying user progress after completing an exercise on Memrise. Source: created by the author based on [25]

of mastery. This helps users determine where they are in their learning of specific topics and words.

- **Leaderboard:** Shows where participants stand in comparison to other users taking this course and the number of points they have earned throughout the course.

In the “Groups” section (Fig. 18), each participant has the opportunity to view:

- **The overall level of your profile:** This includes information about the user’s overall progress and achievements on the platform.

- **Number of words learnt:** A metric that displays the number of words the user has learnt over a period of time or in total.

- **The total number of points:** An indicator of user success that takes into account their achievements and activity on the platform.

- **A table of leaders among all his contacts:** A list of the users he follows, showing their ranking and achievements.

- **A table of leaders for each group:** A list of group members with the number of points each participant received in the overall rating and separately for each course. This allows the instructor to analyse student results and make the necessary adjustments to the learning process.

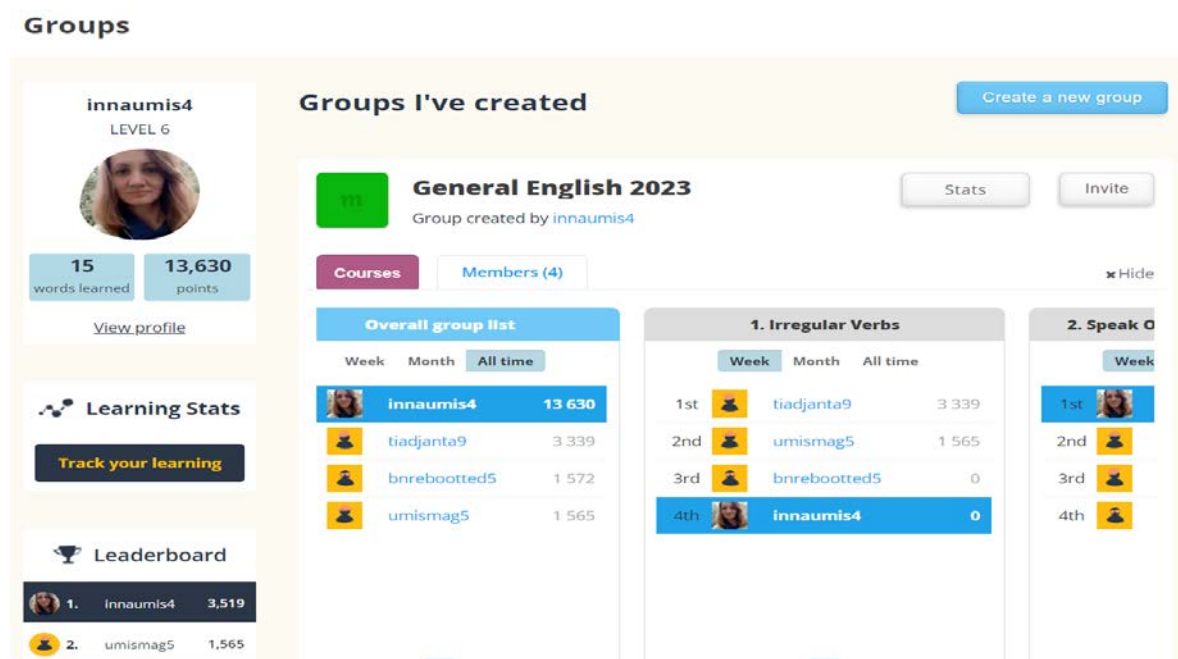


Fig. 3 Groups section on Memrise
Source: created by the author based on [25]

In summary, Memrise stands out as a gamified learning platform that offers a vibrant and engaging experience for learning languages and other subjects. Its innovative approach to gamification, personalised learning process and group interaction system make Memrise an effective tool for developing skills and achieving users’ learning goals in a fun and dynamic way. Despite this, the lack of

real-time competitions should be noted as one aspect that could be improved to further stimulate users.

An analysis of gamified learning platforms such as Quizlet, Kahoot!, Duolingo and Memrise reflects the various aspects of gamification in learning. The comparison table below (Table 1) shows how each of these platforms uses gamification elements to stimulate learning.

Table 1

Comparison of gamified educational platforms

Elements of gamification	Name of educational platforms			
	Kahoot!	Quizlet	Duolingo	Memrise
Communities				
Classes/Groups	+	+	+	+
Teams	+	+		
Leaderboard	+	+	+	+
Competitions in real time	+	+		
Personalisation of the process				
Points				
Badges		+	+	+
Rating, progress scale	+		+	+
Experience points (for leveling up)			+	+
Next/advanced level			+	
Own currency – coins, bonuses			+	
Avatar / character	+		+	

Gamification includes a number of key aspects that are applicable in the educational context:

System: Gamification creates a system of interaction with clearly defined rules and goals. Participants act within this system, where each action affects the outcome. For example, Duolingo uses a level system where users complete tasks to earn points and progress to new levels of difficulty.

Participants: Participants in a gamified process interact with the game content or with other participants. Individual interaction with the content allows the learning process to be tailored to the needs of each learner, providing instant feedback and a safe environment for practice and learning. Social interaction allows participants to work in teams to achieve common goals, such as in the Teams mode on Quizlet.live, where students come together to solve problems together.

Challenge: Players in a gamified system face challenges and tasks that motivate them to achieve defined goals. Real-time competitions like Kahoot! and Quizlet.live create a competitive environment that motivates learners to achieve better results.

Points: Points establish a link between user effort and completed tasks, incentivising participants to complete more tasks. It is important that the points have a specific meaning and are used in further interactions.

Achievements: Leaderboards help to increase player engagement by creating a competitive environment. Badges serve as symbols of achievement, increasing motivation and providing status recognition. Rating systems or progress bars visualise the achievements of participants, creating a healthy competitive environment. Avatars allow for personalisation by presenting a virtual identity to the participant.

The high effectiveness of gamification in education lies in the introduction of game elements as part of a holistic system. This not only motivates participants, improving their academic achievements, but also engages them more deeply in the educational process, creating a stimulating and individualised environment for successful learning.

A comparative analysis of the platforms shows that each of them has unique features that can be useful in the educational process. For example, Quizlet and Duolingo focus on personalisation, giving users the opportunity to tailor learning to their needs and receive instant feedback. The competitive environment created by Kahoot! and Quizlet.live can stimulate competition and increase student motivation.

It is important to note that the effectiveness of gamification in education depends on how it is integrated into the overall learning system. Gamified elements should be part of a coherent system with clearly defined rules and goals. For the successful implementation of gamified elements in the learning process, it is important to take into account the needs and characteristics of a particular audience and integrate them into the overall learning system.

Conclusions. Thus, the use of gamification in education can be an effective way to increase motivation and individualise the learning of computer science students, as well as improve the results of learning English.

The prospect of further research is to study the impact of gamified elements on learning, taking into account the specific needs and characteristics of the audience. In particular, it is worth investigating how gamified elements can be adapted to the needs and interests of computer science students and focusing on the optimal combination of these elements with the overall learning system.

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