

**Zaripova Shaxnoza Shaxobiddinovna**

*Assistant teacher of the Samarkand State Institute of Foreign Languages*

*Contact: +998915244966*

**Tleujanova Kenzhebala Tleujankyzy**

*Senior Lecturer, Master of Pedagogical Sciences. Faculty of Foreign Languages,*

*Department of Practical Foreign Language Course.*

*Tel: +7 707 828 54 86*

*Gmail: [tuzhankyzy.kenzhe@gmail.com](mailto:tuzhankyzy.kenzhe@gmail.com)*

## THE IMPACT OF DIGITAL GAMES BASED ON INNOVATIVE TECHNOLOGIES ON LANGUAGE LEARNING AND THE INTERRELATION WITH UNIVERSITY STUDENTS' ATTITUDES TOWARD LANGUAGE

**Annotation:** While the potential of digital games in education has been extensively debated, there remains a notable gap in scholarly literature focusing on their impact on foreign language acquisition—particularly in Central Asia—through mixed-method research approaches. This study aims to bridge this gap by providing empirical data from a new cultural context. Employing a mixed-methods research design, the study examines the influence of digital games on the language learning outcomes of university students studying English as a foreign language (EFL). A total of 99 students from Samarkand State Institute of Foreign Languages were randomly selected, with 10 participants chosen for qualitative interviews to ensure data triangulation. The findings reveal that students engaging in digital games demonstrated a significant improvement in vocabulary acquisition and developed a more positive attitude toward language use. However, no statistically significant difference was observed between gamers and non-gamers in overall academic performance. These results suggest that digital games have the potential to enhance vocabulary acquisition and foster a positive attitude toward language learning among EFL learners. Additionally, the study provides key recommendations for future research in this field.

**Keywords:** Digital games, innovative technologies, Language learning, EFL students, Vocabulary acquisition, Mixed-methods research, Student attitudes, Foreign language acquisition, Game-based learning, Educational tools, Cognitive development, Motivation in learning, Gamification and Academic performance

**Introduction.** In the modern era, the rapid advancement of innovative technologies is widely acknowledged. As a result, educators have long recognized the potential of games as effective educational tools. One of the earliest historical figures to emphasize the significance of games in education was John Amos Comenius in the 17th century. This recognition has only strengthened with technological progress, with scholars such as Hubbard and Phillips laying the foundation for understanding the educational potential of innovative digital games. Building on this foundation, Prensky introduced the concept of digital game-based learning (DGBL) as an effective pedagogical approach. This idea was further developed by Gee, whose contributions provided deeper insights into the educational opportunities afforded by digital games.

Many digital games popular among adolescents are not available in their native language, requiring them to use a foreign language to achieve success in the gameplay. The use of video games for language learning gained significant traction between 2010 and 2011, and digital game-based

language learning (DGBLL) emerged as a promising approach for improving language skills, vocabulary acquisition, and grammatical knowledge. DGBL has been demonstrated to be an effective tool for enhancing foreign language learning outcomes in various contexts, with the majority of related research conducted in Asia and Europe. Within Europe, studies on this topic have primarily originated from Finland, France, and Spain.

Despite the growing popularity of digital games and significant advancements in DGBL research, to the best of our knowledge, no empirical studies have investigated the impact of digital games on English as a Foreign Language (EFL) learning in Central Asia. Moreover, only a limited number of studies have explored the relationship between digital games and the cognitive and affective aspects of foreign language acquisition. In particular, there is a noticeable lack of research employing mixed-methods approaches in this field. This study aims to fill these research gaps by providing empirical data on the effects of digital games on language attitudes and acquisition in the Central Asian context.

**Literature Review.** Digital games based on innovative technologies have become widespread across various demographic groups and regions worldwide. According to the Entertainment Software Association, 65% of all Americans play video games, with the majority being over 18 years old (74%), and 35% of all players falling within the 18–34 age range. Similarly, data from the European Union’s Statistical Office indicates that 58% of Europeans aged 16–24 use the internet to play or download video games. Additionally, the Video Games Europe report states that more than half of Europeans play video games, with the majority (76%) being over 18 years old, similar to the statistics in the United States.

Given the widespread engagement of learners with digital games, researchers have focused on exploring the potential of digital games in education. Most studies on digital game-based learning (DGBL) have concentrated on cognitive benefits in STEM (science, technology, engineering, and mathematics) disciplines. While these studies have demonstrated the positive impact of digital games on academic achievement, clear results in the humanities and social sciences remain elusive. Some studies have found a positive correlation between students’ engagement with digital games and their GPA in English-related subjects. However, other findings suggest that excessive time spent playing digital games may reduce study time and subsequently lead to lower academic performance.

Despite these mixed findings, there is a general consensus on the effectiveness of digital games in language learning, particularly in vocabulary acquisition. Research indicates that digital games provide unique opportunities for learning, memorizing, and applying new words in context. Vocabulary learning is particularly enhanced due to the immersive and interactive nature of digital games, which reinforce words through repeated exposure and contextual application within the gameplay. The gaming environment contributes to a more effective learning process by increasing student motivation, improving memory, facilitating task-switching, providing immediate feedback, and enhancing interactivity. These factors help learners develop independent learning strategies, such as searching for new words and adapting them to different contexts. Such strategies can extend language learning beyond the traditional classroom and foster a positive attitude toward language acquisition.

Learning through digital games creates a safe environment where learners can experiment with different approaches and develop problem-solving strategies without the fear of real-world consequences. Mistakes are perceived as an integral part of the learning process. Furthermore, the gaming environment can evoke feelings of enjoyment and security in players, potentially reducing anxiety about using a foreign language and making errors.

Language learners have expressed positive attitudes toward using digital games for language learning, highlighting increased motivation as one of the primary benefits. Chen et al. emphasize that

the genre of digital games is a crucial factor in determining language learning effectiveness. For instance, multiplayer online role-playing games (MMORPGs) can positively impact English language acquisition by requiring players to communicate with native speakers and other international users. Adventure game genres, in particular, may be more engaging and stimulating for learners, as they involve complex cognitive processes such as critical thinking, problem-solving, and task engagement. These factors create more effective learning opportunities compared to non-adventure game genres.

**Methodology.** In today's rapidly evolving era, our study aims to determine whether playing digital games in English influences EFL (English as a Foreign Language) students' attitudes toward the language and their academic achievements. Since previous research has identified vocabulary acquisition as the most positively affected linguistic aspect of digital games, we focused specifically on students' English vocabulary knowledge. The frequency of playing digital games in English was considered as a predictor variable, with the assumption that it could predict the following outcome variables. Additionally, it was hypothesized that there might be certain correlations between the predictor variable and the outcome variables. Therefore, correlations between the collected data were calculated using research tools.

Since school curricula do not allocate sufficient time for integrating digital games into lessons, this study did not adopt a long-term experimental method. Instead, this cross-sectional study drew conclusions based on independent gameplay outside the classroom. Data collected from participants at a single point in time were analyzed using a mixed-methods research design. The findings were based on both quantitative and qualitative data obtained through surveys, rating scales, tests, and interviews.

Descriptive statistical analysis of individual scores in each section was conducted using the Statistica 9.0 Standard Plus CZ software. The combination of quantitative and qualitative research methods enabled a comprehensive exploration of the issue. All variables, including game-playing frequency, attitudes toward English, academic achievement, and vocabulary knowledge, were quantitatively assessed using reliable research instruments. The relationships between these variables were further examined through participants' perspectives in interviews.

Based on the study's objectives, the following research questions and hypotheses were formulated:

#### Hypotheses:

1. Students who actively play digital games based on innovative technologies will have a more positive attitude toward English compared to those who do not play digital games.
2. Students who play digital games will have higher academic achievements in English than those who do not play digital games.
3. Students who play digital games will have better vocabulary knowledge in English than those who do not play digital games.
4. There is a significant positive correlation between the frequency of playing digital games in English and attitudes toward English.
5. There is a significant positive correlation between the frequency of playing digital games in English and academic achievements in English.
6. There is a significant positive correlation between the frequency of playing digital games in English and vocabulary knowledge.

#### Research Questions:

1. How does playing digital games in English affect participants' attitudes toward English based on their self-assessment?
2. How does playing digital games in English influence participants' academic achievements in English based on their self-assessment?

Based on these research questions, we decided to use surveys and interviews as research instruments.

**Survey.** The survey was designed in the participants' native language to determine the impact of digital gaming on their English language competence. Initially, a block diagram method was used to plan the sequence of questions. The preliminary version of the survey was tested with a sample of 10 students who matched the research criteria (internal consistency coefficient: 0.82). Following this pilot test, the survey was refined, with modifications made to the design and wording of two items.

The survey was personally conducted by the author, allowing participants to receive immediate answers to their questions. The first question, "Do you play computer games in English?" served as a filtering question, based on which participants were divided into two groups: players (P) and non-players (NP). The number of questions was equally distributed between both groups. Players were asked about their gaming habits, the types of games they played, and their opinions on the impact of games on their English language competence. The gaming frequency was coded using a four-point scale: 4 – daily, 3 – weekly, 2 – monthly, 1 – yearly. Non-playing participants, on the other hand, were asked about their opinions on games and other activities that help improve English language skills.

Through this survey, we were also able to identify students' attitudes towards language learning. This scale was developed based on the Foreign Language Enjoyment Scale and the Foreign Language Classroom Anxiety Scale. The scale, consisting of 30 items, was rated on a five-point scale (ranging from 30 to 150 points), with all items presented in a positive form (strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5).

Half of the items related to foreign language anxiety (even-numbered items) were reverse-scored, meaning that a higher score indicated greater enjoyment of foreign language learning. Pilot test results confirmed satisfactory internal consistency and test-retest reliability for the scale (Cronbach's alpha = 0.88). Additionally, the students' average grade point average (GPA) was measured. Participants' overall academic achievements in English were assessed using a GPA system ranging from 1.0 to 4.0 (A = 1.0, B = 1.5, C = 2.0, D = 2.5, E = 3, F = 4), with reverse coding applied during the evaluation process.

Furthermore, a semi-structured individual interview was conducted alongside other methods to gain deeper insights into participants' self-perceptions and the impact of gaming and other activities on their English language attitudes and achievements. Ten students who played games the most frequently (several hours daily) were selected for the interview. Initially, the research objectives were categorized and transformed into eight directly formulated questions. The flowchart technique was applied to plan the order and structure of the questions based on the following directions:

1. How does playing digital games in English influence attitudes toward learning English?
2. What is the impact of playing digital games in English on achievements in English courses?
3. How does playing digital games in English affect English vocabulary acquisition?
4. How do other activities contribute to overall English proficiency?

Interviews were conducted face-to-face using these questions. The interviewer explained the purpose and structure of the interview to each participant and asked for permission to record their responses. If necessary, the interviewer had the opportunity to clarify questions or ask participants to elaborate on their answers. Participants were asked to answer based on their personal opinions, resulting in responses that were not necessarily definitive. The interviews were later transcribed, analyzed, and categorized into groups. To ensure the reliability of data collection and analysis, the methods recommended by Lincoln and Guba were used.

Additionally, after each interview question, participants' responses were re-confirmed to ensure they aligned with the research objectives. Students were also given the opportunity to add supplementary information to their responses. The interviews were recorded solely for the purpose of

accurately reflecting the responses. Furthermore, the peer debriefing method was employed, where all collected data was reviewed with the other authors of the study. This process helped reassess the interviews and identify potential errors or overlooked approaches.

**Results.** If we turn our attention to the research results, the findings of the survey can be summarized as follows: The first question, "Do you play computer games in English?" allowed the division of participants into two groups: 45 players and 54 non-players. The majority of players (43 students) emphasized that playing computer games helps improve English language competence, mainly vocabulary (89%) and pronunciation (31%). These students reported playing digital games several times a week on average (mean playing rate – 3.18). Similarly, most non-players (89%) also considered computer games beneficial for enhancing English language competence—primarily vocabulary (83%). However, they noted that they preferred other activities for language development, such as watching audiovisual materials (movies, TV series, videos, podcasts, songs) (63%) and reading (54%). According to them, these activities contribute more effectively to improving vocabulary (85%) and grammar (37%). Next, the results of the language attitude scale were examined. The average scores (within the given interval) were higher among players than non-players. The difference between the groups was statistically significant at  $\alpha = 0.05$  ( $Z = 1.975$ ,  $p = 0.048$ ), confirmed by the Wilcoxon Rank Sum Test. The frequency distribution showed little difference between the two groups.

Subsequently, the Grade Point Average (GPA) results were analyzed. The average scores (within the given interval) were almost identical in both groups (Players = 1.92; Non-players = 1.91), and the difference between groups was not statistically significant ( $\alpha = 0.05$ ,  $Z = 0.598$ ,  $p = 0.550$ ). Examining the lower scores of the GPA, the group results showed only slight differences:

- System: Players = 2.24, Non-players = 2.14
- Skills: Players = 1.44, Non-players = 1.44
- Research: Players = 1.78, Non-players = 1.69

The score ranges showed minimal differences between the two groups.

The next phase involved analyzing the final results of the Vocabulary Test. According to the scores, the average results (scores obtained from a 25-question test) were higher among players than non-players. The difference between groups was statistically significant ( $\alpha = 0.05$ ,  $Z = 3.660$ ,  $p = 0.000$ ), confirmed by the Wilcoxon Rank Sum Test. Comparing the score distribution, the difference between the groups became even more evident. Most players (73%) scored in the highest range, while non-players' scores were distributed across the three upper ranges.

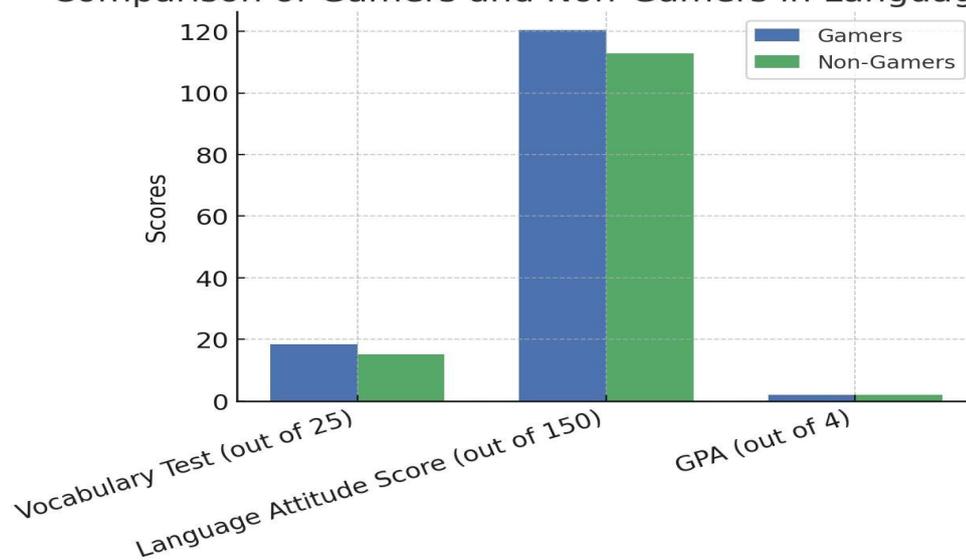
Variable	Gamers	Non-Gamers
Vocabulary Test (out of 25)	18.5	15.2
Language Attitude Score (out of 150)	120.4	112.8
GPA (out of 4)	1.92	1.91

**(Table 1– "Comparison of Gamers and Non-Gamers in Language Learning")**

The following result focused on the impact of game genre, which was found to be related to students' Vocabulary Test scores, Language Attitude Scale scores, and GPA. Each player typically played at least two different game genres, with the most common being role-playing games (49%). The highest individual scores were achieved by players who preferred role-playing and action-adventure genres. However, directly comparing average scores was somewhat difficult due to the different numbers of players in each group, which could lead to extreme values affecting the variables.

Nonetheless, action-adventure and role-playing genres had the highest average scores in the Vocabulary Test. Additionally, action-adventure games ranked second in language attitude, closely followed by role-playing games. Surprisingly, role-playing games had the lowest GPA rankings, while action-adventure games ranked just above the lowest. The study revealed that all identified digital games were commercially available, ready-made products. Notably, none of the participants played educational or serious games, nor were there any numerically based games among the digital games. Therefore, it is reasonable to conclude that most participants preferred games that included direct or indirect textual or voice instructions.

Comparison of Gamers and Non-Gamers in Language Learning



(Chart 1 – "Impact of Digital Games on Language Learning Performance")

According to the interview results, most students who participated in the survey (8 out of 10) stated that playing games contributed to a positive attitude toward English and motivation for learning it, but it was not the only factor. They noted that "having good English teachers" and "watching interesting English-language videos" had an impact of around 30–40%. Students felt that digital games helped improve their academic performance in English at every educational stage, from elementary to higher education. Most participants reported that the greatest impact of digital games was felt during middle school. Furthermore, since they used English as the primary communication language during the game, they began communicating in English outside the game, even when they had the opportunity to speak in their native language.

Additionally, except for one student, all participants felt they had an advantage over their peers in English language skills during elementary or middle school. Interestingly, even the student who did not feel different from their peers had represented their class in a prestigious English language competition. All respondents attributed this academic advantage during school years primarily or partially to digital games. Eight participants mentioned that the repetition of words and phrases in digital games made it easier to memorize them. Six students stated that digital games greatly helped in mastering English phonetics and phonology, while four reported better comprehension of complex words in English texts compared to their peers.

**Discussion.** Thus, our research confirms that in today's rapidly developing era, based on innovative technologies, digital games play a significant role in education. The trend identified by the European Union's Statistical Office is also reflected in our study: 45% of undergraduate students learning English as a foreign language reported playing video games, which can be compared to the 58% reported in the European Union's report. In line with many previous studies, attitudes toward the English language were more positive among gamers than among non-gamers. Students listed games, as well as having a good English teacher and watching interesting videos in English, as factors that contributed to forming a positive attitude toward the language. The immersive method and experience provided by games allow players to embark on virtual journeys, which in turn may enhance their interest in learning foreign languages and exploring different cultures. The desire to speak English at a near-native level appeared to be one of the strongest motivations among students. Therefore, it would not be incorrect to suggest that incorporating intrinsic motivational models from foreign language learners could enhance language learning motivation among regular gamers.

Comparing the overall academic achievements in English during undergraduate studies—measured by Grade Point Average (GPA)—showed similar results between gamers and non-gamers, including their performance in English language system courses, language skills, and cultural studies (Hypothesis 2 was rejected). This finding neither fully aligns with studies that have shown a positive impact of digital games on foreign language acquisition nor with those that indicate a negative correlation between gaming activity and exam scores. However, caution is required when generalizing this finding, as the students in our sample (those studying English) had relatively similar proficiency levels in the language. Additionally, our interview results contradicted the quantitative findings based on GPA, as participants stated that digital games helped them outperform their peers in English-related subjects.

Contrary to some studies that suggest digital games may hinder vocabulary acquisition due to cognitive load, our research has demonstrated their undeniable benefits in vocabulary enrichment. Gamers reported that digital games helped them memorize foreign words, a claim supported by our study results. Notably, vocabulary test results showed that gamers scored significantly higher than non-gamers (Hypothesis 3 was also confirmed). Furthermore, qualitative interview findings indicated that players attributed their success to visualization, frequent exposure to words and phrases, and contextual repetition. These results align with Rasti's research, which highlights the importance of these elements in foreign language vocabulary acquisition. Thus, playing digital games can be an effective method of implementing vocabulary into practice, as this activity provides diverse presentations of words in real-life contexts. Nevertheless, developing a reliable tool to measure this variable precisely proved to be quite challenging. Although the selection of test tasks was based on the authors' pedagogical and gaming experience, the vast variety and rapid evolution of digital games make it difficult to create a universal vocabulary test that encompasses all aspects of gaming-related language learning.

**Conclusion.** The results of this study confirm that playing digital games is an effective supplementary activity in the process of learning a foreign language, and it can be easily applied in various educational contexts. This method has been shown to enhance learners' positive attitudes toward language learning and expand their vocabulary. Given the limited classroom hours dedicated to foreign language lessons, gaming can provide an additional opportunity for practicing the material. However, playing games cannot fully replace real-life communication practice. Interestingly, most students emphasized that studying with a good English teacher is also a crucial motivator for language learning. We hope that this research project will contribute valuable empirical data to future studies on foreign language acquisition through digital games in different cultural contexts. Nevertheless, it is important to consider several limitations when interpreting these results. Firstly, due to space

constraints in a single research paper, not all aspects of the study could be fully covered in one text. Overall, the data collected in this research may offer additional approaches for exploring this topic further.

Moreover, the sample size and composition should be taken into account. While the results for each group indicated clear trends, future studies involving a larger and more diverse student population may provide a more detailed understanding of group differences. This is particularly relevant as learners of English as a foreign language exhibit unique characteristics in this context, with a noticeable inclination toward language learning through games. Future research could analyze the variables examined in this study over a longer period, develop a classification system for digital games in terms of language learning, create and validate assessments to measure foreign language competencies related to gaming, and explore other significant variables that influence foreign language acquisition through digital games.

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