International Journal of User-System Interaction 17 (1) 2024, 1-24

Is the gamification of educational apps worth it? A questionnaire-based study as a possible answer

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Abstract. As the integration of gamification elements in educational apps continues to gain prominence, there is a growing need for effective evaluation methods to assess their impact on learning outcomes. This article presents a questionnaire-based approach for evaluating students' depth of knowledge and perception about the existence of gamification elements in apps, as well as extracting the most appropriate elements based on the games types the respondents play in their everyday lives. The questionnaire, which was tested for consistency and reliability, includes a comprehensive set of questions that capture various dimensions of gamification, including game mechanics, feedback systems, progress tracking, rewards, and social interaction. We performed several analyses on the collected answers and the obtained results led us to the conclusion that gamification elements are worth including in the design of future educational applications. The resulting improvements we suggest can enable the creation of a more effective and appealing learning experience by enhancing student engagement and motivation.

Keywords: gamification, education, gamified apps, questionnaire study, smart learning, active learning methods, learning outcomes, AI

DOI: 10.37789/ijusi.2024.17.1.1

1. Introduction

In 1917, John Dewey said “If we teach today as we thought yesterday, we rob students of tomorrow”, however a hundred years passed and teaching methods in education have not changed a lot although technology has evolved greatly. The apparition of computers and the internet made the content more accessible for education and provided tools for making lessons more

engaging by using images, PowerPoint presentations, videos, and more interactive content.

Six years ago, the increased demand for digital technologies in all domains and institutions was significantly impacted by the COVID-19 pandemic which forced many businesses to shift their operations online. Gradually people began to rely more heavily on technology for day-to-day activities leading to an increased demand for digital technologies and a change in direction in research and development.

As all other domains, education was also forced to adapt by switching to online learning to minimize the risk of COVID-19 virus transmission (Pokhrel & Chhetri, 2021). This shift presented challenges for students and teachers alike, including but not limited to internet access issues, lack of adequate personal devices (PCs, laptops, tablets), lack of adequate educational online tools or operative knowledge of education tools, etc. Although, in theory, the online classes would allow students' access to classes from the comfort of their home without traffic and early hours, during and after the pandemic a decrease in students attendance and involvement has been noticed (Uekusa, 2023).

In this context, it was apparent that teachers struggled to adapt and provide students with better tools and mechanisms in order to make education more accessible and interesting as well as to regain or boost interest and attendance.

To add to this challenge, 3 years ago, on the 30th of November 2022, the release of ChatGPT marked the dawn of a new age in technology and innovation. As it slowly improved, and other AI models appeared, the use of AI became widespread and students started using AI chatbots to complete assignments - essays and well formulated analysis were done in the blink of an eye by AI. In answer, in an effort to stop students from using AI, most educational institutions prohibited AI on institutional devices and tried to check student work with AI detecting tools, which, as AI evolved, quickly became less and less reliable. It is exceedingly important to adapt teaching methods to better engage students and provide them with the tools they need to succeed. As with the apparition of computers, internet and phones, we need to incorporate AI in education and use it to fight fire with fire (Bezzina, Dingli & Pfeiffer, 2022, Velazquez-Garcia et al., 2024).

Gamification is the process of incorporating game design elements and mechanics into non-game applications or situations in order to make them more engaging and motivating. Game design elements like points, badges,

levels and leaderboards are used to create a game-like experience that encourages participation, learning and behavior change. Gamification is an emerging strategy used for students' educational process (Jayawardena et al., 2022). Gamification of classes, class activities or evaluation can potentially help address some of the challenges associated with online learning, such as limited social interaction, lack of motivation and time management issues.

Taking into account the continuously developing technology (Reis & Melao, 2023) and the extensive use of devices in students' everyday life, therefore also in the learning stages, gamified applications are strongly connected to the current reality.

Although creating a gamified experience is challenging work, AI can be used to help in creating content by extracting quiz questions from a given material, generating stories or non-playable characters personas and of course, evaluate student provided content and give suggestions of improvements. AI can also help technical teachers in choosing or developing gamification platforms so that gamified content can be easily created with little to no programming knowledge.

With all these in mind, we developed a questionnaire by considering the newest research in the educational field and application design in order to identify the needed characteristics a gamified learning experience must have.

The motivation of this study is, on one side, to extract game elements that users are looking for in games without knowing the theory and, on the other side, to compare them with the ones that researchers find as most used and effective in gamification. This will validate the research and also give us a better understanding of the specific group of respondents which will be targeted for future research of gamified educational apps development.

The goal of this study is to gather information via the questionnaire from a selected group of people and determine if relevant game elements are worth being used when designing a gamified learning experience. Teachers can apply the results to create a specific gaming experience for their classes, purposefully correcting and preventing targeted issues previously observed.

In this article we showcase a literature review of the use of gamification in education and present our questionnaire, detailing the method and results, followed by our conclusion of the research.

2. Literature review

By tapping into the natural human desire for competition, achievement, and recognition, gamification strives to make non-game activities more enjoyable and satisfying. Game elements that are integrated into tasks such as learning, exercise or work increase engagement, motivation and the successful performance of the task.

In the last decade, gamification has been a constantly growing phenomenon with applications in various domains such as education, psychology or finances. The gamification concept has been defined by various researchers (Klock et al., 2020) that studied and tried to design, analyze and implement strategies for gamified applications with different functionalities. In spite of their undoubted importance, a common standard for the gamification elements usage hasn't been clearly defined. Users' attention, commitment and motivation are increased via gamification elements usage in everyday applications (Kalogiannakis, Papadakis & Zourmpakis, 2021). Gamification mechanics included in applications design tend to help users achieve better performance at work, in learning or even in everyday life.

The gamification elements used in apps aren't well defined in the literature, being identified with different names such as badges or trophies. Depending on the context where the gamification elements are implemented, there are several classifications based on their properties: *chance* (based on randomness of an event, the probability of gaining points after accomplishing a task), *choice* (based on the explicit decision the user must make to select a certain path in the application environment), *exchange* (the possibility of trading points in the app for different benefits further used in the application), *exclusivity* (refers to items that are limited in the application and motivate users to accomplish a certain task), *timer* (also implemented as a deadline, is used to put pressure on the user, forcing him to focus and make quick decisions. According to Toda et al. (2019), this type of gaming element could have a negative impact on the user, detaching him from the objective), *competition* (comprises leaderboards, scoreboards or player vs player events. Users are competing against each other for a common purpose), *cooperation* (users work together in accomplishing a certain task. This type of teamwork helps improve social relations), *status* (is a type of users classification, establishing a hierarchy in the app based on points earned during the process of task completion), *social pressure* (social interactions, such as guild

missions in an app, add psychological pressure for users), *updates* (periodically updating the app with new game elements or content helps keeping the users motivated and engaged), *objectives* (this refers to milestones that users must accomplish in order to finalize a certain task), *cognitive tasks* (refers to quizzes or challenges and focuses on testing the user's cognitive level, especially useful in the learning process), *second chances* (allows users to redo a task that they have failed before or they want to improve, being an important incentive that makes applications fun), *stimulation* (refers to augmented visual or auditory environment that enhances user's senses for an improved experience within the app), *narrative* (presents the app context from user's experience perspective), *storytelling* (the connection within the app's context between users and the environment is achieved via *narrative* from the user's perspective and through *storytelling* that completes the user's experience by enhancing the environment with text or audio stories).

The recent popularity of gamification leads to the need for thorough research regarding its benefits in the learning system and its impact on education (Saleem, Noori & Ozdamli, 2022). However, there are some factors affecting the use of gamification in the educational field consisting of the type of users to whom it is addressed and the subject of the application.

When designing a gamification experience, the context and target audience needs to be carefully considered to find common objectives and activities suited to the group and to the gamified activity. Added game elements must be conscientiously designed to enhance the activity, otherwise, if the game elements are not meaningful or relevant to the activity, they can become a distraction or even a barrier to participation.

As previously mentioned, one of the challenges of gamification is ensuring that the game elements are aligned with the objectives of the activity. Another important challenge is avoiding over-rewarding or over-incentivizing users. If the rewards are too easy to obtain or too frequent, they can become meaningless and lose their motivational value, so balancing rewards with the effort required to achieve them is crucial. Implementing a certain gamification approach must be done for a clear audience and with specific and well-defined subjects and goals.

Current literature contains multiple cases and examples of gamified experiences created by teachers based on existing information and followed by questionnaires addressed to participating students to determine the

efficacy of the experience.

In the last years there has been an increased interest in using AI and gamification (Application of artificial intelligence in adaptation of gamification in education: A literature review) or using AI to enhance the education experience (Enhancing Educational Gamification through AI in Higher Education) so it will be useful for teachers which usually create an experience based on known gamification elements, such as badges and leaderboards to map student perception to that experience (Oliveira, Hamari & Shi, 2023). The systematic literature review found a significant gap in the study of tailored gamified educational experiences, explicitly in the lack of researched design solutions based on student profiles, determining the need to research and develop methods to design education gamified environments that accommodate user specific needs and profile characteristics.

It is for this reason that we have designed a questionnaire that is intended to discover game elements that are preferred by students from our area and that will help us understand the user profile in order to design a gamified experience for our students.

2.1. Gamification in education

The fast-paced growth of technological progress affected the way people think, study or interact. Thus, the use of apps in everyday life seems like a natural thing. This, in turn, influences the manner we think, learn and process information. Digital games are more and more used for recreational purposes (Cheah, Shimul & Phau, 2022) and this naturally leads to incorporating games or game elements into the educational process. Education level, demographic spread or other group characteristics have a significant influence on the gamification level used in applications.

In the educational domain, gamification emerged from the need to disseminate information, being perceived by students in a faster, easier and concise manner, boosting their sense of achievement. New technologies that use gamification facilitate the learning process, reducing learning time and instruction disparities. The most important aspects of gamification in the educational process are those focusing on learning and testing. The reward mechanism, as part of the gamification elements, elevates students' motivation and enjoyment of the gamified lessons. Regarding the testing aspect, gamification helps students acknowledge their limitations and the amount of information they acquired on a certain subject during the gamified

learning.

There is a correlation between gamification theory, gaming elements, learning strategies and results. All these components (Tsai, 2018) should be interconnected as gamified applications design and development must take all these into account (Davis et al., 2018).

In education, gamification's main objective is to influence various learning factors such as focus or motivation in order to obtain a better learning outcome compared with the traditional methods. Thus, it is of great importance that the gamified app architecture is meticulously designed considering the psychological influence it has on users. In order to achieve their learning goals, the students must keep their engagement and motivation through the entire learning process and this should be facilitated by the gamified app design.

Gamification elements included in the educational process proved to be efficient in solving several educational issues such as difficulties in lessons understanding that usually leads to dropouts, rejection or negative emotions and educators pedagogically inexperienced or disinterested (Praderio Gaias et al., 2024).

At first, gamification elements were included in applications used mainly in computer science classes. Now, due to their promising results, their usage has been extended to other learning topics, such as science, literature, economy, linguistics and more.

In the hybrid learning environment where a lot of students lose focus, feel disengaged or bored, and tend to postpone or even fail to complete coursework on time, gamification can be a solution by:

- increasing engagement by making learning more attractive. Incorporating game elements such as points, badges, and leaderboards can motivate students to complete coursework and participate in class activities.
- promoting social interaction by encouraging collaboration and competition among students. Multiplayer games where players work in teams provide opportunities for users to work together and build relationships. Leaderboards create a sense of competition and encourage users to challenge each other to improve performance.
- providing immediate feedback to students, helping them stay on track and make progress towards their learning goals.

- helping with personalized learning as it can be customized to the individual needs and interests of students and groups of students. Using gamified experiences and elements corresponding to the objective and the interests of the target group creates a more relevant learning experience that can help motivate and engage.
- promoting problem-solving skills by challenging students to solve puzzles, complete quests, and overcome obstacles to progress in the gamified experience.

Another important aspect described in literature with which gamification can help by making education more engaging is school dropout. Concerning this topic, some of the measures that are believed to be effective are early warning systems. Other solutions that can be implemented by school systems are mentoring programs, alternative educational programs, online courses and personalized learning plans. Gamification aids in applying all these measures by:

- using boards and badges to monitor student involvement, behavior and academic progress levels and thus recognizing students who are at risk of dropping out or who may need additional support;
- introducing team quests or team activities that make mentoring fun and seamless;
- personalizing the learning programs to the needs of the students as the content to be learned can be easily divided in small increments that can be combined in multiple ways;
- creating a more engaged cohesive group via games and fun activities, that generates a safe and welcoming environment, promoting positive relationships between students and teachers, and providing opportunities for student involvement. Schools with positive and supportive climates are more likely to retain students.

3. Methodology

As a research tool, the questionnaire determines patterns for individuals' groups, mainly from an objective perspective, providing results that could be easily generalized due to the large number of respondents. It is a fast and easy method for obtaining direct answers about certain topics or perceptions from individuals in a community targeted by the questionnaire's designers. Errors in interpreting the results of a questionnaire could appear as a result of

deficient questionnaire design or unreliable or ignorant respondents (Taheri & Okumus, 2024). Ignoring some responses must be thoroughly done by the researchers interpreting the questionnaire results in order to maintain the objectivity of the study in question. Regarding the questionnaire design, statistical methods like Cronbach's *alpha* (Christmann & Van Aelst, 2006) or factor analysis can be used to analyze the consistency and reliability of the questions.

Based on our experience as educators in the IT field, we have observed a lot of applications, both commercial as well as educational, that are using game elements. To research gamification and its use in the educational process, we conceived a questionnaire to analyze if gamified apps are worth developing with the purpose of improving students' learning results. The questionnaire was distributed online mostly via Google Classroom and prior to completing the questionnaire, the study participants gave their informed consent for participation, filling a human participant consent form. The answers were registered anonymously so that potential biases could be reduced as much as possible.

The questions were designed in such a way as to determine suitable game elements preferred by our students that can be used in designing gamified applications that match the user profile in order to correct or prevent learning issues.

We used Cronbach's *alpha* measure for the study of internal consistency of our questions because we wanted to determine if the reliability of the scale is suitable for our study. For that, we used SPSS Statistics 22. For the Cronbach's *alpha*, we obtained a value of 0.783, which shows us that the level of internal consistency is high. We analyzed the column that presents the value of Cronbach's *alpha* deleting one item at the time and we observed that removing almost any of the questions would give a lower *alpha* value.

Cronbach's *alpha* just provides a reliability coefficient for our set of variables that are questions. However, it is not able to distinguish between the different dimensions of gamification. For that purpose, we wanted to run a different test such as principal components analysis (PCA).

Further, we performed a Factor Analysis in SPSS. Studying the Total Variance Explained table and the eigenvalues of the components, we observe that our variables seem to measure 6 underlying factors, because only 6 components have their eigenvalues at least 1. Looking at the Communalities table in PCA, we notice that all the *r* squares are greater than 0.60, meaning

they all contribute to measuring the underlying factors. So, there was no reason to remove any of the variables from the analysis.

The questionnaire consists of 23 questions with an estimated completion time between 15 and 20 minutes and could be analyzed into several sections matching the research objectives intended for this study:

- The first part of the questionnaire is meant to objectively establish the respondent's profile that helps us understand the category of individuals for whom the learning gamified apps are most beneficial. These are questions like: “How old are you?”, “What is your gender?”
- Next, we tried to determine the most used and preferred devices and how much time users spend in a session of playing on their devices by asking questions like: “What type of device do you prefer to play games on?”, “How often do you play games on your favorite devices?” or “How many hours do you play in a typical session?”
- We also included questions about the subjective experience and motivation of respondents while playing on their favorite devices in order to determine what keeps them engaged in gamified apps. Respondents answered to questions like: “Why are games fun for you?”, “Why do you play games on your devices?”, “What do you enjoy the most about playing games?”, “When playing games on your device, what keeps you engaged and motivated to continue playing?”, etc.
- One of the main goals of the questionnaire was to establish whether, from the type of game users like to play, we can extract the appropriate gamification elements that can be further used for developing gamified educational apps. These are questions like: “What type of games do you prefer to play?”, “Do you prefer single player or multiplayer games?”, “If you prefer multiplayer games, how do you like to play”, “When playing a game how important are points and rewards for you?”, etc.
- In the final part of the questionnaire, we intended to find out respondents' common knowledge about the concept of gamification and how open they are to using apps that include gamification elements. Respondents answered to questions like: “Have you heard of Gamification (a method that enriches educational content and marketing or business processes with game mechanics)?”, “Have you ever used an app with gamification elements to help with learning? If

yes, choose which ones.", "Have you ever found yourself more engaged with a task because it was presented in a gamified manner (with elements such as points, progress bars, badges, etc.)", "In your opinion, could gamification elements, such as rewards, progress tracking or leaderboards make non-game systems more enjoyable to use?", etc.

Given that gamification needs to be context driven to be effective, one of the purposes of the present questionnaire is to create a gamer profile for students and assess their attraction to different game areas so that the exact interest points can be used in targeted gamification lessons or gamified educational apps.

4. Data Analysis

We administered the questionnaire to a total of 587 respondents, most of them being students, teachers and their families, all of them residing in Romania at the moment of the questionnaire, although a small percentage of our students are from neighboring countries or attending through Erasmus exchange program. The answers were anonymously registered so that we can reduce any social bias especially regarding the subjective parts of the questionnaire. Since some questions refer to understanding the gamification concepts and how they are applied in apps, it is a difficult task for very young individuals to understand the involved notions. Therefore, we have very few respondents under 14 years old. However, that doesn't mean that gamified education doesn't apply to them, quite the contrary, it could be even better perceived and more effective, since they are a more technology-oriented generation.

As previously mentioned, the questionnaire was spread mainly through the academic medium of our Faculty's Department of Informatics and affiliated departments (students, teachers and their respective families and friends), it is not surprising that the vast majority (79.4%) of respondents have ages between 19 and 30, followed by people with ages between 31 and 50 that represent 15.5% of the total. Respondents with ages under 14, between 14 and 18 and over 51 represent only 5.1%. Gender wise, most of the respondents were male (69.96%) which also is in accordance with the gender spread of our department's students.

The first part of the questionnaire helps us in creating the gender-age

profile as it contains user relevant questions addressing age interval and gender.

Questions asked in the second part of the questionnaire are meant to provide insight into which platforms or devices are most used. At the same time, the spread of devices and platforms is directly connected to the income of the respondent and the respondent's family and being valuable information to have as it connects to Sustainable Development Goal 4 (SDG4), quality and equitable access to education, a target of the UNESCO initiative (SDG, SDG4).

Preferred devices frequency usage and typical duration of a gaming session provide information on how long people tend to play games in a single sitting. Previous studies (Jayawardena et al., 2022) have shown that short-term game play can improve the attention duration, while longer sessions (2 hours or more) may have negative effects, such as addiction, sedentary lifestyle or social isolation.

Questionnaire respondents selected the preferred devices with the following rates: 80.3% for laptop/PC, 37.8% for smartphones, followed by 20.6% for console, while tablet has 1.3% and VR headset has 3%. Around two thirds of the respondents use only one device (67.7%), while 23.7% use 2 devices and 7.8% use 3 devices. Those that use 4 or 5 devices represent an insignificant percentage of the total number of respondents (0.4%). The respective answers show a discrepancy between our respondents and global user statistics (Statista, Statcounter) that have smartphones at 66.2% and laptop/PC at 37.9%. We account for this discrepancy by considering the fact that most of the respondents are or should be students or families of students from computer related fields of our Faculty’s Department of Informatics and affiliated departments so a laptop/PC at home is common and thus more used in day-to-day activities, learning and playing.

Almost half of the respondents play games daily (48.5%) and almost a quarter play weekly (23.2%). Combined with the age of the respondents we can see that the majority of people with ages between 19 and 30 play daily or weekly (as seen in figure 1). Most respondents play between 1 and 3 hours during a play session (52.8%), while the rest play less than 1h (24%) or more than 3h (23.2%).

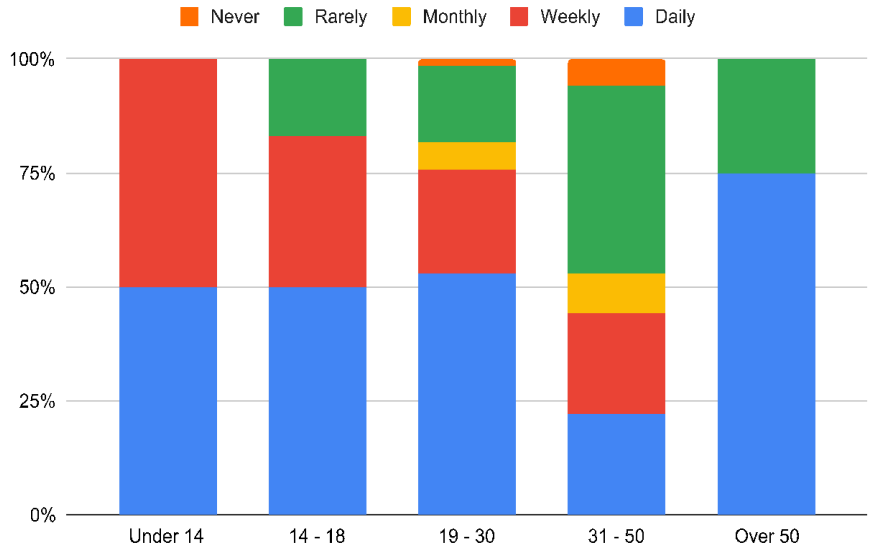

Figure 1. Frequency of playing games on preferred devices by age category

The next group of questions relates to respondents' motivation and experiences. These are important aspects of creating personalized gamified learning activities.

Understanding why respondents find games fun, what they enjoy about games, and what they gain from play will provide insights into how to design effective and engaging educational games and how to create strategies that sustain student involvement based on what motivates them to continue playing games. Relying upon responses to the questions, motivation, and experience for playing games can be divided into the following complementary areas, also represented in Figure 2 as a sunburst chart:

- *Social, Mastery & Achievements*. Respondents who play for social reasons appreciate the interaction with other players, enjoying both the competition and collaboration aspects of games. Duels and matches are important, be it player versus player or team versus team, as well as the collaboration and the community sense that comes with being in a team, interacting with others by chatting or performing tasks together. Fast-paced gameplay, finishing levels, tasks or quests, collecting rewards or trophies, and the general growth in experience

and bettering oneself are also important for the vast majority of respondents.

- *Creativity & Learning*. Respondents agree that playing games helps them to think more creatively, learn new skills, and improve themselves. The challenge that comes from solving puzzles or from finishing a difficult task improves reasoning skills and self-trust, while, at the same time, cultivating grit and creating a persevering mindset.
- *Immersion*. Respondents are immersed in the game universe through the story and plot of the game. Most people appreciate the escape from reality and enjoy exploring the open worlds.
- *Technology*. Some participants enjoy or prefer to play more active and visually stimulating games and intuitive controllers are of great importance to them in the chosen games
- *Playing for relaxation*. Fewer respondents reported they play for relaxation. They use games to decrease the levels of stress, however, passing levels will still generate endorphin release and give players a sense of well-being and happiness as well as improve brain function and facilitate attention, retention, and learning.

In Figure 2 we present all these complementary areas based on users' motivation and experience as a sunburst chart. Additionally, respondents added the following motivations to our other fields: obtaining financial gains; learning about history and culture; learning or improving a foreign language; and game character evolution.

In the fourth part of the questionnaire, we intended to find out the gaming preferences of the respondents in order to extract the most beneficial elements to be used for developing gamified educational apps. Knowing the type of games preferred by different people (single player vs multiplayer) will help in designing a gamification approach that best caters to their interests and preferences and ensures their attention retention. In addition, using this information, we can also determine the appropriate level of social interaction needed in the gamified experience to be created.

Figure 2. Gamification sunburst based on questionnaire responses

The majority of our respondents prefer to play role-playing games / massively multiplayer online (67.8%) and adventure/action (65.2 %). Puzzles are preferred by 38.6% and around a quarter like racing/sports games (27%) or cards/gambling games (10.7%). Comparing these percentages by age category, we noticed that individuals over 50 mainly prefer puzzle games to any other game type.

As most respondents to our questionnaire belong to the 19-30 age group, their preferred types of games are plotted in Figure 3. We observe in this age group that Massively Multiplayer Online games are the most played type of games, thus we deduce that social interaction aspect is one of the most

important elements of gamification to be implemented in educational apps.

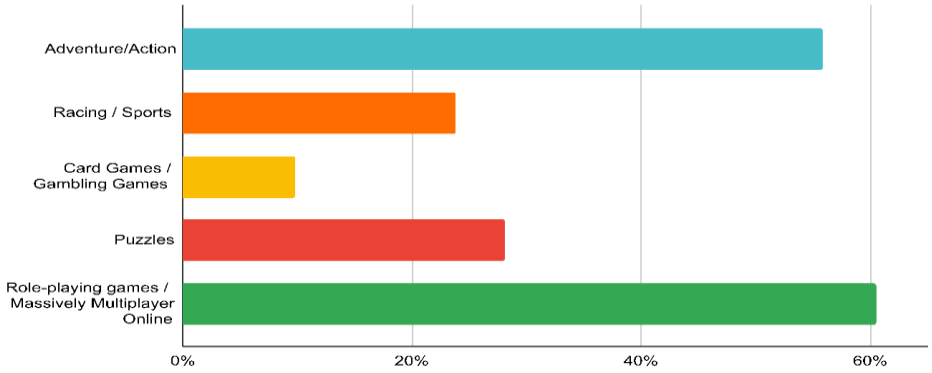

Figure 3. Preferred types of games for respondents in 19 - 30 age category

From our responders, a bit less than half have clear preferences for either single-player games (18.3%) or to multiplayer games (28.9%), while the other 52.8% have mixed preferences that depend on the game they are playing.

Similarly, from the responders that chose multiplayer games, 18.7% prefer PvP (player versus player) gameplay, 18.9% prefer Co-op (where players are united in guilds, tribes, clans, alliances, parties, crews, etc.), while the other 62.1% have mixed preferences that depend on the game they are playing. For this particular group of respondents, taking into account the responses above, a gamified experience should include elements of massively multiplayer online and adventure/action games.

Questions in the final section of the questionnaire are meant to help us determine users' general knowledge and openness to gamification and the impact certain game elements have on respondents. Knowing the game elements that are most appreciated by responders helps in designing the gamification characteristics an educational app could have.

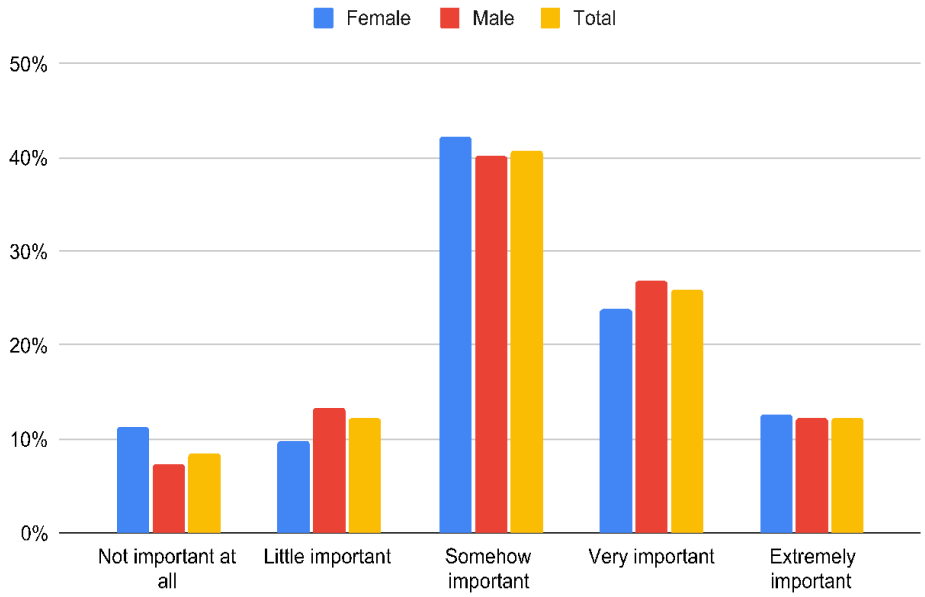

Figure 4. Importance of game elements and rewards in gameplay

The majority of our respondents consider that it depends on the game implementation if a time constraint for passing levels or solving quests increases the game experience (63.4%). 18.7% consider that having a time limit always increases the game experience, while 17.9% definitely don't like time constraints.

An interesting finding is that, per answer, the percent of males and females selecting the same answer is extremely similar, with a variance between 0.5 to 3.9 showing that in the selection of the game elements significance, men and women think alike (figure 4).

Regarding the respondents' background, 44.7% had prior knowledge about gamification, while 43.8% had not heard about it and 11.5% were uncertain.

However, only 22.1% of our respondents said they do not have any prior experience with a gamified educational app showing that most of them use gamified apps without even knowing, while the rest of them, 81.9%, said they used one or several gamified apps for learning like Duolingo, Memrise, Duolingo Kids, Edmodo, Genially, Khan Academy, Coursera, Udemy etc.

More than half (51.5%) of the responders can definitely say they have found themselves more engaged with a task because it was presented in a gamified manner (with elements such as points, progress bars, badges, etc.) and just 36.2% said that only sometimes they were more engaged in a task because of the gamification elements. When asked if gamification elements, such as rewards, progress tracking, or leaderboards could make non-game systems more enjoyable to use, responses were: definitely - 51.91%; probably - 36.59%; maybe - 10.63%; no, not at all - 0.85%.

From the responders, 59.1% consider that adding game elements in any non-game system will make it more pleasant, 29.8% consider it depends on the implementation while only 11.1% think that adding game elements would not impact their user experience.

Additionally, given two apps with similar use, but only one containing gamification elements, most of our respondents consider it very likely (32.3%) and somewhat likely (58.7%) to use the gamified app, while only 6.4% say it's not very likely and 2.6% think it is unlikely to use the gamified app over the one with no game elements.

When asked if they think gamification in education has an age limit to which it can be effective, the respondents' opinion is that gamification in education has no age limit. The broad belief is consistent with the fact that learning should and does continue throughout an individual's entire life.

We examined multiple game elements used in gamified applications for education from previous research, and the questionnaire allowed us to identify the ones that are best suited to our respondents.

The different game elements considered as important by our interviewees are described below. We have selected the game elements taking into account responses from corresponding age intervals, gender mix, device preferences, and usage, and most importantly their game preferences. The following list displays selected game elements organized by the game genders preferred by the questionnaire respondents and include the percentage of repliers that prefer the game type.

RPGs / MMOs 60.43%

- Social Characteristics - Collaboration, Players vs Player Competition (PvP), Team work, Team contests, Recognition, Belonging, Role Playing, Players vs Environment (PvE), Guild competitions;

- Achievements - Trophies and achievements gathering, High scores, Unlocking objectives, Competition, Accomplishments, Completion, Rewards;
- Mastery - Improving Skills, Gameplay, Challenging levels or worlds, Customization, Multiplayer, Reward system;
- Immersion - Escaping reality, Story/plot, Excitement, Open world exploration, Massive World Scale, Multiple storylines, Main & Secondary quests, Escaping reality;
- Creativity & Learning - Crafting & Creating, Discover or learn new things, Improve skills, Challenge oneself, Strategic thinking;

Adventure / Action 55.74%

- Social Characteristics - PvP, PvE, Social Interaction, Collaboration;
- Achievements - Competition, Accomplishments, Unlocking objectives, High scores, Rewards;
- Mastery - Developing a Skill Set, Challenging levels or worlds, Fast pace gameplay;
- Immersion - hero journey, scale, main storyline, Intense gameplay;
- Creativity & Learning - Strategic thinking;

Puzzles 28.09%

- Social Characteristics - PvE;
- Achievements - Competition, Accomplishments, Unlocking objectives, High scores;
- Mastery - Developing a Skill Set, challenging levels;
- Immersion - low immersion;
- Creativity & Learning - Strategic thinking, Discover or learn new things;

Racing / Sports 23.83%

- Social Characteristics - Team spirit, PvE, Social Interaction, Collaboration, Organization;
- Achievements - Competition, Accomplishments, Unlocking objectives, High scores, Rewards;
- Mastery - Fast pace gameplay, Developing a Skill Set;
- Immersion - Hero journey, Intense gameplay;

- Creativity & Learning - Strategic thinking;

These results will be taken into account in developing a gamified app for education targeting the same user profiles.

5. Conclusions

Online or hybrid classes together with improved access to smart devices and the internet for both students and teachers have increased the need and use of educational technology, such as online learning platforms and educational apps. These technologies will certainly continue to be used as learning tools in the future, even in local learning. In this context, gamification proves to be a handy tool for teachers as it helps to maintain the (digital native) students involved in the learning process.

The motivation behind addressing the topic of gamification is the desire to explore its potential as an effective tool for enhancing educational experiences and improving learning outcomes. By understanding the psychological effects and benefits of gamification, educators, and developers can make informed decisions regarding its implementation in educational settings. Adding to this, AI can be used to help create gamification software and to generate content. In this manner, if used well, AI can become a tutor for students (art Combining Gamification and Intelligent Tutoring Systems in a Serious Game for Engineering Education) and a perfect professor assistant. In addition, there is a clear benefit that AI can bring to gamification by providing flexibility and more dynamic interactions. (Leveraging Gamification Through Artificial Intelligence: A Case For Personalized And Adaptive Assessment).

In this article, the analysis of the existing literature and the research results provide valuable insights into the use of game elements as a tool for enhancing student engagement and motivation. The findings of this study clarify how gamification can be effectively leveraged in educational app design and development, taking into account that different game elements are more effective in different contexts. We also emphasize the importance of testing and refining the design to ensure its effectiveness. The inclusion of game elements and mechanics can create a sense of achievement and competition among students, by increasing motivation and aiding in progress tracking. Elements such as points, badges, and leaderboards provide clear goals and feedback, encouraging students to actively participate and strive for

improvement.

Introducing gamification in education is expected to have positive psychological effects, such as increased motivation, engagement, and enjoyment among learners. Gamification elements that contribute to students' fun and interest in learning are widely used in educational applications. These types of applications promote proactive learning and decrease the fear of failing by allowing students to restart tasks and facilitate social interaction in a specific learning environment.

The present study utilized a comprehensive questionnaire as a basis for analyzing the impact of game elements on user engagement.

The questionnaire was designed in such a manner as to permit us to extract game elements that users are looking for in games without knowing the theory and emphasize the ones that can be successfully applied in developing educational gamified applications.

The questionnaire was distributed mainly to our Faculty Department of Informatics students who were asked to share it with friends and families, so, as is shown by the collected data, the spread of the questionnaire was limited. Participation in the questionnaire was voluntary and anonymous to eliminate any influences or biases. We used all the responses we received, not eliminating any answers, and we considered the sample to be representative of our students.

An interesting finding is that in the selection of the game elements' significance, men and women think alike, meaning that these elements are not a specific gender type preference. Besides gender, age does not impact the respondents' opinion about gamification. When asked if they think gamification in education has an age limit to which it can be effective, the general opinion was that gamification in education has no age limit.

Also, more than half (51.5%) of the responders said they definitely found themselves more engaged with a task because it was presented in a gamified manner (with elements such as points, progress bars, badges, etc.). A significant majority of the responders (59.1%) considered that adding game elements in any non-game system would make it more pleasant, with only 11.1% thinking that adding game elements would not impact their user experience.

The results indicate that the questionnaire provides a reliable measure of gamification elements and demonstrates its potential as a valuable tool for evaluating and optimizing educational apps.

In conclusion, the questionnaire allowed us to gather information from respondents and showcase the utility of using game elements in the educational process. Furthermore, we were able to determine the most relevant game elements we could apply to create a specific gaming experience for our students.

By incorporating the most relevant game elements, such as points, badges, leaderboards, narratives, rewards, and social interactions, gamified educational apps can enhance the learning experience and increase engagement.

Using this questionnaire, we identified the game elements most preferred by students in our area, along with their general user profiles. These insights will guide the design of a tailored gamified learning experience, enhanced by existing AI tools to maximize engagement and effectiveness.

A limitation of the present study could be the fact that a fair share of the results is based on respondents' subjective perceptions. This can be vulnerable to misinterpretation, as respondents may readjust their responses in order to alter their appearance so that they can obtain certain social benefits. To address these limitations, we plan on implementing a gamified educational experience customized to our target students and test student engagement and learning evolution in a gamified versus a classical education program.

Another limitation of the study is that the respondents were all from Romania and mostly students. An extension of this work can be achieved by applying the survey to a broader group of people, not only University students.

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