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Motivation through play: Gamification as a tool to increase student engagement

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Abstract

Motivation through play: Gamification as a tool to increase student engagement is a multi-layered and relevant topic in the modern education system. In the context of the digitalization of education and the changing needs of the younger generation, the need to find new approaches to increase learning motivation is becoming increasingly important. One of these approaches is gamification, the introduction of game elements into the educational process. Low student engagement, difficulties with time management, and a decrease in interest in traditional forms of learning can negatively affect students' academic performance and overall level of education. Constant exposure to the digital environment, information overload, and lack of interactivity often reduce the productivity of the learning process. At the same time, not all students perceive such conditions in the same way; individual characteristics, the level of self-organization, and personal motivation play an important role in the effectiveness of learning the material. Gamification, which takes these differences into account, can act as an effective tool that can increase interest, develop self-organization skills, create healthy competition, and stimulate progress. For this purpose, educational institutions must implement pedagogical practices that encourage active student participation and foster sustainable learning motivation. This study aims to provide an in-depth study of the influence of gamification on students' motivation and the degree of their involvement in the learning process. In addition, in the context of rapid technological advancements, it is crucial to recognize the potential of gaming approaches in enhancing academic performance and fostering key competencies. As a result, educational institutions can develop effective gamification strategies adapted to the digital habits of students and focused on achieving sustainable educational outcomes.

Keywords: Computer science education, Digital competencies of future teachers, Education, Gamification, Perception of competence.

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1. Introduction

Currently, the rapid development of technology has significantly transformed many aspects of education and students' daily lives. Especially the active introduction of digital platforms, mobile applications, and network communications has led to a constant flow of information, which includes students. These technological advances, along with their undeniable benefits, have brought new challenges, including reduced motivation for learning and decreased attention to the learning process.

In this context, gamification is becoming one of the relevant tools the use of game elements in an educational environment to increase student engagement and interest. Motivation to learn reflects the level of energy, aspirations, and engagement that students demonstrate in the learning process. In today's digital environment, the success of the educational process largely depends on how motivated and interested students remain in learning.

Recent research indicates that traditional forms of teaching materials are becoming less effective in the face of digital overwork and reduced concentration. In this regard, the importance of methods that can increase the active participation of students is increasing. Gamification, in this context, is a promising approach that can have both positive and negative effects, depending on the context and the method of implementation.

Understanding how gamification affects students' motivation is becoming an important condition for improving the quality of education, developing sustained interest in the learning process, and fostering personal and professional competencies. The present study aims to examine the influence of game mechanisms on motivation to learn in higher education, as well as to identify factors contributing to the successful implementation of gamified solutions.

As part of the work, a review of the scientific literature on the topic of gamification and educational motivation was conducted. Validated survey scales measuring the level of motivation and perception of gamified learning were used to collect empirical data. The data was processed using the statistical package SPSS 28.0. To determine the normality of the distribution, the Shapiro–Wilk test was applied, the results of which showed a deviation from the normal distribution. In this regard, nonparametric methods were used in the analysis: the Mann-Whitney U-test for comparing two groups, and the Kruskal-Wallis criterion for analyzing differences between three or more groups. 110 students of the Eurasian National University named after L.N. Gumilyov of the Republic of Kazakhstan participated in the study. The data obtained allows for a deeper understanding of which elements of gamification most effectively contribute to the formation of sustainable learning motivation and provides the basis for developing strategies to increase student engagement in the educational process.

2. Literature Review

Modern digital technologies are actively integrated into the field of education, changing approaches to learning and students' perceptions of the educational process [1]. One of the promising methods for increasing engagement is gamification the introduction of game elements (scores, levels, badges, missions, etc.) into the educational environment. This approach aims to strengthen motivation, develop interest in learning, and foster sustainable learning activities.

According to the Merriam-Webster Dictionary, motivation is defined as "an acting force or incentive that causes behavior" [2]. In the educational context, motivation plays a key role: it determines the level of student engagement and their perseverance in achieving goals and striving for success. Gamification promotes extrinsic motivation by providing students with instant rewards and positive reinforcement.

However, research shows that over-focusing on external stimuli can lead to a weakening of internal motivation—when interest in learning exists only in the presence of game elements. In such circumstances, students may focus not on the content of the course [3] but on mechanically completing tasks for the sake of reward, which reduces the educational value and depth of learning of the material.

The mechanisms underlying gamification are related to the reward system in the brain, in particular, the dopamine response, which is formed in response to a positive result. This explains why gamification can be so effective: it activates pleasure zones, thereby increasing the desire to continue participating in the learning process. However, it is precisely this effect that requires pedagogical control to prevent a shift in emphasis from the goal of learning to "playing for the sake of playing."

Pedagogy emphasizes the need for a balanced approach: game elements should be used as an auxiliary tool aimed at maintaining interest and engagement, and not as the only source of motivation. It is important that, in the learning process, an internal learning motivation is formed an interest in knowledge, independence, and a desire for professional development.

There is an active growth of interest in using gamification as a method of increasing student engagement in the educational environment. However, it is important to take into account that excessive or inappropriate use of game elements can lead to maladaptive behavior in students. Modern research in the fields of pedagogy and psychology indicates that an excessive passion for gaming especially in digital formats can manifest as a compulsive desire for external stimulation, which diminishes critical thinking and independent motivation to learn. Recent clinical and educational studies [4] identify certain forms of behavioral behavior in which game mechanics (in the form of points, awards, levels, and ratings) become an end in themselves, rather than a means to achieve educational outcomes. This can lead to a decrease in the student's ability to concentrate on the essence of the learning material rather than on the gameplay [5].

In addition to the widely studied phenomenon of gambling addiction, forms of problematic use of digital technologies that can accompany the introduction of gamification are also noted in educational practice. These include excessive Internet usage [6] a passion for gaming applications [5], constant interaction with smartphones [7] and high social media activity [8, 9]. These phenomena can have an impact on cognitive load, attention, and the quality of information assimilation by

students. Based on this, the authors concluded that when introducing gamification into the educational process, it is extremely important to maintain a pedagogical balance: game elements should remain auxiliary tools that support interest and activity, but not replace intrinsic motivation and meaningful learning. A competent design of a gamified environment requires consideration of both motivational and psychological factors, ensuring the development of sustainable rather than situational involvement of students. Engagement through game mechanics generates students' interest, desire to achieve goals, and a positive attitude toward the learning process [10].

Research shows that game elements such as scores, ratings, badges, and levels can inspire students with a sense of satisfaction, progress, and healthy competition [10]. According to research by Hanus and Fox [11] and Serik et al. [12], the inclusion of game elements in learning promotes deeper cognitive activity and enhances emotional engagement. Gamified platforms encourage students to participate in educational activities regularly, creating sustainable behavioral patterns aimed at development and self-realization. The reward system embedded in gamification activates the dopamine centers of the brain, which enhances the enjoyment of the learning process and promotes long-term learning [13]. This is especially important in conditions where it is necessary to keep the attention of students, to form their independence, and interest in knowledge. The World Health Organization [14] emphasizes the importance of an informed approach to the use of gaming technologies. However, in the educational environment, gamification does not manifest itself as a risk but as an innovative pedagogical technique that allows for personalized learning, increased student activity, and the development of self-regulation skills.

Research by Alsawaier [15] highlights key aspects of the positive effects of gamification [15].

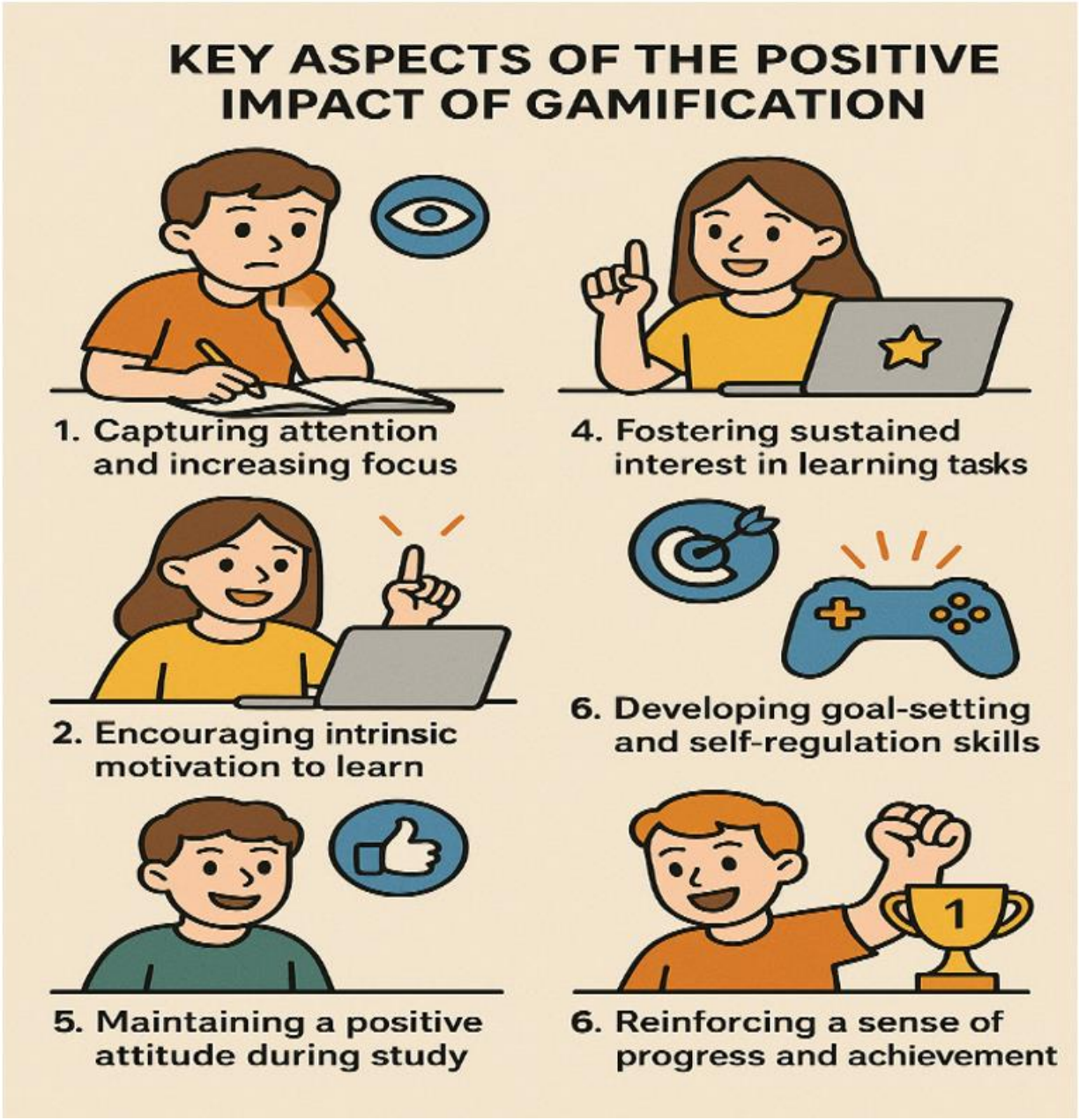

Figure 1.
Benefits of Gamification.

Gamification is becoming not just an auxiliary tool but a strategic approach to learning that can improve its quality, emotional engagement, and effectiveness. With proper pedagogical implementation, it contributes to the development of responsibility, initiative, and sustained cognitive motivation among students.

The use of game mechanisms in an educational environment has a significant impact on the cognitive and emotional processes of students. Research shows that properly structured gamification can stimulate areas of the brain associated with motivation, attention, and reward, which promotes active and mindful learning [16].

The observed psychological reactions to a gamified educational environment can be described in terms of the following aspects:

Table 1.
Aspects of student engagement when using gamification in an educational environment.

Aspect	Pedagogical significance
Cognitive engagement	The student shows a steady interest in educational content through game mechanisms.
Emotional response	Involvement in the game causes positive emotions, increases satisfaction with the learning process.
Increased activity time	The desire of students to spend more time on educational tasks in a playful way.
Conscious participation	The ability to regulate their behavior within the framework of game rules and goals.
Striving to overcome difficulties	Students' willingness to continue completing assignments despite difficulties.
Replacing passive activity	The game form replaces boring, ineffective teaching methods with more productive ones.
Focus on educational goals	Students use game strategies to achieve specific learning outcomes.
Social engagement	Involvement in a group game promotes communication, cooperation, and the development of soft skills.
Priority for development	Striving for self-development through participation in meaningful educational gaming activities.

Gamification, as a pedagogical strategy based on the use of game elements in a non-game context, has proven to be a powerful tool for increasing motivation, engagement, and learning effectiveness.

Thus, according to a review by Sailer and Homner [17] which includes more than 40 empirical studies, gamification contributes to improved learning motivation, active participation, and better learning outcomes Ekici [18] also emphasizes that game mechanics allow for the creation of an interactive educational environment conducive to the development of critical thinking, collaboration, and self-organization [18].

The theory of self-determination proposed by Urdan and Schoenfelder [19] explains that students' motivation is enhanced when three basic needs are met: autonomy, competence, and social affiliation [19, 20]. Gamification, which is competently integrated into the educational process, helps to realize these needs through a system of achievements, choices, and joint assignments.

Therefore, gamification is not a distraction in the educational context. On the contrary, it represents a methodically guided, scientifically based approach aimed at:

- Fostering a sustained interest in learning.
- Development of self-organization and purposefulness skills.
- Activation of cognitive processes.
- Strengthening digital literacy and teamwork.

When applied pedagogically, gamification becomes not only a motivational resource but also a fully developed element of the modern educational model.

Table 2.
Factors requiring pedagogical attention when using gamification in education.

The factor	Explanation
Frequency of interaction with games	It is necessary to control the frequency of use of game mechanics to maintain the learning focus.
Intensity of engagement	It is important to ensure a balance between the passion for the game and the achievement of learning goals.
Time spent in a gaming environment	The duration of the game interaction should be pedagogically justified.
Priority among other activities	Game tasks should not replace other important types of educational and social activities.
Continuing to participate in difficult situations	Students should be motivated through positive reinforcement, not through coercion or pressure.

The scientific literature emphasizes that excessive and unstructured use of digital technologies can lead to addiction, especially among children and youth [21]. At the same time, it is important to clearly distinguish between the pathological use of technology and the conscious, pedagogically sound introduction of digital tools such as gamification into the educational environment.

Gamification, based on the application of game mechanics in a non-game context, is becoming an effective strategy to increase students' motivation, interest, and engagement. Modern research in the field of educational psychology indicates that well-structured game elements contribute to the formation of stable learning motivation, develop cognitive and social skills, and create a positive emotional atmosphere in learning [22].

If uncontrolled use of technology can be associated with sleep disorders, anxiety, and decreased social activity [23] in an educational environment, gamification, on the contrary, can serve as a preventive and motivational mechanism that enables students to channel their interest in technology constructively. Students engaged in playful forms of learning exhibit high activity, initiative, and a willingness to work as a team.

It is important not to reject technology because of possible risks, but to foster a digital culture among students in which gamification functions not merely as a means of entertainment but as a tool for development. With appropriate methodological support and pedagogical design, game elements can help overcome learning apathy, enhance learning outcomes, and develop essential 21st-century competencies: critical thinking, communication, cooperation, and creativity.

The concept of motivation was first defined as the internal energy that motivates the body to act [24]. According to the theory of Rodriguez [25] any internal or external factors that upset the balance cause the body to strive to restore this balance through activity. Motivation determines the nature of this activity, including desires, needs, and even fears [26].

According to Bandura [27] motivation is a person's desire to achieve a goal based on their desires and efforts. Thierry, H. emphasizes that motivation and satisfaction are closely related: motivation initiates behavior aimed at satisfying a need and has an impact on a person's entire life [28].

High motivation promotes a positive perception of the world, increases the level of happiness, and inspires others [29]. That is why it is extremely important in education to create conditions conducive to inner motivation for learning.

One of the modern effective tools for increasing students' motivation is gamification, which involves the introduction of game elements into the non-game (educational) process. Game mechanics contribute to the development of interest and pleasure from completing tasks, thereby maintaining activity. By encouraging progress, basic competition, and instant feedback, gamification activates students' intrinsic motives, making the learning process emotionally engaging and meaningful.

Gamification, being one of the effective approaches, helps to translate external motivation into stable internal motivation, which, in turn, has a positive effect on learning outcomes and the general attitude of students toward learning.

3. Materials and Methods

The purpose of this study is to systematically examine the impact of gamification on students' learning motivation in higher education, as well as to determine how game elements can enhance student engagement and activity. The research aims to analyze how game mechanics introduced into the educational process contribute to increased interest in learning, sustained motivation, and improved learning outcomes.

3.1. Research Hypotheses

- The level of motivation of students varies statistically significantly depending on gender.
- The use of gamification in an educational environment has a positive effect on students' learning motivation.

The general population comprises students enrolled in pedagogical programs at a state university in the Republic of Kazakhstan. The sample includes 110 second-year students (40 females and 70 males), selected through random sampling. Participation in the study was voluntary.

To obtain reliable data, an analysis of the scientific literature on the topic was conducted, followed by the application of a questionnaire methodology using standardized scales. The "Academic Motivation Scale" was used to assess the students' motivation levels.

In this study, a motivation scale adapted from the model developed by Mottaz (1985) was used to measure the level of academic motivation among students. The scale includes two main components: intrinsic motivation (for example, interest in learning and a sense of satisfaction from the learning process) and extrinsic motivation (for example, expectations of evaluation, approval from teachers, or graduation).

The scale comprises 24 statements, of which 9 assess intrinsic motivation and 15 assess extrinsic motivation. Participants rated the statements on a 5-point Likert scale, where:

1 - "Totally disagree".

5 - "I agree".

This scale enables us to identify which motivational factors—internal or external—prevail among students, as well as how they change when gamification elements are incorporated into the educational process.

4. Results and Discussion

The data were analyzed using the statistical software SPSS version 28.0. The Shapiro-Wilk test was used to verify the normality of the data distribution. Since some of the data did not conform to a normal distribution, nonparametric analysis methods were employed.

- To compare the two groups, the Mann-Whitney U test was used.
- The Kruskal-Wallis test is used to analyze the differences between three or more groups.

Table 3.
Demographic characteristics of the participants.

Indicator	Category	N (number)	%
Gender	Male	70	63.6%
	Female	40	36.4%
Course of study	2nd year	110	100%
Education level	Bachelor course	110	100%

As shown in Table 3, 110 people participated in the study. The distribution of participants by gender is as follows: 70 males and 40 females. All participants are second-year undergraduate students. Regarding the level of education, all respondents are enrolled in a bachelor's degree program.

Table 4.
Distribution of participants' scores on scales of engagement and motivation in the context of gamification (Shapiro-Wilk test).

Measurable indicators	Shapiro-Wilk
The scale of engagement as a result of gamification	0.001
The scale of educational motivation	0.036

As can be seen from Table 4, the distribution of points received by participants on the scale of motivation and school involvement in the educational process based on gamification is not normal (p

Table 5.
Mann–Whitney results on the distribution of students' scores on a scale of motivation and engagement depending on gender.

Metrics (related to gamification)	Gender	N	Average	Standard deviation	U Manna–Whitney	p
Using game elements in learning (interest)	Male	70	13.60	5.15	-0.115	0.889
	Female	40	13.30	5.10		
Motivation to complete tasks through the game	Male	70	12.72	5.08	-0.505	0.612
	Female	40	13.12	5.25		
Participation in competitive elements	Male	70	12.85	6.40	-0.395	0.695
	Female	40	12.68	6.78		
Using gaming platforms to study	Male	70	13.95	6.65	-0.460	0.649
	Female	40	13.60	6.30		
Overall score on the scale of motivation and engagement	Male	70	53.15	20.20	-0.165	0.870
	Female	40	52.85	18.50		

As can be seen from Table 5, the indicators for all sub-items of the scale of motivation and involvement through gamification, such as interest in game elements, motivation to complete tasks, participation in competitive activities, and use of gaming platforms, did not demonstrate statistically significant differences depending on gender ($p > 0.05$). Also, the overall score on the motivation and engagement scale did not show a significant difference between men and women ($p > 0.05$).

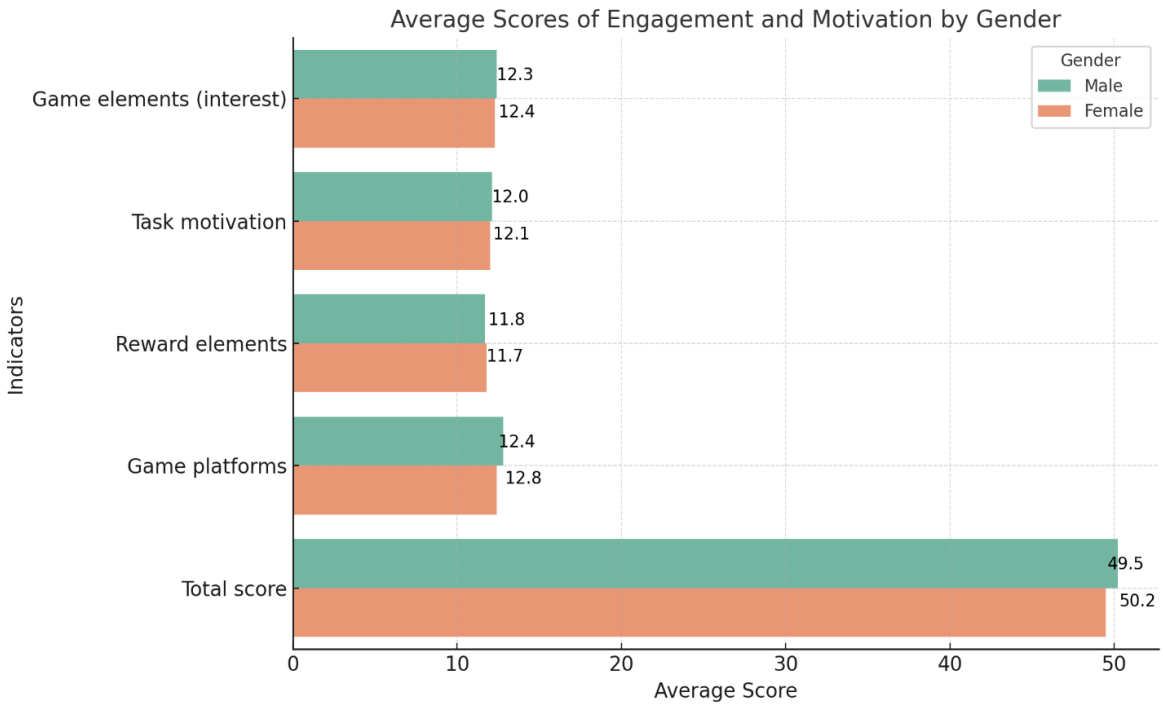

Figure 2.
Visualization of average student engagement and motivation scores in the context of gamification.

Table 6.
Results of the Mann–Whitney test on the motivation scale depending on gender.

Motivation type	Gender	N	Average	Standard deviation	U Manna - Whitney	p
Intrinsic motivation	Male	70	36.80	5.50	-0.790	0.429
	Female	40	35.85	5.20		
Extrinsic motivation	Male	70	50.60	8.70	-2.210	0.028
	Female	40	53.10	9.90		

As can be seen from Table 6, there were no differences between men and women in the level of intrinsic motivation in the context of gamification ($p > 0.05$). However, there is a statistically significant difference in the indicator of external motivation ($p < 0.05$): female students demonstrate higher external motivation compared to male students. This may indicate that women are more responsive to external stimuli such as points, rewards, and recognition used in the gamification process.

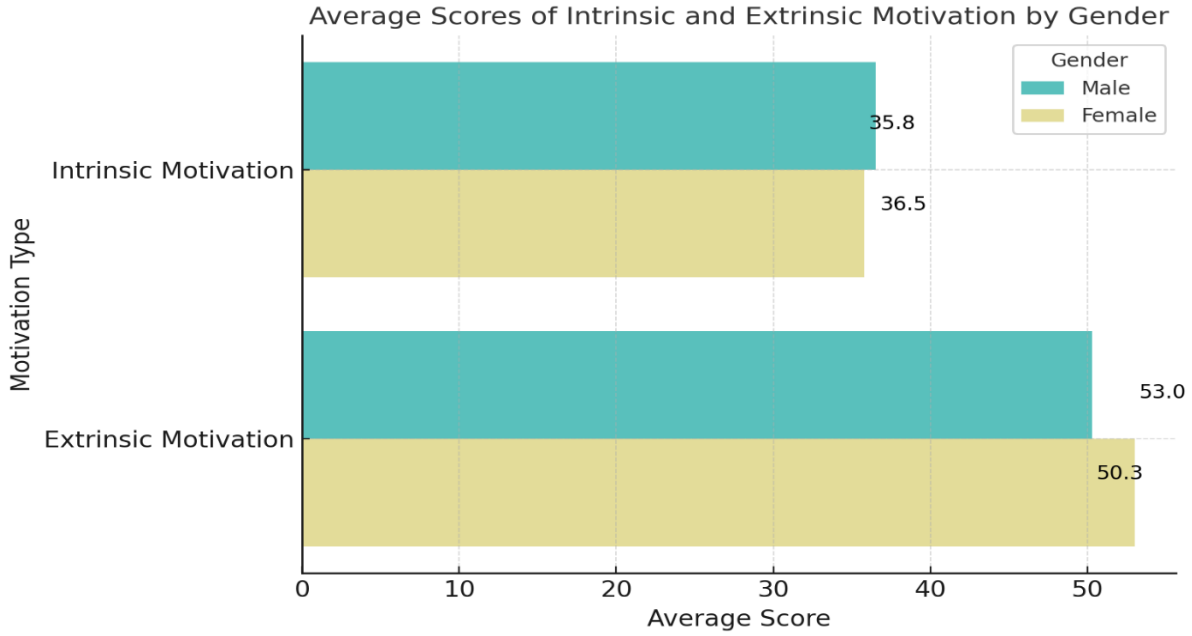

Figure 3.
Comparison of internal and external motivation between men and women.

5. Conclusion

In modern education, students' motivation and involvement in the learning process are becoming key factors for successful learning. In situations where traditional teaching methods do not provide an adequate level of interest, there is a need to use innovative approaches. One of these approaches is gamification, the use of game elements in non-game educational contexts.

Numerous studies show that gamification can significantly increase students' internal and external motivation, improve their concentration, reduce fatigue, and increase academic satisfaction. However, excessive or unstructured use of game mechanisms can lead to the opposite effect, distraction from learning goals, dependence on rewards, and decreased critical thinking.

Motivation in the educational process is divided into two main types: internal (based on interest, curiosity, and enjoyment of the process) and external (based on awards, grades, and recognition). Gamified platforms and technologies can activate both types of motivation.

- Intrinsic motivation is enhanced by elements of competition, achievement, storytelling, and real-time feedback;
- Extrinsic motivation is supported by a system of points, ratings, levels, badges, and awards.

Research shows that the effects of gamification can vary depending on the gender, educational level, age, and even social status of students.

- It has been found that female students are more likely to demonstrate higher external motivation compared to men when using game mechanics;
- Intrinsic motivation does not always depend on gender but may vary depending on the learning environment and gamification context;
- Junior students are more involved in game elements than senior students, who prefer a more pragmatic approach to learning.

Some works emphasize that gamification really increases motivation, especially in the digital learning environment (for example, when studying programming, languages, and history). At the same time, a number of studies show that excessive attention to game elements without taking into account pedagogical goals can reduce academic results.

The following recommendations are offered for the effective use of gamification in an educational environment:

- Development of clear rules for the use of game elements for educational objectives.
- Periodic evaluation of the effectiveness of gamified tools through student feedback.
- Conducting training seminars for teachers on the implementation of game methods.
- Maintaining a balance between the learning load and game components.
- Taking into account the individual characteristics of students when introducing gamification.

Gamification is a powerful tool for increasing students' motivation and engagement, provided it is used correctly and pedagogically. It helps to make the learning process more interesting, interactive, and meaningful for students, which ultimately contributes to improving the quality of education.

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