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Vocabulary Size and Flow Experience: Unexplored Realms of Game-Based Learning in Iranian EFL Programs

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Abstract

In the past few years, there have been many studies about how game-based learning can help people learn languages. Since little research has been conducted on games in the Iranian EFL context, a deeper study of how games affect vocabulary size and flow is needed. The current study, conducted as a quasi-experimental research design with a pre- and posttest control group structure, investigated this effect by recruiting 60 Iranian intermediate EFL learners through a convenience sampling procedure and assigning them to experimental and control groups. The researchers utilized the EF Standard English Test (EF SET) to ascertain the proficiency level of the participants. Before the treatment phase, version A of Nation and Beglar's (2007) vocabulary size test was given to both groups, and their vocabulary sizes were measured. The experimental group then participated in an eight-week massively multiplayer online role-playing game. The control group only received traditional, ordinary instruction. After this, version B of Nation and Beglar's test was conducted. Along with this, learners' flow experiences in the experimental group were measured through a questionnaire adopted from Egbert (2004). A comparison of the experimental and control groups suggested a statistically significant difference between the vocabulary sizes of learners in the experimental and control groups, whereby an increase in the vocabulary sizes of learners in the experimental group was witnessed. Moreover, flow was observed in 83% of the participants in the experimental group. Implications of the study, including using games in language instruction in the Iranian EFL setting, have been considered.

Keywords: flow experience, game-based learning, massively multiplayer online role-playing games, vocabulary size test

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1. Introduction

Social interaction and personal and professional success rely heavily on our ability to communicate (Fairclough, 2014). As a first (L1), second (L2), or foreign language (FL), English is spoken all over the globe (Caine, 2008). Because of this, it's easy to see why English is more commonly spoken than any other foreign language. The ability to communicate effectively in English is essential for both academic and professional success. Like in any other country that pays special attention to learning English, the desire and demand for learning English in Iran have increased significantly in recent years. Because of Iranians' great interest in participating in English courses, English as a foreign language (EFL) education in Iran has become a trend, as the significance of English has been recognized both individually and nationally. This increase in people's desire and demand for learning English has had a significant impact on the progress of the private language sector in Iran (Sadeghi & Richards, 2015). While around two decades ago, in most cities in Iran, there were few language institutes, the number of these centers has increased, and nowadays, approximately all middle- and high-school students take part in private institutes and study English there.

Despite the rapid growth of students' interest in English teaching in the private sector, unfortunately, the public education system has failed to provide practical English lessons for students' progress and has been essentially unchanged and, in many ways, ineffective (Khazaee & Pourhosein Gilakjani, 2022; Sadeghi & Ghaderi, 2018). To compete with private schools, the state education system needs to change its teaching methods and assessment system, update its materials and resources, increase the number of teaching hours, and hire more skilled teachers (Khazaee & Pourhosein Gilakjani, 2022). It must also use more advanced technologies, such as the Internet and digital media. For both systems to meet the needs of students, more attention must be paid to teachers by providing financial support and continuous opportunities for professional advancement (Sadeghi & Ghaderi, 2018).

1.1 Statement of the Problem

In Iran, despite the efforts of language teachers, both in the public education system and in private institutions, there are still many weaknesses in such skills as speaking and writing among Iranian language learners. One of the reasons for such weakness in productive skills (speech and writing) is the low vocabulary size of Iranian language learners (Zohrabi et al., 2012). Thus, since the size of vocabulary knowledge has a vital role in improving the productive skills of Iranian language learners, paying attention to it through teaching with the help of new teaching techniques might make a significant contribution to the quality of these skills. One of these new educational techniques that is currently very popular is game-based learning (GBL). Online game environments can increase the level of interaction among learners, increase their willingness to communicate, and may also affect their vocabulary (Babakhani & Tabatabaee-Yazdi, 2022; Delavari Khalifehkari & Pourhosein Gilakjani, 2022; Karbalaei & Kord Afshari, 2019; Nabizadeh Haghighi & Khazaee, 2021; Niromand Naserkiadeh & Khazaee, 2022; Pakdaman & Pourhosein Gilakjani, 2019; Reinders & Wattana, 2012). In addition, the flow experiences of Iranian language learners may be pleasant because of their presence in the game environment, and flowing in it might affect the vocabulary size of these learners. Since the combination of these three variables, namely GBL, vocabulary size, and flow experiences, has not been studied in the literature of research in the Iranian EFL setting, the present study aims at researching and assessing the effect of GBL on the vocabulary size and flow experiences of Iranian language learners with an intermediate level of language proficiency.

1.2 Research Questions

In the current study, based on a broad review of the studies of GBL in different contexts, the following research questions were posed:

1. Is there any statistically significant difference between the vocabulary size scores of Iranian intermediate EFL learners before and after applying the GBL approach?
2. Do Iranian intermediate English learners who received GBL and those who did not receive it have statistically significant differences in their vocabulary size scores?
3. How much flow do Iranian intermediate EFL learners experience while applying the GBL approach?

2. Review of the Related Literature

2.1 Games and Their Roles in Today's Language Learning

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In recent years, games have received a great deal of attention as a potentially effective learning tool. In various studies, it has been shown that games improve learners' communication skills, enhance their interaction, increase their motivation, and improve their ability to memorize words (Chou, 2014; Derakhshan & Khatir, 2015; Williams & Williams, 2011). Games designed for educational purposes are known as serious games or educational games (Ma et al., 2011; Sørensen & Meyer, 2007). Choosing suitable educational games is essential in game-based learning (GBL). Whenever we use a game for teaching purposes, we must consider the students' proficiency level and cultural background. Games have been investigated for their roles in language instruction. For example, students find memorizing vocabulary tedious. Therefore, it has been suggested that vocabulary learning should be done through computer-based educational games because it is an enjoyable activity for students and has a more significant impact on learning (Prensky, 2001). With the advent of digitized computer-based network technologies such as the Internet, learners' access to online games such as massively multiplayer online role-playing games (MMORPGs) has increased. For this reason, schools should use computer and network technologies as much as possible for language learners' progress.

2.2 Vocabulary Size and Vocabulary Size Tests

The relationship between how many words someone knows (the size of their vocabulary knowledge) and how well they know those words (the depth of their vocabulary knowledge) has been investigated over time. Given that the relationship between the learners' vocabulary size and the percentage of words that the learner is familiar with in the reading text can be quantified (Nation, 2006), this percentage of coverage can be linked to comprehension of the text. It is mainly believed that the more words the learners know, the more likely they are to understand the text (Schmitt et al., 2011). Knowing at least 98% of the text is adequate for most learners to comprehend a text, but several factors can have an impact on understanding a text. In terms of vocabulary, 98% coverage is acceptable. In longer texts, the learner may encounter over 1,000 new words. Learners need to be familiar with an 8,000–9,000 word family vocabulary in order to be able to read newspapers and novels (Nation, 2006).

To measure vocabulary size, several tests have been devised (e.g., Aviad-Levitzky et al., 2019; Nation & Beglar, 2007). Vocabulary size tests measure learners' receptive vocabulary in their L1 and L2. Knowledge of written word forms, form-meaning connections, and concept knowledge is measured in such tests. Based on Read and Chapelle (2001), vocabulary size tests are specific, principled, nearly context-independent vocabulary tests given in a multiple-choice format and found in monolingual and bilingual versions. Such tests essentially follow a trait definition of vocabulary, however. It means that vocabulary knowledge is tested independently from contexts of use.

2.3 Flow Experiences of Language Learners

Flow first came to Csíkszentmihályi's (1990) attention while he was studying artists for his postgraduate thesis. He observed that when the artists were deeply immersed in their work, they reported a sense of effortless concentration and enjoyment, which is now referred to as the "flow state." This phenomenon has since been studied extensively and has been found to be a valuable asset in many areas of life. Based on flow theory, flow experiences result in learning. Based on research, flow can be found in EFL classes (Egbert, 2004). Flow theory contains the complicated cooperation of several items as follows:

- a steady state of skills and challenges,
- moments of subtle focus,
- tasks with a comprehensible purpose,
- a clear result that shows the task is successful,
- a feeling of power,
- feeling comfortable and secure, and
- the idea of time passing rapidly

Focused intrinsic motivation begins with being in the flow, according to Csikszentmihályi (1990). Being in flow means being between interest and fear in a narrow channel. Providing learners with the right skills is as important as the challenge of the task. When skills do not meet the challenge or the task is too simple and easy to accomplish, a balance must be struck to avoid disillusionment.

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2.4 Previous Studies on the Role of GBL

The employment of GBL is not a novel methodology. According to Lenhart et al. (2008), GBL has experienced advantages due to the increasing prevalence of digital games as a form of recreational pursuit. Hence, it is unsurprising that GBL is a burgeoning research domain, as scholars endeavor to establish links between the captivating and incentivizing aspects of games and their potential for educational objectives (e.g., Assapun & Thummaphan, 2023). Upon reviewing the relevant literature, it is evident that various terms, including *playful learning* and *gamification*, have been employed to denote endeavors that incorporate game-like elements (Plass et al., 2015). The various methods employed to facilitate learning through game-like techniques are often referred to collectively as GBL. The efficacy of incorporating games into early and primary education has been acknowledged in the field of ESL/EFL research, as evidenced by studies conducted by Hainey et al. (2016) and Moyles (1989). Nonetheless, it is worth noting that this type of learning is not exclusive to children, as it has been observed in adults as well (Ritterfeld et al., 2009). Thus, it can be inferred that there exists no inherent decline in the inclination to engage in play or any associated advantages of playing throughout an individual's lifespan. However, the reasons for the absence of games in advanced educational settings remain unclear.

The assertion that games serve as an optimal instrument for learning was contested in evaluations and comprehensive analyses conducted by Hainey et al. (2016) and Wouters et al. (2016). The authors posited that conducting more rigorous experimental studies that explore game elements to determine the most effective ones in fostering engagement and facilitating learning would be advantageous for future research. In the realm of knowledge acquisition, a commonly scrutinized outcome measure, it is imperative to acknowledge that while the majority of studies indicate favorable impacts of GBL, discrepancies may arise with respect to study attributes. In relation to GBL, research findings indicate that it outperforms conventional learning environments (Boyle et al., 2016; Wouters et al., 2013), despite the varied games, designs, and methodologies employed. The factors that contribute to promoting favorable outcomes in the retention of knowledge over an extended period of time in political science games (Nishikawa & Jaeger, 2011) may differ significantly from the impact of a role-playing game that improves English listening, writing, and reading skills (Suh et al., 2010). According to Boyle et al. (2016), there has been an increase in the prevalence of the positive effects of games on learning in recent years. Specifically, studies published in 2014 were four times more likely to report such effects compared to studies published five years prior. This trend suggests a heightened level of interest in or improved quality of games designed for educational purposes. The attainment of a standardized procedure for conducting digital GBL effectiveness studies has been contended to have been accomplished through recent endeavors in this field (All et al., 2016).

2.5 Previous Studies on the Vocabulary Size of Language Learners

According to Read (2004), the concepts of vocabulary size and depth are not antithetical but rather exhibit a degree of interrelatedness. The differentiation between size and depth has frequently been made by scholars when discussing vocabulary knowledge (Zeng et al., 2022). Qian's (1999) study, for example, revealed a significant and close correlation between the scores of the vocabulary levels test (VLT) and the word association test (WAT) for both Korean and Chinese participants. The author arrived at the conclusion that the dimensions of size and depth are equally important for the acquisition of vocabulary knowledge, as they exhibit a significant degree of overlap and interconnection. According to Qian's (2002) findings, the measures of depth and size of vocabulary knowledge have the potential to account for a significant proportion (more than 50%) of the variability in reading comprehension scores (p. 532).

Vermeer (2001) conducted a study that examined the correlation between the size and depth of vocabulary knowledge. The study established a connection between these concepts and the acquisition of language as well as the frequency of language input. The initial investigation employed various tasks, including receptive vocabulary, description, and association exercises, to examine the extent and profundity of lexical proficiency in a cohort of 50 Dutch-speaking children at the kindergarten level, comprising both monolingual and bilingual individuals. The second study aimed to examine the correlation between the likelihood of word recognition and the frequency of input in a sample of 1,600 Dutch-speaking monolingual and bilingual children aged 4 and 7 years. The findings indicate that there was no discernible conceptual differentiation between the magnitude and profundity of the lexicon and that comparable factors influenced the extent and profundity of vocabulary proficiency for both cohorts of participants. The findings indicate a significant positive correlation between the two groups in terms of their likelihood of word recognition, which is highly influenced by the frequency of exposure to the word during primary education. Vermeer posited that

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an individual's depth of knowledge regarding words is directly proportional to the quantity of words they possess knowledge of. According to the source Vermeer, there is a positive correlation between a child's vocabulary size and their knowledge of individual words.

Schoonen and Verhallen (1998) conducted a study wherein they administered a Dutch version of the Peabody Picture Vocabulary Test as a breadth test and the WAT as a depth test to primary school children in the Netherlands. The researchers then compared the results of the vocabulary tests with the performance of the children on two cloze passages, which were considered indicators of their reading comprehension skills. The findings indicated a significant correlation between the breadth test and the depth test. Nevertheless, the inclusion of the depth test resulted in the explanation of further variability in the cloze scores, surpassing that accounted for by the breadth test. Nurweni and Read (1999) conducted a study on the English vocabulary proficiency of first-year students enrolled in a university in Indonesia. A vocabulary assessment was conducted on a sample of 350 students using a word translation test to determine vocabulary size and a word association test to evaluate vocabulary depth. The tests were based on the General Service List and University Word List, which together comprise 2,800 words. In general, the correlation coefficient between the two tests was 0.62. However, upon categorizing the students into three groups based on their overall English proficiency, the correlations exhibited notable variations across the proficiency levels. The sample was divided into three groups based on their performance. The high-performing group, comprising 10% of the sample, yielded a correlation coefficient of 0.81. The middle group, consisting of 42% of the sample, obtained a correlation coefficient of 0.43. The low-performing group, which constituted 48% of the sample, produced a correlation coefficient of 0.18 between the two tests.

The English vocabulary knowledge (breadth and depth) of Hong Kong university students was examined by Chui (2006). The researcher utilized the productive vocabulary levels test developed by Laufer and Nation (1999) to evaluate the vocabulary size of 186 participants. Additionally, a self-constructed depth-of-knowledge test was administered to assess the lexical competence of the participants across various aspects. Chui selected a total of 20 headwords from Coxhead's (2000) academic word list (AWL) for the latter. The students engaged in a multi-step process involving the construction of a coherent sentence, identification of a specific part of speech, assignment of a derivative, explanation of meanings, and selection of a single collocational word from a set of four options. The results indicate that participants demonstrated a relatively strong understanding of high-frequency vocabulary, while their comprehension of low-frequency vocabulary was notably lacking. The students demonstrated a moderate familiarity with academic vocabulary; however, the level of comprehension was suboptimal. Specifically, while they were able to correctly identify the parts of speech, this may be attributed to the emphasis on grammar instruction in Hong Kong. Regrettably, the students were unable to provide multiple definitions for the words, limiting their grasp of the full range of meanings. The conversion rate of headwords into the necessary derivatives was only 52%, while the identification of appropriate collocational words for the items was only 57%.

2.6 Previous Studies on Flow Experience in GBL

While game designers may not explicitly reference the notion of flow, they do take into account comparable elements that contribute to the flow phenomenon. Lehtimäki (2013, as cited in Perttula et al., 2017) discussed the concept of zone experience in relation to games. The term "being in the zone" is frequently employed in studies related to flow, as evidenced by the works of Lewis (1999) and Krug (1999). Rollings and Adams (2003) make reference to a state resembling Zen. In this particular phase, the players appeared to experience a sense of temporal disorientation and focus their attention on the entirety of the playing field. Studies based on empirical evidence have demonstrated that flow experiences in games are a significant factor contributing to the sustained appeal of games for players (Leung et al., 2022; Voiskounsky et al., 2004). The study conducted by Hsu and Lu (2004) utilized a technology acceptance model that integrated social influences and flow experience as a construct in order to forecast individuals' acceptance of online games. The identification of flow experience has been established as a significant predictor in determining the intention to engage in future gameplay. Moreover, the optimal usability of the gaming interface was a crucial requirement for facilitating the state of flow.

Kiili and Lainema (2008) assert that playability is a concept that encompasses the pertinent elements of both flow and usability. According to Weibel et al. (2008), the flow experience was found to be higher when a human-controlled opponent was used as compared to a computer-controlled opponent. As per their research, the phenomenon of flow serves as a mediator in the correlation between presence and enjoyment. Scholars have constructed theoretical frameworks pertaining to the phenomenon of flow experiences within the realm of gaming. Sweetser and Wyeth

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(2005) developed a GameFlow framework to assess the level of enjoyment in games. The framework comprises various elements such as concentration, challenge, skills, control, clear goals, feedback, immersion, and social interaction, each of which encompasses a range of criteria that contribute to the overall enjoyment of games. Kiili et al. (2012) have proposed an experiential gaming model for educational games that is grounded in experiential learning theory, flow theory, and game design principles. The study employed flow theory as a conceptual framework to enhance the user experience and optimize the efficacy of educational games. Furthermore, Kiili and colleagues introduced a flow framework aimed at enabling the analysis of educational games and offering design assistance to game developers.

Various methodologies have been employed to investigate flow experiences, with self-report measures being the predominant approach. The Flow State Scale-2 (FSS-2) and Dispositional Flow Scale-2 (DFS-2) are widely employed in sports as the most prevalent flow scales (Jackson, 2002). The scales utilized in this study were derived from the primary dimensions of flow as initially posited by Csíkszentmihályi (1990). Procci et al. (2012) have suggested that there is a requirement for the DFS-2 scale to be refined in the context of gaming. Furthermore, there have been advancements in the creation of scales intended to quantify subjective experiences during gameplay. Brockmyer and colleagues (2009) devised a questionnaire to measure game engagement. The questionnaire consisted of a subscale for flow and additional subscales for presence, absorption, and immersion. Nonetheless, it is common for game experience surveys to lack sufficient representation of the flow dimension.

Novel approaches for investigating the flow are currently being developed. The continuous monitoring of player status has become feasible due to the progress made in neuroscience, as evidenced by the works of Ninaus et al. (2014) and Plotnikov et al. (2012). According to Klasen et al. (2011), the utilization of functional brain imaging can serve as a means of verifying particular aspects of flow, thereby enhancing comprehension of human emotions and motivational mechanisms in the context of media entertainment. According to Berta et al. (2013), the integration of both subjective and objective measurements has the potential to enhance the explained variance of player experiences, including but not limited to flow, immersion, and engagement.

3. Methodology

3.1 Design of the Study

The present study followed a quasi-experimental research design with a pre- and posttest control group structure. It used a quantitative approach to examine the effectiveness of computer games, specifically MMORPGs, and their potential effects on learners' vocabulary size and flow experiences. The participants were recruited through a convenience sampling procedure. This required the researchers to choose the groups of EFL learners available at the Kousha Institute in the city of Langeroud, Iran. The design imposed that randomized sampling was not feasible, but the researchers used the other elements of an actual experimental design (i.e., pretest, posttest, and control group).

3.2 Participants

60 Iranian learners of English, both male (N = 35) and female (N = 25) learners of English, participated in the study. They voluntarily attended English classes at the Kousha Institute. According to the institutional placement procedure, the participants were at an intermediate language proficiency level. All the subjects in the current study were learners of English at the same institute for at least two consecutive semesters, with ages ranging from 18 to 30 (mean = 25.26). These learners were all Persian native speakers and were learning English as a foreign language. The academic semester at the Kousha Institute lasts for 12 weeks, with two 90-minute sessions every week for a total of 24 sessions. The coursebook was level 2 of the Top Notch series. The researchers utilized the EF Standard English Test (EF SET), which can be accessed at no cost via https://www.efset.org/, to ascertain the proficiency level of the participants. Specifically, the researchers recruited learners who demonstrated an intermediate level of proficiency (EF SET's B1) for the present investigation.

3.3 Instrumentation

3.3.1 Vocabulary Size Tests

The researchers utilized the print format of Nation and Beglar's (2007) vocabulary size test, which includes versions A and B, as the pre-test and post-test measures. These tests can be accessed at https://www.lextutor.ca/tests/. They evaluate the extent of a person's written receptive vocabulary in English, catering to individuals who are proficient in

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either their first or second language. Nation and Beglar (2007) posited that the vocabulary size test was designed to furnish a dependable, precise, and all-encompassing evaluation of a student's lexicon from the initial 1000 to the final 1000 word families in the English language. According to Beglar's (2010) findings, the instrument's Cronbach's alpha reliability is 0.96.

3.3.2 Flow Questionnaire

Lonczak (2019) posits that the concept of flow presents a challenge in terms of identifying psychometrically sound measurements, given its subjective nature. According to Lonczak, the assessment of flow is predominantly subjective and is typically conducted through various means such as interview questionnaires, experience sampling methods, and self-report questionnaires. The present study employed Egbert's (2004) self-report questionnaire (see Appendix) to assess flow experiences in the context of GBL. The survey utilized a Likert-scale with seven points, where participants were asked to indicate their level of agreement or disagreement with each statement by selecting the appropriate option on the scale ranging from 1 (strongly disagree) to 7 (strongly agree). The assessment comprised a total of 14 items that corresponded to the four distinct dimensions of flow: interest, control, focus, and challenge-skill balance. The developer conducted a pilot test of the instrument with a cohort of 22 undergraduate EFL learners to ascertain the reliability and validity of the items and instructions. The instrument's Cronbach's alpha reliability coefficient was 0.87.

3.3.3 Raid: Shadow Legends: The Applied MMORPG

MMORPGs refer to a type of video game that integrates the characteristics of a role-playing video game and a massively multiplayer online game. The utilization of immersive virtual environments enables players to engage in collaborative or competitive interactions on a grand scale. Individuals have the ability to generate and personalize their own avatars, collaborate in groups, and engage in both exploration and combat within a simulated environment. The researchers utilized Raid: Shadow Legends, a no-cost MMORPG that can be accessed at http://pcgamesn.2.vu/RaidShadowLegendsW, in the computer laboratory of the institute for a duration of eight weeks as part of the present investigation. Throughout the duration of the investigation, the first researcher monitored the conduct of the participants and gathered empirical evidence to assess the influence of MMORPGs on the individuals. Subsequently, the findings of the investigation were examined and documented. The game Raid: Shadow Legends presents a strategic and management-oriented approach to its genre, wherein players are tasked with collecting heroes and optimizing their squad for gameplay. The utilization of the game has demonstrated its efficacy in facilitating the enhancement of players' analytical, strategic, and planning proficiencies. The success of the subject matter has been credited to its distinct methodology, in addition to its superior visual representation and captivating narrative.

3.4 Data Collection Procedure

Prior to study initiation, the investigators presented the study's aims and provided sufficient details. The researchers provided assurance to the participants that their involvement in the study could yield benefits for both parties. The participants were informed that their personal data would be solely utilized for the research and would not be divulged to any third party. As the identity of the first researcher was familiar to the students, fostering a sense of credibility was a relatively effortless task. Prior to conducting the experiment, the participants provided written consent after being fully informed of the details and purpose of the study.

The customary duration of an academic term at the institute was 12 weeks. The first investigator employed random assignment to allocate the 60 participants in the current investigation into both experimental and control groups. In this study, the first researcher assumed the position of the instructor. The purpose was to mitigate the impact of extraneous variables that might compromise the internal validity of the study. In addition, successful implementation of the MMORPG program necessitated the teacher's familiarity with the fundamental concepts as well as theoretical and practical issues. Consequently, the allocation of distinct instructors may have resulted in disparate outcomes and jeopardized the validity of the investigative endeavor. The research was carried out over a complete academic semester and consisted of three discrete stages: (1) pretest, (2) intervention, and (3) posttest.

The initial stage entailed the administration of Version A of the vocabulary size test and subsequent data collection. The test was administered by the first researcher during the initial session. The entire group of 30 participants belonging to the experimental group actively participated in the test. The process of administration was concluded in approximately 50 minutes. The control group received the same test in a separate session. The first investigator was accessible to offer direction and assistance regarding any possible inquiries. The central component of the research

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was the second phase. The MMORPG was administered to the experimental group over the course of eight weeks within a language laboratory, utilizing computer systems that were equipped with internet connectivity. The control group only received ordinary instructions of the institute from the first researcher. Upon the completion of the treatment phase and intervention program, the third phase, involving the repetition of the initial phase, was executed. The administered version B of the vocabulary size test and the flow questionnaire on flow were collected from the learners in the experimental group, but learners in the control group were only tested on the vocabulary sizes. The administrative process was executed in complete conformity with the pretesting phase.

3.5 Data Analysis Procedure

According to Nation and Beglar (2007), learners scores on the 140-item test needs to be multiplied by 100 to find the learner's total vocabulary size. The vocabulary size scores of all learners in the experimental and control groups in the pre- and posttests were measured and inserted in the Microsoft excel to be analyzed in SPSS version 23. The comparison of the experimental and control groups was conducted through an independent samples t-test on SPSS version 23. The comparison of the experimental group's and control group's pre- and posttests was conducted through two paired-samples t-tests on SPSS version 23. The guidelines for scoring the flow questionnaire, as outlined by Egbert (2004), were adhered to. Specifically, learners who attained an average score of 5.0 or higher were identified as having experienced flow.

4. Results

4.1 Answering the First Research Question

Before dealing with the research questions of the study, tests of normality are required. Table 1 presents tests of normality concerning the first question of the study. Looking at Table 1, we can conclude that the data comes from a normal distribution for both experimental and control groups.

Table 1. Tests of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
experimental group vocabulary size test A	.124	30	.200*	.934	30	.064
experimental group vocabulary size test B	.144	30	.114	.956	30	.237
control group vocabulary size test A	.126	30	.200*	.938	30	.081
control group vocabulary size test B	.132	30	.194	.936	30	.071

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 2 presents the paired samples *t*-test concerning the first question of the study. As is seen in Table 2, there is a statistically significant difference between the vocabulary size scores of Iranian intermediate EFL learners before and after the treatment using GBL (t (30) = -13.200, p < .05), showing a large effect size (Cohen's d= -4.90236).

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Table 2. Paired samples t-test between the vocabulary size scores of Iranian intermediate EFL learners before and after the treatment with the aid of GBL

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	experimental group vocabulary size test A - experimental group vocabulary size test B	-4346.667	1803.585	329.288	-5020.136	-3673.197	-13.200	29	.000

As the results of the data analyses showed above, there is a statistically significant difference between the vocabulary size scores of Iranian intermediate EFL learners before and after treatment using GBL. Therefore, the assumed null hypothesis of the study is rejected. The findings provide the necessary details on accepting the directional hypothesis pinpointing the significant effects of computer games on the vocabulary size of Iranian intermediate EFL learners. In fact, their vocabulary size scores after the intervention utilizing the computer games outweighed their vocabulary size before the intervention through the computer games. Table 3 presents the paired samples t-test concerning the first question of the study. As is seen in Table 3, there is a not any statistically significant difference between the vocabulary size scores of Iranian intermediate EFL learners in the control group before and after receiving the ordinary instruction ($t(30) = -1.000$, $p < .05$), showing a large effect size (Cohen's $d = 0.37139$).

Table 3. Paired samples t-test between the vocabulary size scores of Iranian intermediate EFL learners in the control group before and after receiving the ordinary instruction

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	control group vocabulary size test A - control group vocabulary size test B	-30.000	164.317	30.000	-91.357	31.357	-1.000	29	.326

4.2 Answering the Second Research Question

Table 4 depicts the results of running an independent samples t-test between the vocabulary size scores (posttests) of learners in the experimental and control groups.

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Table 4. Independent samples t-test between the vocabulary size scores (posttests) of learners in the experimental and control groups

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Vocabulary size between groups	Equal variances assumed	2.212	.142	11.502	58	.000	4180.000	363.409	3452.558	4907.442
	Equal variances not assumed			11.502	51.146	.000	4180.000	363.409	3450.477	4909.523

As Table 4 shows, there is a statistically significant difference between the vocabulary size scores of Iranian intermediate EFL learners who received GBL and those who did not ($t(60) = 11.502$, $p < .05$), showing a large effect size (Cohen's d= 3.02057). In fact, the learners in the experimental group outperformed the learners in the control group. This was proof of the influential effects of GBL.

4.3 Answering the Third Research Question

The third research question of the current study was: How much flow do Iranian intermediate EFL learners experience while applying the GBL approach? In scoring the flow questionnaire, following Egbert (2004), learners who attained an average score of 5.0 or higher were identified as having experienced flow. Table 5 summarizes the flow experience perception statistics and the percentage of participants who did and did not report experiencing flow while performing GBL.

Table 5. Flow experience for Iranian intermediate EFL learners while applying the GBL approach

Min	Max	Mean	SD	No flow a	Flow b
3.5	6.86	4.54	0.81	5(16%)	25(83%)

[a] Number of learners with a mean of <5 signifying almost no experience of flow.

[b] Number of learners with a mean of ≥ 5 indicating the experience of flow.

As Table 5 depicts, the occurrence of flow experience was observed for 83% of the participants while applying the GBL approach.

5. Discussion

The impact of GBL on the vocabulary size and learning experiences of Iranian intermediate EFL students taking English classes at a private institute in Iran was examined by the researchers. The results of the present study, which demonstrated a significant influence of GBL on the vocabulary size of Iranian intermediate EFL learners, are compatible with Chapelle's (1998, p. 23) "hypotheses relevant for developing multimedia CALL." Chapelle asserts

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that video games have a substantial positive impact on the teaching and learning of foreign languages. This is especially clear in his suggestions on how to improve language descriptions in various reference books to improve comprehension of the language and how it works. The findings are consistent with Lenhart et al.'s (2008) assertion that the increasing acceptance of digital games as a form of entertainment has contributed to the success of GBL. The study's findings indicate that the participants exhibited a positive disposition towards the utilization of games as an educational tool, as evidenced by the occurrence of authentic communication among the learners.

The findings of the current study provide supporting evidence that the utility of games is not limited to children but extends to older age groups as well (Ritterfeld et al., 2009). All participants in the present study were adult individuals, and it was observed that GBL had a positive impact on enhancing their lexicon. It can be inferred that there is no inherent decline in the inclination to engage in play or any advantageous effects of game-playing throughout an individual's lifespan. The findings provide additional support to previous research indicating that the use of GBL can enhance the pleasure of vocabulary acquisition and accelerate the retention of desired words among students, as demonstrated by Riahipour and Saba (2012). The findings are consistent with the favorable impacts of GBL, as reported in various studies such as those conducted by Aslanabadi and Rasouli (2013), deHaan et al. (2010), Dolati and Mikaili (2011), Kalaycioglu (2011), Vahdat and Rasti-Behbahani (2013), and other scholars.

The present study examines the impact of GBL on the flow experiences of Iranian EFL learners. The results indicate that 83% of the participants reported experiencing flow during the study. The findings of the current investigation provide corroborative support for the applicability of the flow construct in the context of second language acquisition, particularly in the case of EFL classes. The research has offered initial empirical evidence to suggest that GBL may facilitate the development of flow among EFL learners. Furthermore, it has been observed that learners need not face difficulties in accessing the flow channel. The phenomenon of flow, whether minimal or substantial, may be observed during the participation of learners in GBL. Consequently, it is plausible to employ a greater number of GBL activities with students possessing a limited vocabulary to engage them in pleasurable educational experiences. The study's findings suggest that EFL research can explore methods of achieving a balance between learners' skills and challenges as they progress through various stages of learning. This balance would enable learners to attain the optimal experience of flow at each stage. The scope of research can encompass a wider range of tasks and incorporate varying levels of task type and complexity within more intricate research designs, thereby facilitating the exploration of potential impacts of these variables.

The results of the study provide support for the research conducted by Wong and Csíkszentmihályi (1991), who introduced the concept of educational environments that produce flow. Additionally, the research indicates that the concept of flow ought not to be regarded as foreign in the EFL instructional setting. When EFL learners are emotionally stimulated by learning activities and engaged in well-rounded tasks, the potential for generating a state of flow is significantly increased. The findings of the study suggest that it is possible to motivate proficient EFL learners to undertake more demanding tasks in order to attain a state of optimal experience known as flow. Additionally, novice learners can be assisted in identifying the specific competencies that they believe will facilitate their attainment of flow during learning. The concept of flow, which refers to the state of optimal experience characterized by complete absorption and enjoyment in an activity, has been observed to be a common occurrence among highly skilled musicians. While this level of flow may seem unattainable in the context of an EFL classroom, this study proposes that deliberate efforts can be made to select tasks that cater to the flow needs of learners, thereby enhancing their experience of flow. The present study's findings serve to reinforce the existing body of research on the phenomenon of flow in foreign language contexts, as evidenced by previous studies such as Egbert (2004), Schmidt et al. (1996), and Schmidt and Savage (1992).

The findings of the present study validate Adlai-Gail's (1994) assertion that specific individuals tend to encounter flow states with greater frequency than others. At times, EFL students encounter obstacles that surpass their abilities. The study's results suggest that English teachers ought to strive to optimize the flow experience of their pupils by periodically prescribing GBL tasks that align with the tenets of flow theory. Csíkszentmihályi (2014) posits that a teacher who possesses an understanding of the conditions that motivate individuals to engage in learning activities such as reading, writing, and arithmetic can effectively facilitate flow experiences. According to Wong and Csíkszentmihályi (1991), the state of flow is not commonly experienced by learners in educational environments, including those in EFL classes. However, EFL teachers have the potential to facilitate the attainment of flow by assisting learners in finding a suitable equilibrium between challenge and skill in their activities. This can result in a

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more frequent occurrence of flow experiences for learners. This approach can potentially stimulate the individual's curiosity, enhance their sense of agency, facilitate their concentration, and establish an optimal equilibrium between their abilities and the level of difficulty presented by the task.

Further research in EFL teaching and learning could be promising if the flow theory is applied. Potential avenues for research could involve examining the phenomenon of flow in the domains of auditory comprehension, written expression, and oral communication, as well as delving into the societal and educational factors that may facilitate optimal flow experiences within EFL instructional settings. Additional research on the phenomenon of flow in the context of EFL may delve into learner conduct across various tasks characterized by controlled levels of complexity, which were not examined in this study due to limitations in scope. Furthermore, such investigations may encompass a broader spectrum of EFL proficiency and ability levels. The association between the flow experience of the game and competitiveness in serious games and GBL contexts has been proposed. Thus, it is imperative to exercise caution when introducing GBL in language courses to ensure that the competitive element is effectively integrated into the classroom environment.

6. Conclusions

The engagement of learners in the learning process has become increasingly crucial in the 21st century, particularly with the growing prevalence of blended and remote learning. One popular approach to fostering learner engagement is through the use of GBL. GBL has been shown to improve learning, as evidenced by numerous studies in the field of education. The literature has examined and proposed that GBL can improve learning performance and outcomes by means of affective, cognitive, and behavioral mechanisms (Koivisto & Hamari, 2019; Sailer & Homner, 2019). The findings derived from the data analysis conducted in the current investigation indicate that GBL has noteworthy effects on the extent of learners' vocabulary sizes and has a moderate influence on their flow experiences. The results suggest that individuals who are exposed to GBL are likely to experience a positive impact on their vocabulary size growth. As such, it is advisable to incorporate GBL in language learning programs to enhance learners' vocabulary size. Hence, the integration of GBL in language education, particularly in the private domain, necessitates adequate financial resources and infrastructure to establish classrooms that are furnished with computers and Internet connectivity.

6.1 Implications of the Study

Based on the findings of this study, it is recommended that learners exposed to the GBL obtain a positive increase in their vocabulary size. Therefore, GBL should be implemented in language classrooms, especially in the private sector, with the required funds and facilities to run classes equipped with the Internet and computers. Moreover, researchers have recommended focusing on motivation, gaming load, and interaction when investigating GBL. Gaming expertise and the English proficiency of learners seem to be further essential aspects of learning success, especially when non-native speakers play an English game. Moreover, teachers should be instructed on how to implement GBL in the classroom. This is because different levels of language proficiency might have different outcomes concerning the implementation of GBL. Competitiveness in serious games and GBL contexts has been suggested to be associated with variations in the flow of the game experience. Therefore, in implementing GBL in language classes, care must be taken to bring this air of competitiveness to the class scene.

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Appendix

Flow Perceptions Questionnaire Adopted from Egbert (2004)

Participants responded to each of the following items on a scale from 1 (strongly disagree) to 7 (strongly agree). Questions 3, 4, 10, and 12 were reverse scored.

1. This task excited my curiosity.
2. This task was interesting in itself.
3. I felt that I had no control over what was happening during this task.
4. When doing this task I was aware of distractions.
5. This task made me curious.
6. This task was fun for me.
7. I would do this task again.
8. This task allowed me to control what I was doing.
9. When doing this task, I was totally absorbed in what I was doing.
10. This task bored me.
11. During this task, I could make decisions about what to study, how to study it, and/or with whom to study.
12. When doing this task I thought about other things.
13. This task aroused my imagination.
14. I would do this task even if it were not required.

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