



A triangulation method on the effectiveness of digital game-based language learning for vocabulary acquisition

İbrahim Yaşar Kazu¹ · Murat Kuvvetli²

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Abstract

This research aimed to explore the views of 8th grade students on digital game-based English language learning as a foreign language (EFL). A total of 69 students between the ages of 12 and 14 participated in the study. Students' vocabulary acquisition skills were tested using a web 2.0 application called "Quizziz." The study utilized a triangulation method in which the results of a quasi-experiment and the metaphorical perceptions of the learners were obtained. The results of the tests were recorded at two-week intervals, and students' reactions to the results were collected using a data collection tool. The study used a pre-test, post-test, and control group design. The experimental and control groups took a pre-test before the study began. The experimental group then practiced vocabulary using Quizziz, while the control group practiced vocabulary by memorizing it in their mother tongue. The post-test results showed significant differences between the control and experimental groups. In addition, content analysis was used to analyse the data, with metaphors being grouped and frequencies calculated. The students generally expressed positive views on digital game-based EFL, stating that it was highly successful and that in-game power-ups, competing with other students, and receiving rapid feedback improved their motivation.

Keywords Distance learning · Games and EFL · Metaphors · Triangulation · Vocabulary acquisition

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✉ İbrahim Yaşar Kazu
iykazu@firat.edu.tr

Murat Kuvvetli
202401101@firat.edu.tr

¹ Department of Educational Sciences, Firat University Education Faculty, Elazığ 23119, Turkey

² Ministry of Education, Elazığ, Turkey

1 Introduction

The World Health Organization announced on December 31, 2019 the identification of a new form of coronavirus infection (Covid-19) in Wuhan, China, which has posed a threat to the entire world. The virus causes symptoms such as infection, high fever, loss of taste and smell, joint pains, and others (Sun et al., 2020). As a result of the outbreak, various areas, including the economy, education, and social relationships, have been negatively impacted. Education has been particularly affected in Turkey, with schools shutting down permanently on November 20, 2020 and distance learning being implemented as the primary source of education. Distance education in Turkey did not develop gradually over time, but rather emerged suddenly as a result of the COVID-19 pandemic. The need for social distancing and remote learning caused by the pandemic led to a rapid shift towards distance education in Turkey. Schools and universities had to adapt quickly to this new reality and implement online learning platforms and technologies to continue educating students. This sudden shift to distance education presented many challenges for educators, students, and families, as they had to quickly adjust to new ways of learning and teaching. This posed challenges for educators who were not familiar with distance learning and lacked technological expertise. In response, the Ministry of Education in Turkey provided in-service courses for teachers on the use of interactive smartboards and web 2.0 tools, such as android app development courses with Kotlin and HTML 5. Among these web 2.0 tools, Quizziz is particularly useful for distance learning as it allows teachers to create multiple-choice, poll, fill-in-the-blank, open-ended, and checkbox questions for students. It also enables students to engage with and compete against each other. Additionally, other teachers' online tests can be imported, copied, printed, and edited, allowing for the quick creation of tests on specific subjects. The Reports section of Quizziz also allows for the representation of each student's accuracy (with names kept anonymous for safety) and the downloading of a detailed report in .xml format, which shows which student made mistakes on which questions. This can save time in the assessment of students. The Reports section also includes a leaderboard feature as shown in Fig. 1. (Quizziz, 2022).

In addition to all these, virtual classes can be created by a teacher and a link can be established through Google Classroom, where homework can be assigned to students at any time, any place, so that a virtual classroom setting can be generated. Furthermore, these features are completely free. When compared with other web tools, it was stated that polls or fill-in-the-blanks types of questions cannot be created in other web 2.0 tools such as Kahoot (Basuki and Hidayati 2020). Once Kahoot, which is another web 2.0 tool, is examined, the features mentioned above required purchase. Nevertheless, Quizziz does not require any purchase for the features mentioned. Moreover, any quiz has the opportunity to be turned into a game and a competition in Quizziz. Therefore, Quizziz is one step ahead of other web 2.0 tools. As a result of the advantages stated, games and competitions can also be used in distance learning.

Integrating games into a classroom setting has a lot of benefits. Cheng and Su (2011) stated that the learning motivations of students have a significant impact

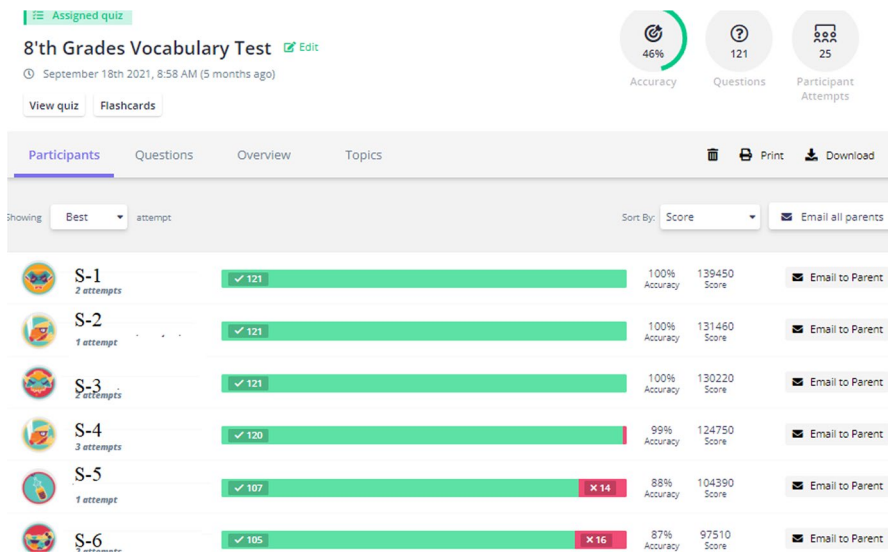


Fig. 1 Quizziz web page “reports” screen (Quizziz, 2022)

on their learning achievement, and as a result, students with game-based learning are better than those who apply traditional face-to-face teaching. Besides, Zou et al. (2021) stated that students are in the process of learning by doing actively, having fun, taking responsibilities, and providing a positive attitude towards the process of game-based education. Nevertheless, despite the numerous benefits of game-based education, distance education has hindered teachers from incorporating face-to-face games into their courses. To address this issue, the advantages of using the "Quizziz" web 2.0 application on 8th grade secondary school pupils were investigated by assessing metaphorical perceptions and academic success in language acquisition. This research, according to the students' perceptions, will provide an opportunity for future research procedures including digital game-based language learning, and it has also been considered to fill gaps in the literature once it is applied to various age groups of language learners with various language skills such as listening, speaking, writing, and reading.

2 Literature review

As a result of the COVID-19 pandemic, which led individuals to stay at home, remote learning became the predominant source of instruction. The effects of face-to-face games integrated into courses have been reduced as a result of the COVID-19 outbreak. However, games can be used in language learning and distance learning, and teams can be formed using web 2.0 tools, which are considered beneficial. Additionally, the academic development of students was maintained during the pandemic outbreak. Apart from these advantages, Pitarch (2018) claims that in the field of foreign language learning, students must gain not only a solid theoretical

understanding of grammar and vocabulary, but also a variety of communicative competencies, which necessitates practicing and experiencing the target language. Competitions and Quizziz's incentive elements can be used to help pupils achieve this. Competitions in digital games, for example, will pique students' interest in learning a foreign language in a more motivated manner.

The COVID-19 pandemic has had a significant impact on education in Turkey, leading to the widespread adoption of emergency remote teaching and virtual classes. Emergency remote teaching (ERT) refers to the quick transition from traditional face-to-face instruction to remote instruction in response to an unexpected crisis or circumstance, while virtual classes involve the use of online platforms for delivering education (Taskaya, 2021). The COVID-19 pandemic has forced many countries, including Turkey, to quickly transition to emergency remote teaching and virtual classes. The Ministry of National Education in Turkey initiated a distance education program called EBA (Eğitim Bilişim Ağı—Education Informatics Network), which provided access to educational content for all levels of education through online platforms (Kazu et al., 2021). The transition to remote learning in Turkey presented numerous challenges, including the need to quickly adapt to new technologies, the lack of access to technology for some students, and the need to maintain student engagement and motivation (Degirmenci, 2021). One strategy that has shown promise in promoting learning and engagement in the remote learning environment in Turkey is the use of digital games. Digital games can be used to present vocabulary in a fun and engaging way, providing students with opportunities to practice and reinforce their language skills in an interactive and immersive environment. In Turkey, some language schools and universities have already started using digital games in language teaching.

Liu et al. (2020) defined distance learning as an education method pursued in a certain center where training materials were prepared specifically for the interaction and communication between the students and educators in various settings. Due to the restrictions of traditional education and practices, there is no possibility to continue in-class activities. In a study, it was stated that the majority of the participating teachers stated that the students did not take this process seriously enough and the lack of technical infrastructure caused this process to be inefficient, and they expressed their ideas through different metaphors (Kazu et al., 2021). Therefore, it is difficult for teachers to interact with and regroup students to create a game and integrate it into the course in distance learning. Quizziz, on the other hand, can not only provide fast feedback and challenge pupils, but it can also easily build teams or groups for competitive activities. According to Kiili (2005), providing players with rapid feedback, clear goals, and challenges that are appropriate for their skill levels has a positive influence on learning and attitudes (Kazu et al., 2022). Students become more interested and active in the learning process as a result of this feature in Quizziz.

Zhang and Yu (2021) stated that learning a foreign language has become essential in today's globalized world. While the grammar structure of a foreign language can be learned easily, developing vocabulary knowledge is generally a tedious and time-consuming task. At this point, it is essential to make learning easy, practical, and fun. Therefore, it can be clearly stated that facilitating language learning is one

of the most essential points to be considered to encourage students. As the importance of games in the teaching and learning process becomes more widely recognized, Toraman et al. (2018) stated that when games are used effectively in teaching, including digital genres, they can be a beneficial support tool for various education levels. This statement, one can see that various educational tools can also be used, and plenty of web 2.0 tools are yet to be discovered by teachers.

There are also other types of distance learning tools such as virtual classrooms, augmented reality, and VR becoming increasingly popular in language learning. As they provide immersive experiences that can help students to better understand and retain new information. For example, a virtual classroom allows students to interact with a virtual teacher and other students in a virtual environment (Cai & Zhao, 2021), while augmented reality (Annamalai et al., 2022) and VR (Khodabandeh, 2022) can be used to create interactive language learning experiences that simulate real-life situations. Research has shown that these technologies can improve language acquisition, particularly for vocabulary and grammar" (Kondratiuk et al., 2022). "Augmented Reality (AR) in language learning has been found to be effective in providing authentic contexts, scaffolding language production, and promoting learner autonomy and motivation" (Costuchen et. al., 2021).

Digital game-based language learning (DGBLL) is a pedagogical experience that appears within a wider term involving the specific application of both technological and non-technological funds (Deterding et al., 2011). These approaches can be implemented in distant environments as well (Lidia et al., 2018). Additionally, Ho et al. (2021) identified game-based learning as exercises having a game at their center, which can either be the main exercise or as a stimulant for other relevant exercises, with a requested or circumstantial outcome. De Freitas (2006) also clarified that the digital approach in terms of education centralizes the utilization of practices involving the features of digital games to supply learners with establishing learning practices concentrating on bringing distinct academic objectives. Thus, it can be inferred that game-based learning can be regarded as an expression of DGBLL (Pitarch, 2018). Furthermore, various authors have presumed the games to be independently persuading, and correspondingly, it is suggested that the utilization of this resource can be rewarding in the learning process (Zheng et al., 2009). DGBLL was founded on communal academic requirements from the utilization of advanced models of technology, crucially shifting learners' contemporaneous thinking designs and stimulation during the pandemic outbreak. In this line, Prensky (2009) set up the term "digital citizens" in reference to the people born in the twenty-first century who were raised using developing digital technology. Thus, it can be implied that these kinds of advanced pedagogical applications and methods are significant to developing and stimulating modern-thinking students, who are called digital citizens. From a wider aspect, Prensky (2009) categorized this application as an approach centered on accomplishing objectives and role-playing reproductions via electronic games. Once taken into account as an approach, DGBLL includes a sequence of learning premises. In accordance with this purpose, Margarida et al. (2010) defined three paradigms related to behaviorism, cognitivism, and constructivism. At first, DGBLL learning supports students' motivations with positive or negative features; hence, the learning process occurs when there is a relationship between them. Secondly,

it necessitates students' active attendance to learn a language, involving recalling and dealing with problems as well. Thirdly, DGBLL includes learning by practicing, creating, and describing knowledge and implementing it in the virtual world in compliance with the learner's background information and experiences. On the other hand, Ekici (2021) stated that learners are required to realize their learning process; this signifies reflective learning. Thus, learners ought to deliberately think, analyze, and learn by checking themselves in game-based language learning. In the field of language learning, different researchers have defined fundamental theories related to game-based learning. For example, Dickey (2007) claimed that DGBLL can reorganize an immersive story and, as a consequence, bolster meaningful learning through problem-based objectives. Furthermore, game-based language learning supports students' language acquisition practices by improving mind maps (Casañ-Pitarch, 2017). This results in the learner's previous experiences being comprehensible. Besides, Margarida et al. (2010) stated that through games, learners can relate themselves to the virtual surroundings, which provides a meaningful context to the learner environments. On the other hand, games in learning a foreign language support students in learning advanced premises in a meaningful and entertaining way, which allows testing and experiencing acquired knowledge (Jonassen et al., 1995).

Distance learning technology enables individuals to form communities of learners that can quickly develop expertise and exchange it with other participants. Aside from social engagement among learners in distance learning environments, communication between learners and their online instructors shouldn't be disregarded either (Zahariadis & Voliotis, 2003). Distance learning enables users to transmit-receive data both synchronously and asynchronously; it is straightforward, clear, and extremely simple to use. Learning has become more personalized and gregarious, allowing for accessible, networked, and cooperative activities and assignments both within and beyond the classroom (Hockly, 2015). Likewise, learning has become omnipresent, with many forms of learning occurring beyond the classroom via social cooperation among students to increase the building and exchange of linguistic content and knowledge (Wenming & Zhang, 2017). In addition to all these, online games that demand collaboration promote students to speak with one another in order to debate and agree on the next stages, as well as strengthening their interpersonal skills (Fang et al., 2022). Furthermore, a well-designed digital game can provide strong participatory experiences in young children that encourage education, skill development, and potential growth (Blau & Shamir-Inbal, 2017). On the other hand, distance learning has a considerable impact on the notion of learning, as well as ways of collecting and absorption of knowledge (Mellati et al., 2018). As a consequence, it can be claimed that interactive environment through online games can be integrated into the distance learning.

Pitura and Pacut (2018) stated that technology-assisted games for upper-secondary school students provided educational gains. On the other hand, Chik (2019) argued that gamers exercised autonomy by managing their gameplay both as leisure and as learning practices in various dimensions (location, formality, locus of control, pedagogy, and trajectory). Thus, it can be inferred that games make language learning possible for learners to be free from time and particular environments such as schools. Cheng et al. (2019) stated that the gaming approach not only benefits

students' motivation, but can also have better results on their academic achievements as well. Peterson (2013) conducted a study on simulation games for language learning, and the observations revealed that the 2D game elicited a high degree of collaboration as learners actively assisted each other in drafting directions during the role-play. On the other hand, Peterson (2016) stated that learners kept being social through in-game interactions. It is clear that learners' interaction and cooperation through games are motivating and lead to peer correction as well. Additionally, Reinders (2012) stated multiple benefits of digital games for language learning, such as focusing on well-ordered problems, giving players beneficial tools with which to solve problems, giving clear goals, and encouraging gamers to revise their aims at times, reducing the outcome of ineffectualness. Hung and Chang (2016) also backed up games, claiming that role-playing online games will help learners improve their characteristic skills. Will try out the alternating ways by trying unprecedented modes of play, experiences becoming a priority, giving copious feedback, and being assessed. This will be accomplished by connecting play and learning through collaboration. Consequently, learners must discover the games' rules and accomplish their tasks ahead.

The use of technology in language learning has increased in recent years due to the availability of digital tools and the need to prepare students for a technology-driven society. Technology-enhanced language learning (TELL) has been defined as "any form of language learning that is facilitated by the use of technology" (Stockwell, 2012). TELL has been used in various language learning contexts, including computer-assisted language learning (CALL), mobile-assisted language learning (MALL), and game-based language learning (GBLL). CALL involves the use of computers to assist language learning, while MALL utilizes mobile devices such as smartphones and tablets. GBLL, on the other hand, uses games as a tool to facilitate language learning. Studies have shown that TELL can have a positive impact on language learning outcomes. For example, a study by Li (2022) found that the use of MALL improved the listening and speaking skills of Chinese EFL learners. Similarly, Tao and Zou (2021) reported that CALL enhanced the vocabulary acquisition of EFL learners. In the area of GBLL, studies have shown that games can be effective in improving various language skills such as vocabulary, grammar, and reading (Hooshyar et al., 2016).

The effectiveness of TELL can be attributed to its ability to provide learners with opportunities for autonomous and personalized learning. According to Warschauer and Healey (1998), TELL enables learners to control their own learning pace, focus on their individual needs, and receive immediate feedback. Moreover, TELL provides learners with authentic and meaningful language input, which can improve their motivation and engagement in language learning (Li, 2022). In conclusion, TELL has emerged as a promising tool for language learning. The use of technology has provided learners with opportunities for autonomous and personalized learning, which can improve their language learning outcomes. The effectiveness of TELL has been demonstrated in various language learning contexts, including CALL, MALL, and GBLL. However, further research is needed to explore the best practices for integrating TELL into language learning and to investigate its impact on different age groups and proficiency levels of language learners.

Lee (2020) stated that even though there had been several research projects utilizing digital games, the integration process into effective teaching and learning environments is still not clear. Since the increasing use of such games may often be the same as a form of addiction, teachers generally argue that games may yield positive results in students' motivation, creativity, agency, and entertainment levels during the language learning process. However, further research is certainly required to examine how these supportive outcomes can be achieved. In their research, a two-year funded project investigated language learners' creativity and dialogical thinking through virtual environments with real-time language games. On three different online platforms named Minecraft, Open-Sim, and Second-Life, learners were educated to set up their own games through those platforms and generate potential games for teachers to master various subjects such as coding, designing, adding role-plays using the second language, and developing simulations and scenarios. Such subjects benefit learners' creativity, motivation, technological skills, and language learning all at the same time. What's more, the e-learning platform called MOOC (massive open online courses) can be adapted for language learning courses without requiring any purchase. Similarly, in this study, in comparison with other games in other studies, when the Quizziz web 2.0 tool is analyzed and applied, no downloading or purchasing was required. This advantageous feature benefited the participants in their academic achievements. The increased interest in DGBLL is linked to some critical technological developments at the moment, such as smartphones, improved internet connections, and the advancement of free or low-cost video games, educational applications in e-commerce, the advancement of speech recognition systems, and artificial intelligence (Pitarch, 2018).

Massive Open Online Courses (MOOCs) burst beyond traditional offline teaching techniques, extend learners' ideas in terms of breadth and size, and remove learning time and space constraints. MOOCs, as an open online course platform, enable anybody interested in taking a course to engage in learning at any time and from any location in order to maximize educational resources (Wu, 2021). Although it provides personalized learning for learners, it may decrease social interaction through peers. Additionally, game-factor increases communicative activities and collaboration among learners. Therefore, it can be inferred that in order to remove learning time and space limitations and promote communicative activities, digital game-based language learning can be utilized via web-based platforms.

A brief analysis of the literature shows that game-based learning was applied in several branches, such as math and science, including foreign languages as well. Among them, game-based language learning was applied in several kinds of research on various age groups and classes. Conclusively, it was found that the game-based language learning approach promoted young learners' speaking skills and motivation significantly, while the control group's speaking achievement and motivation level nearly remained the same at the end of the study, according to Fithriani (2021). Based on this statement, it can be deduced that students are both motivated by having fun and by achieving success on their test results.

In the literature there are scarce research regarding metaphorical perceptions of learners and teachers over game-based language learning. One of them is on teachers and according to the results of the study most teachers who actually use

games in class perceived student engagement with a game and cognitive learning outcomes as effects of the use of games in formal teaching settings (Huizenga et al., 2017). Therefore, once compared with this study it can be claimed that students and teachers' views regarding game-based language learning are directly proportional. In another study, Alakurt and Bardakçı (2017) investigated staff employees' metaphorical impressions of Google apps. Their research revealed a favorable opinion of Google apps over the language learning process. These metaphors indicate that language learning via digital game-based environments enhances language learning.

According to the findings of the studies, it can be stated that there is plenty of research carried out on DGBLL, focusing on various subjects such as competitions, real-life situations where learners can improve their social competencies in video games, and mobile games to integrate language learning. On the other hand, as Xu et al. (2020) stated, in practice, learning with games has been increasing, but the learning outputs, including digital-games to enhance learning a foreign language, are rare. Thus, it can be inferred that although there are multiple advantages to web 2.0 tools, no research has been carried out on integrating the web tools into language learning settings through games. There is only one national research project carried out for the concept of DGBLL in the thesis center, but that research is neither in a qualitative method nor takes the views of the students. Therefore, it has become clear that previous research has been in an endless circular rotation among the perceptions of teachers and primary students on digital games, language learning, and distance education. Nonetheless, no comprehensive research on the metaphorical perceptions and academic achievements of secondary school 8th grade students on DGBLL using the web 2.0 tool "Quizziz" in distance learning has been conducted thus far. Intended to measure the metaphorical perceptions of 8th grade students on DGBLL with a web 2.0 tool named Quizziz, this research is considered to shed light on the studies carried out in the future. The research questions (RQs) created in order to realize the purpose of this study are given below:

- **RQ₁.** Is utilizing DGBLL or learning words through their meanings in the mother tongue better for vocabulary acquisition?
- **RQ₂.** What are the metaphorical perceptions of the participants regarding the DGBLL through vocabulary acquisition?

Based on the RQ2, four hypotheses were developed:

- **H₁:** The experimental group, who practiced the words with the DGBLL method, remembered the words better in the post-test results than the control group.
- **H_{a1}:** The control group, who tried to memorize the words with their meanings, remembered the words better in the post-test results than the experimental group.
- **H₂:** There is a statistically significant difference between the pre and post-test results in the experimental group and control group.
- **H_{a2}:** There isn't any statistically significant difference between the pre and post-test results in the experimental group and control group.

3 Methods

3.1 Research design

This research utilizes a triangulation method in which the results of a quasi-experimental design and the metaphorical perceptions of the learners were obtained. Triangulation is a research method that uses multiple data sources, investigators, methodologies, theoretical perspectives, or analytical methods in a single study (Thurmond, 2001). This leads to different types of triangulation methods, such as data triangulation, investigator triangulation, methodological triangulation, theoretical triangulation, and analytical triangulation. Researchers that use between- or across-method triangulation acquire both qualitative and quantitative data in the same study (Boyd, 2000). Therefore, a between- or across-method triangulation design was administered, including both qualitative and quantitative approaches.

A quasi-experimental design is a research method in which subjects are not randomly assigned to treatment and control groups (Sirotová et al., 2021). Instead, subjects are divided into groups based on pre-existing characteristics or assigned to a treatment group based on availability. This design is used to establish a cause-and-effect relationship between variables, with the presence of a control group that allows for the isolation of the specific effects of the treatment. A pre-test–posttest design with a control group was administered (Jia & Chen, 2020). In this design, participants were measured on an outcome variable (being 10th grade students and having English as a second language) before and after the treatment was applied. This design can be used to establish a causal relationship between the treatment and the outcome variable, but it is important to consider alternative explanations for any changes in the outcome variable (Yang et al., 2019). Therefore, by utilizing qualitative research methods, it was attempted to gather information about the effectiveness of the Quizziz application by analyzing the metaphorical perceptions of the students through a phenomenological design.

Lakoff and Johnson (2008) defined the research carried out with metaphorical design as explanatory studies about how people experience a metaphor. Additionally, metaphorical thinking is not just a matter of language, but is fundamental to how we conceptualize and make sense of our experiences. The main question, expected to be answered in metaphorical studies, is "What is the meaning, structure, and essence of the experience of this metaphor for a person or people?" As this study was based on determining the perceptions of secondary school students on the contributions of digital games to language learning in distance education through metaphors, the participants were asked to produce metaphors for the relevant concept. Zhang and Hu (2009) defined metaphor as expressing thoughts that are accurately the same or that are close to each other, emphasizing a different feature and establishing different similarities. On the other hand, Gatti and Catalano (2015) mentioned that metaphors help people think creatively. In the literature, findings indicate that approaches and methods used in education can be determined through metaphors and can respond to perceived needs (Li et al.,

2022). In this respect, it is clear that metaphors are powerful tools in revealing students' metaphorical perceptions of the contribution of games in language learning during the distance learning process by reflecting on their past, present, and future thoughts.

3.2 Research group

The participants of this research consist of a total of 69 secondary school 8th grade students who were getting prepared for the high school entrance exam. 44 of them are females (63.8%) and 25 of them are males (36.2%) studying in Turkey in the academic year of 2020–2021. In order to give speed and practicality to the study, a facilitated accessible sampling technique was determined. For the study group, a simple random sampling design was applied. The learners participated in the process voluntarily. For the quantitative part of the study however, of the 69 students, 13 of them couldn't attend the courses consistently. Therefore, only 56 of the participants' test results had to be taken into consideration. For the qualitative part, 69 students contributed to the process and the results had been able to be obtained from the participants.

3.3 Data collection

In this study, both phenomenological design (qualitative) and an experimental design (quantitative), were applied. In order to carry out the qualitative research, an online data collection tool was created by the experts in the field. For the quantitative research, a pre-test, an interval test and a post-test were applied.

3.3.1 Metaphorical perception form

In the explanation part of the form, the necessary explanations about the metaphors were administered to the participants. The online form, which was prepared within the scope of the research, learners were asked to answer the questions on a voluntary basis. Within the scope of the research, two metaphorical questions were directed: "In my opinion, learning English with games is like Because" and "In my opinion, the benefits of learning English with games are similar to Because" and they were asked to fill in the blanks. For the validity and reliability of the study, name-surname information was not requested from the participants and there was no time limitation when filling out the form.

3.3.2 Pre-interval and post tests

The pre and post-tests were conducted prior to and following the intervention, correspondingly. The goal of these examinations was to assess the participants' learning results. These tests (see Appendix Table 4) assessed whether or not the participants in this study had learnt the relevant vocabulary in their curriculum. The test comprised of 25 words selected from the curriculum (see Appendix Table 3).

The assessment approach was based on writing the meaning of those words in their mother language. These 25 items were delivered based on their curriculum, in that, all the vocabulary items were covered in the courses. These tests took 20–30 min.

3.4 Data analysis

The words chosen before the test was prepared were selected from the word pool in the 8th grade curriculum approved by the Ministry of National Education. Nevertheless, in order to ensure the reliability and validity, test preparation professionals (a linguistic, a measurement and evaluation expert, and a scholar) from the analyst's university evaluated the vocabulary test. The experts were required to consider the terms' fit for the research aim, intelligibility, and language utilized. The test was modified as a result of their affirmation verdicts. Furthermore, the test's content validation was guaranteed by a table of parameters that was also validated by professionals. A "table of requirements" is a 2-grid table that displays the alignment of the materials with the stages of the proficiency level according to Bloom's taxonomy of educational objectives. In the building projects of the 25-item vocabulary test, the analyst enumerated the topics discussed as columns on the desk and the levels of the cognitive ground as the columns of the table. Immediately afterward, average percent weight values were implemented for each of the items and the stages of the cognitive domain. Those percentage weights for each issue as well as the degree of cognitive domain led to a reduction in the number of words. That was done to check that the contents presented were adequately addressed in the test. After the data was collected, the vocabulary set was generated from the 25 new phrases (see the Appendix). Meanwhile, in order to analyze the internal consistency reliability (pilot testing) of the test, duplicates of the vocabulary test were administered to a comparable sample ($n=10$) of diverse learners in order to improve the items' reliability. By providing copies of the vocabulary test at 2-week intervals after the first administration, the temporal stability of the test was tested. The reliability statistics ($=0.91$) were used to analyze the results of the two administrations. The test's reliability was validated.

The metaphors obtained from the forms filled out by the participants were analyzed using the "content analysis" method. As Zhang et al. (2020) stated, the basic process in content analysis is to gather similar data within the framework of certain concepts and themes to interpret them by organizing. Within the scope of the study, metaphors containing similar elements, which were produced by teachers for the relevant questions, were organized under certain categories and interpreted for the reasons created by the participants. Positive and negative metaphors were divided into categories involving their reasons. Zhang et al. (2020) stated that informing the individuals accurately about the study in a detailed way and not changing the answers given to the questions in the qualitative research increase the validity of the study. In this context, in order to increase the validity of the study, the studies carried out in the process have been explained in detail. In order to ensure reliability, the data were evaluated in detail by consulting an expert in the field. After the evaluation process was completed, the agreement between the evaluators was evaluated.

Interrater reliability calculation was calculated using the formula $(\text{consensus} / (\text{agreement} + \text{disagreement}) \times 100)$ (Miles & Huberman, 1994) and the reliability was found 96%. Furthermore, basic statistics such as frequency and percentage calculation processes were also exerted to calculate the distribution of the participants' demographic information and the frequency of the generated metaphors.

4 Findings

The study revealed both quantitative and qualitative results related to the effectiveness of Digital Game-Based Language Learning (DGBLL) in promoting vocabulary learning among English as a Foreign Language (EFL) students. The quantitative results indicated that the experimental group outperformed the control group in remembering the vocabulary they practiced with DGBLL on both the interval and post-tests. On the other hand, the qualitative results demonstrated that students had a positive perception of DGBLL and perceived it as an effective method for improving their academic achievement. They found DGBLL motivating and exciting, with the bonus features enhancing their learning experience. Participants believed that DGBLL helped them remember vocabulary better and for a longer period, and they likened it to a renewable energy source that allowed them to learn individually without fear of failure. The results of both quantitative and qualitative results are given below.

4.1 Quantitative results of participants

4.1.1 The experimental results of both groups

Prior to the students' test results, the experimental procedure is presented in Fig. 2.

It is clear from the procedure that in the first phase of the experiment, the pre-test was applied to both groups, and then on the second week, the experimental group practiced the words through the "Quizziz" web application. At the end of the tests, the students' metaphorical perceptions regarding the issue were gathered.

Prior to analyzing whether there was a significant difference between the assessments applied in the experimental and control groups, the normality of the distribution was checked. When the findings of the normality of the distribution were

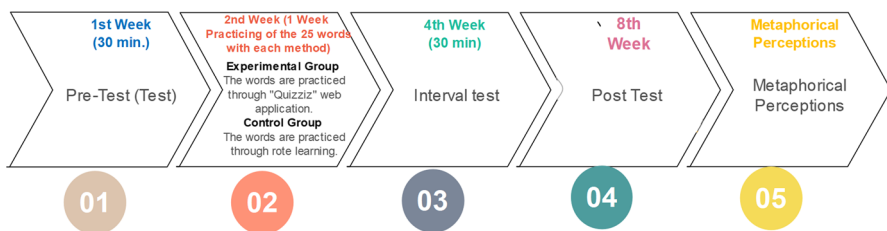


Fig. 2 The experimental procedure

analyzed ($F_{(pre-test)}=0.292$, $p=0.59>0.05$; $F_{(interval-test)}=0.194$, $p=0.66>0.05$; $F_{(post-test)}=0.142$, $p=0.70>0.05$), it was noted that the distribution was normal, hence the findings of the repeated measures ANOVA (Grund et al., 2016), which is a one-way analysis of variance, were examined. To further clarify the findings, the repeated measures ANOVA was applied to assess the vocabulary acquisition over a two-week interval. The impacts of the two teaching strategies on the pupils' word retention were evaluated.

The findings obtained are presented below:

According to Table 1, the pre, interval, and post-test results showed statistically significant meaning ($F_{(pre-test)}=34.35$, $p=00.05$; $F_{(interval\ test)}=07.00$, $p=01.05$; $F_{(post-test)}=68.00$, $p=00.05$). Therefore, it can be stated that the H_2 hypothesis is confirmed: there is a statistically significant difference between the pre-and post-test results in the experimental and control groups.

At partial 2 (η^2) values, 0.01 is considered low potency, 0.06 is considered average potency, and 0.14 and above is considered high potency (Jakimovski et al., 2021). According to the partial effect size value, an average effect in the interval test and a high potential effect in the post-test results were detected in favour of the DGBLL ($\eta^2_{(interval\ test)}=0.09$; $\eta^2_{(post-test)}=0.50$). Therefore, the H_1 hypothesis is also confirmed: the experimental group who received DGBLL remembered the words better compared to their post-test results as shown in Fig. 3.

Once the mean analysis of the test scores was obtained, it was revealed in Fig. 3 that a significant improvement (Mean (interval test)=65.23>53.82; Mean (post-test)=76.00>44.74) was obtained in the experimental group, implying that DGBLL aided students in improving their memory of words for a longer period of time compared to rote learning.

During the interval test, it can be seen that the control group started to forget the words, while the experimental group remembered more of the words they had learned. In addition, of the two techniques applied to evaluate word retention on the two-week interval tests, even though the control group was more successful in remembering the words in the pre-test results (Mean (pre-test)=43.17>72.57), two weeks later on the complementary tests, the learners in the control group were

Table 1 The repeated measures of ANOVA test results of the participants

Weeks	Groups	Sources of Var.	df	Mean Square	F	p*	η^2
1 st week (pre-test)	Experimental Group	Between Groups	1	14901.96	34.35	.00	.33
	Control Group	Within Groups	567	433.72			
Interval Test (3 rd Week)	Experimental Group	Between Groups	1	2243.98	07.00	.01	.09
	Control Group	Within Groups	56	320.28			
Post Test (6 th Week)	Experimental Group	Between Groups	1	16849.86	68.00	.00	.50
	Control Group	Within Groups	56	247.77			
Levene= (F _(pre-test) =.292, p=.59 >.05**; F _(interval-test) =.194, p=.66 >.05**; F _(post-test) =.142, p=.70 >.05**)							

** The homogeneity of variances $p>0.05$, There is a statistically significant difference, $p<0.05^*$

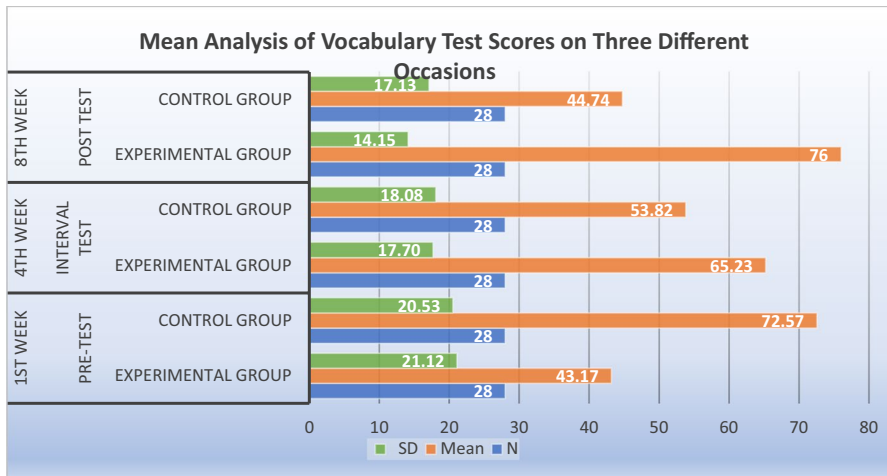


Fig. 3 Mean analysis of the vocabulary test scores of the participants on three different test occasions

not able to remember the meanings of the words they had memorized and had forgotten them as time passed. The reason the control group was already statistically different might have been because they were familiar with the vocabulary beforehand. However, as time passed, the words they were familiar with in the pre-test began to be forgotten, and the opposite happened in the experimental group.

As a result, both the interval and post-test revealed that the experimental group remembered the vocabulary they practiced with DGBLL better on the interval and the post-test. As a consequence, it can be concluded that the experimental group was more successful in remembering the words than the control group.

4.2 Qualitative results of participants

4.2.1 Students' metaphorical perceptions on the concept of digital game-based education on academic achievement in EFL

In this section, students' metaphorical perceptions of the effects of DGBLL on academic achievement were presented. In addition, descriptive expressions related to high-frequency metaphors in the specified categories were included. Whilst direct quotations were cited, coding was made in the form of S1, S2, S3, Table 2 shows the frequency and percentage values for these categories:

The results of the Table 2 are explained in 4.3 and 4.4.

4.2.2 Metaphors regarding the effectiveness of digital game-based language learning on academic achievement

In Table 2, it was observed that for the students' metaphorical perceptions of the concept of digital game-based education as it relates to academic achievement in EFL, two categories were created regarding the effectiveness and ineffectiveness

Table 2 Students' metaphorical perceptions on the concept of digital game-based education to academic achievement in EFL

Categories	f	%	Metaphors	f	%
The effectiveness of EFL through digital games on academic achievements	66	97.05	Entertainment (9), A bird (6), gold (4), chocolate (3), puzzle (2), game (2), medicine (2), heart (2), happiness (2), a race (2), a baby (1), alphabet (1), a book (1), a coffee (1), Minecraft (1), a cow (1), chips (1), a peach (1), sugar (1), a road (1), laughing (1), self-confidence (1), a private course (1), dancing (1), excitement (1), a bridge (1), playing with a tablet (1), a mind game (1), a table (1), a cartoon (1), a car (1), a dog (1), a tree (1), a cat (1), a staircase (1), drinking water (1), a fish (1), efficiency (1), a walnut (1), a friend (1), a key (1), milk (1),	42	95.45
Ineffectiveness of EFL through digital games on academic achievement	2	2.95	A black hole (1), Wall (1)	2	4.55
TOTAL	68	100.00	TOTAL	44	100.00

of DGBLL on academic achievement. Moreover, positive metaphorical perceptions consider "DGBLL" as beneficial ($f=66$). On the other hand, based on the justifications produced, the metaphors produced for the concept in question, having a negative meaning and considering "game-based language learning as ineffective" ($f=2$), were given in the categories mentioned. Since it is a descriptive adjective, the candidate metaphor "irrelevant," written by a participant, was removed from Table 2. 66 of the participants (97.05%) considering DGBLL as effective during the distance learning process based on their test results created 42 (95.45%) metaphors in total. Within the scope of the research, out of 44 different metaphors related to this question, 42 (95.45%) of them regarding game-based language learning that is beneficial on academic tests were located in this category. "Entertainment (9), a bird (6), gold (4), chocolate (3), puzzle (2), game (2), medicine (2), heart (2), happiness (2), a race (2), a baby (1), alphabet (1), a book (1), Minecraft (1), a cow (1), chips (1), a peach (1), sugar (1), a bridge (1), a cartoon (1), a car (1), a dog (1), a tree (1), a cat (1), a staircase (1), drinking water (1).

From the test results, it can be deduced that participants enjoyed carrying on the game-based language learning activities to enhance their academic skills. Below are some of the metaphorical perceptions based on the most used metaphors in the category that DGBLL is found valuable:

- *It makes learning more effortless to improve my English freely at home. (S-58)*
- *You will see that the story improves your cognitive ability as you read it, and you realize that the games increase your knowledge as you play. (S-57)*
- *We can learn in an unlimited way. We can learn endless words from a single source similar to renewable energy. (S-40)*

- *I can get bored when I take a test, but I don't get bored when it's in the form of a game. (S-42)*
- *An easy method and a tutorial app for easy language learning. (S-43)*
- *I focus more on my lessons and I love my lessons more thanks to Quizziz. (S-65)*
- *Learning while having fun is more beneficial and catchier. (S-35)*

Once the positive metaphorical perceptions are analyzed, language learning with DGBLL, Quizziz is found to be beneficial (S-35), entertaining (S-42), facilitated (S-42), (S-43), renewable (S-40) and effortless (S-58) according to the participants' metaphorical perceptions given in Table 2.

4.2.3 Metaphors regarding the ineffectiveness of digital game-based language learning on academic achievement

Out of 69 participants, merely 2 (4.55%) of them, regarding DGBLL on academic test results as ineffective, produced metaphors related to this category. 2 (4.55%) metaphors out of 44 regarding the ineffectiveness of game-based language learning are located in this category. In this regard, the metaphors created respectively are as follows: "a black hole (1), a wall (1)". The students who produced these metaphors emphasized that this process is irrelevant to learning a language by stating that memorizing words is not efficient. In addition, oral production activities ought to be implemented, and language learning by merely memorizing vocabulary is regarded as difficult. The following are quotations about the metaphors mentioned in this category:

- *We have difficulties in life, like learning English. Everything has a challenge. (S-45)*
- *I do not participate in games related to learning English. (S-11)*
- *I do not think that English will be learned by words. I would like it to be explained by hearing or being animated to me, in my opinion, English can only be learned by hearing the words or by hiring a private tutor. (S-25)*
- *I think it's irrelevant. (S-13)*

Once the results stated above are taken into consideration it can be concluded that few students are of the opinion about this process being ineffective through expressing that English is a difficult language and a difficult subject to learn (S-45, S-25), and that learning English merely by memorizing words is irrelevant (S-13, S-11). Additionally, it was stated that it was a subject to be learned only by hiring a private tutor (S-25).

In conclusion, within the context of students' opinions regarding the concept of DGBLL and academic achievement, it is clear that more positive metaphors were produced regarding the DGBLL, and it was underlined that the desired level of efficiency from the process was experienced in positive results. Most of the participants, who are of the view that EFL with digital games is effective, brought forward the reasons for their opinions, stating that it developed their academic achievements on tests by learning and keeping vocabulary in memory longer. Furthermore, it is

stated that this process motivated them by giving excitement with in-game bonus features, and it is implied that students learned individually and infinitely by resembling it as a renewable energy source without having a fear of failure.

5 Discussion

As the coronavirus outbreak has affected educational institutions, changing the way knowledge is gained, Schneider and Council (2021) stated that the rapid spread of COVID-19 forced governments to close schools and implement distance learning. Various initiatives were implemented to ensure that study activities continued despite the absence of in-person schooling. As a result of this situation in many parts of the world, smartphones, tablets, laptops, and desktop computers became integral to the process, leading to education being conducted through technology (Mulenga and Marban, 2020). Therefore, both language teachers and learners must pay attention to how technologies affect language use and the potential communicative and social consequences of using different forms of technology (Chun et al., 2016). When properly designed and functioning, technology can support and improve language learning by combining synchronous and asynchronous communication tools (Yang & Chen, 2007).

Digital-based foreign language teaching has been found to be effective in improving speaking skills. For example, research has shown that using digital language-learning software such as AI and chatbots can lead to gains in pronunciation, fluency, and vocabulary (Belda-Medina & Calvo-Ferrer, 2022). Additionally, the use of digital tools such as video conferencing and speech recognition software can provide learners with opportunities to practice their speaking skills in a simulated real-life context (Ranieri et al., 2016). However, digital game-based foreign language teaching has been found to be even more effective in developing speaking skills. This is because games provide an engaging and interactive context for language learning, which can increase motivation and lead to more opportunities for oral practice. Furthermore, games often involve problem-solving and communication, which can provide learners with opportunities to practice their speaking skills in a more authentic and challenging context (Govender & Arnedo-Moreno, 2021). In conclusion, both digital-based foreign language teaching and digital game-based foreign language teaching can be effective in developing speaking skills. However, research has shown that digital game-based foreign language teaching may be more effective, as it provides learners with more opportunities for oral practice and authentic communication.

The triangulation of the quantitative and qualitative results revealed a compelling picture of the effectiveness of Digital Game-Based Language Learning (DGBLL) in promoting vocabulary retention and academic achievement. The quantitative results indicated that the experimental group, who used DGBLL to practice vocabulary, performed significantly better on the interval and post-tests than the control group. Specifically, the experimental group remembered the vocabulary they practiced with DGBLL better than the control group did. These findings suggest that DGBLL can be an effective strategy for promoting vocabulary retention in language learning. On

the other hand, the qualitative results provided additional insights into the potential benefits of DGBLL in promoting academic achievement. Most of the participants in the study produced positive metaphors regarding DGBLL and underlined the desired level of efficiency from the process. They stated that DGBLL developed their academic achievements on tests by learning and keeping vocabulary in memory longer. In addition, they noted that DGBLL motivated them through the use of exciting in-game bonus features, and that they felt they could learn individually and infinitely, without fear of failure. These findings suggest that DGBLL can be an effective strategy for promoting academic achievement by enhancing motivation, providing excitement, and reducing fear of failure.

As a consequence, the quantitative and qualitative results provide a comprehensive understanding of the effectiveness of DGBLL in promoting vocabulary retention and academic achievement. The quantitative findings demonstrate that DGBLL is associated with improved vocabulary retention, while the qualitative findings suggest that DGBLL is associated with enhanced motivation, excitement, and reduced fear of failure. These findings suggest that DGBLL has significant potential as a tool for promoting language learning and academic achievement in the context of EFL. However, further research may be needed to explore the extent to which these findings can be generalized to other language learning contexts, and to explore the potential of DGBLL for promoting more complex language skills, such as critical thinking and creativity.

Although there is some evidence to suggest that digital games can be effective tools for promoting language learning in Turkey, there is still much that we do not know about the potential benefits and limitations of this approach. For example, we need to explore the extent to which digital games can be used to promote learning across different age groups of language learners with varying language skills, including listening, speaking, writing, and reading in the Turkish context. We also need to consider how digital games can be used to support the development of more complex language skills, such as critical thinking and creativity. Finally, we need to examine the extent to which digital games can be integrated into existing language learning curricula in Turkey, and the potential challenges associated with such integration. In conclusion, the shift to emergency remote teaching and virtual classes has brought about a number of challenges in the education sector in Turkey, including the need for effective strategies to promote learning and engagement in the remote environment. Digital games present a promising strategy for presenting vocabulary in language learning in Turkey, with the potential to engage students in fun and interactive ways. While there is still much to learn about the benefits and limitations of this approach in the Turkish context, there are many opportunities for future research to explore the potential of digital games in promoting language learning across different age groups and language skills.

Although distance education activities are common in our country, school administrators, teachers, and students experienced confusion at the beginning of the outbreak. However, thanks to the measures taken by the authorities and the production of distance education materials, a rapid recovery was achieved and everyone adapted to the process. There is no doubt that Quizziz, a Web 2.0 tool, is one of the most preferred educational materials for facilitating the adaptation to this process and

actively contributing to the academic achievement of students. In this study, gathering students' metaphorical perceptions provided new knowledge on DGBLL. Therefore, the students' metaphorical perceptions in this study are crucial for shedding light on future research.

6 Conclusion, implications and limitations

In this research, it was concluded that the majority of the participants were of the opinion that DGBLL learning was efficient through Quizziz. The majority of the students stated that learning English with games yielded positive results in their test scores, such as motivating them to learn the language, providing them with an easy way to access the game, and changing their attitudes towards foreign language learning positively thanks to using their in-game reinforcements and features. However, a few of the students (2.07%) stated that they could not follow this process due to a decrease in motivation and a feeling that language learning could not be sufficient by solely relying on vocabulary teaching and learning.

It was also found that students mostly (95.6%) formed positive metaphors for foreign language learning with digital games. Participants stated that the vocabulary of the themes was easily remembered, especially on academic test exams, and they also stated that this process was efficient. Furthermore, students created metaphors stating that the DGBLL tests are beneficial in new generation questions and efficient in recalling the necessary words required on academic tests. Of these metaphors, "entertaining" (7), "gold" (4), "easy" (2), "medicine" (2), and "heart" (2), were the most preferred. "Entertaining" was the most preferred one.

According to the experimental findings, there was a high potential effect on the post-test results when compared with the pre-test results. This means that digital game-based language learning plays a critical role in language learning. In a scoping review study on DGBLL, Hung et al. (2018) set out to provide a comprehensive review of empirical data on the usage and effects of digital games in language education from 2007 to 2016 as a method to promote burgeoning research on DGBLL. A total of 50 chosen papers were rigorously examined, yielding significant conclusions. A significant proportion of DGBLL studies showed beneficial results concerning student learning, with the most commonly cited ones relating to efficacious or psychological domains, followed closely by language acquisition. Overall, these results reflect the multifaceted nature of this subject and demonstrate the general practicality of using digital games to enhance the language and literacy acquisition of both native and quasi-native speakers in many aspects. Alfalah (2018) argued that, from the perspective of students' learning, it is confirmed that the learning environment is entertaining and inspiring. It also draws learners' attention more, improves the learning process, and raises grades. The teacher's evaluation of the use of video game quizzes also shows that students became more engaged in the material and task-based activities, and their language proficiency increased. To sum up, through game-based

learning, enjoyment, significance, facilitation, vitality, and life itself can be cited as the qualities and advantages of DGBLL among secondary school students.

Although there are many alternatives to distance learning activities, Quizziz was chosen due to its game features, ease of use, competition features, etc. The most effective results about the efficiency of this web 2.0 tool were obtained by gathering the opinions of secondary school students. The students played in-test games at their own time at home and at their own pace, having fun with the aim of language learning without having to adhere to a specific time frame and achieving success by adding them to their real test results. Additionally, it was noted that the effectiveness of the experimental group steadily grew in the mid-test and post-tests. Furthermore, it was revealed that the recollection of phrases in the control group declined gradually, indicating that it was difficult for the control group to remember the words. Upon evaluating this outcome, it was found that thanks to the DGBLL conducted on the experimental group students, the participants were able to recall the words and demonstrate their achievement even more clearly in the test results.

As a result of this research, the metaphorical perceptions of the students about the studies they carried out in their own time using DGBLL were changed. With the findings obtained, it was determined that the majority of the students had positive opinions on DGBLL. Additionally, this study included an evaluation of the process from a student's perspective, and similar studies could be conducted by considering students' opinions. This study focused on foreign language learning, but similar studies could be conducted in different fields.

It was also discovered that the participants were more motivated and had more fun by competing with other students interactively on the web tool through in-game reinforcements, and they stated that it felt as if they had brought a teacher home. However, a few participants argued that a foreign language cannot be learned solely through the use of words and that speaking practice should be used for language learning by hiring a private tutor. Therefore, it may be suggested to produce digital game-based foreign language learning web 2.0 tools that focus not only on vocabulary practice but also on speaking and other skills in the future. In order to acquire the results in a holistic approach, the triangulation method was used and it was presented in Fig. 4.

The Triangulation method involves using multiple methods or data sources to cross-validate findings in research (Howe, 2012). In this case, two different data sources were used to study the effectiveness of using Digital Game-Based Language Learning (DGBLL) on vocabulary retention and academic achievement. The first data source was a pre-interval and post-test study which revealed that the experimental group, who practiced vocabulary with DGBLL, remembered the words better than the control group. This suggests that DGBLL was more effective in helping the experimental group retain vocabulary. The second data source was an interview of students' metaphorical perception on DGBLL on vocabulary learning. The majority of participants had positive perceptions of DGBLL and reported that it helped them develop their vocabulary acquisition. They also stated that DGBLL was motivating and engaging, and it allowed them to learn independently and without

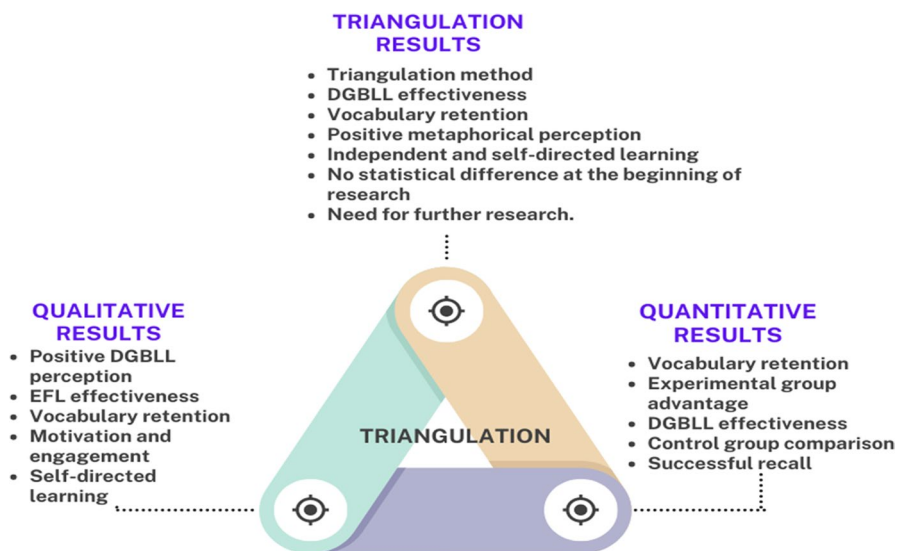


Fig. 4 Across-method triangulation results

fear of failure. Overall, the triangulation of these two data sources provides converging evidence for the effectiveness of DGBLL in vocabulary retention and academic achievement. As, there were no statistical differences between the control and experimental groups at the beginning of the research, future experiments should involve different groups that have no statistical difference at the beginning in order to more clearly determine the effectiveness of the intervention.

In light of the promising results of integrating digital games as a strategy for language learning, there is a need for further research in this area. While existing research has shown that digital games can be effective for promoting language learning, more research is needed to understand the potential benefits and limitations of this approach for different age groups of language learners. For instance, future research could investigate the effectiveness of digital games for promoting language learning in young children, teenagers, and adults. Moreover, research could be conducted to examine the extent to which digital games can be used to promote different language skills, such as listening, speaking, writing, and reading, across different age groups of language learners. In conclusion, while the existing research has provided valuable insights into the effectiveness of digital games as a language learning strategy, there is still much to be learned. By conducting further research on this topic, we can gain a better understanding of the potential benefits and limitations of using digital games in language learning for different age groups and language skills. This can ultimately contribute to the development of more effective and engaging language learning strategies that can help learners achieve their language learning goals.

Appendix 1

Table 3 The 25 words selected for the experiment

Honest	Tactful	Caring	Fair	Loyal
Determined	Supportive	Laid-Back	Arrogant	Stubborn
Unreliable	Mate	Count on	Accept	Refuse
Invitation	Reason	Apologize	Join/Attend	Sender
Receiver	Reunion	Busy	Visit	Forget

Appendix 2

Table 4 The vocabulary tests

Items' type	Instruction	Pre-test / Interval Test / Post-Test	
			Meaning
Closed-ended	Please write the meanings of these words.	1) Honest	1) _____
		2) Determined	2) _____
		3) Unreliable	3) _____
		4) Invitation	4) _____
		5) Receiver	5) _____
		6) Tactful	6) _____
		7) Supportive	7) _____
		8) Mate	8) _____
		9) Reason	9) _____
		10) Reunion	10) _____
		11) Caring	11) _____
		12) Laid-Back	12) _____
		13) Count on	13) _____
		14) Apologize	14) _____
		15) Busy	15) _____
		16) Fair	16) _____
		17) Arrogant	17) _____
		18) Accept	18) _____
		19) Join/Attend	19) _____
		20) Visit	20) _____
		21) Loyal	21) _____
		22) Stubborn	22) _____
		23) Refuse	23) _____
		24) Sender	24) _____
		25) Forget	25) _____

Data availability The datasets generated and/or analyzed during the current study are available at: <http://meb.ai/U4QgSy6>

Declarations

Conflict of interest Authors declare that they did not have any conflict of interest.

Ethics approval The study was approved by the university's Institutional Review Board, and informed consent forms were obtained from the participants and their parents.

References

- Aksu, H. H. (2021). Mathematics Teachers' Opinions on Distance Education Using the Educational Informatics Network (EBA). *Turkish Online Journal of Educational Technology-TOJET*, 20(2), 88–97.
- Alakurt, T., & Bardakci, S. (2017). Seeing google through the eyes of Turkish academicians. *Turkish Online Journal of Distance Education*, 18(3), 105–119. <https://doi.org/10.17718/tojde.328940>
- Alfalah, S. F. (2018). Perceptions toward adopting virtual reality as a teaching aid in information technology. *Education and Information Technologies*, 23(6), 2633–2653. <https://doi.org/10.1007/s10639-018-9734-2>
- Annamalai, N., Uthayakumaran, A., & Zyoud, S. H. (2022). High school teachers' perception of AR and VR in English language teaching and learning activities: A developing country perspective. *Education and Information Technologies*, 1–27. <https://doi.org/10.1007/s10639-022-11275-2>
- Basuki, Y., & Hidayati, Y. (2019). Kahoot! or Quizizz: The students' perspectives. In: *Proceedings of the 3rd English*
- Belda-Medina, J., & Calvo-Ferrer, J. R. (2022). Using chatbots as ai conversational partners in language learning. *Applied Sciences*, 12(17), 8427. <https://doi.org/10.3390/app12178427>
- Blau, I., & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. *Education and Information Technologies*, 22(3), 769–787. <https://doi.org/10.1007/s10639-015-9456-7>
- Boyd, C. O. (2000). Combining qualitative and quantitative approaches. In P. L. Munhall & C. O. Boyd (Eds.), *Nursing research: A qualitative perspective* (2nd ed., pp. 454–475). Jones & Bartlett.
- Cai, Y., & Zhao, T. (2021). Performance analysis of distance teaching classroom based on machine learning and virtual reality. *Journal of Intelligent & Fuzzy Systems*, 40(2), 2157–2167. <https://doi.org/10.3233/JIFS-189215>
- Casañ-Pitarch, R. (2017). Gamifying content and language integrated learning with serious video-games. *Journal of Language and Education*, 3(3), 107–114. <https://doi.org/10.17323/2411-7390-2017-3-3-107-114>
- Cheng, C., & Su, C. (2011). A Game-based learning system for improving student's learning effectiveness in system analysis course. *Procedia-Social and Behavioral Sciences*, 31, 669–675. <https://doi.org/10.1016/j.sbspro.2011.12.122>
- Cheng, S., Hwang, G., & Lai, C. (2019). Effects of the group leadership promotion approach on students' higher-order thinking awareness and online interactive behavioral patterns in a blended learning environment. *Interactive Learning Environments*, 28(2), 246–263. <https://doi.org/10.1080/10494820.2019.1636075>
- Chik, A. (2019). *Motivation and informal language learning*. In: *The handbook of informal language learning*. 13–26. Wiley Online Library.
- Chun, D., Kern, R., & Smith, B. (2016). Technology in language use, language teaching, and language learning. *The Modern Language Journal*, 100(1), 64–80. <https://doi.org/10.1111/modl.12302>
- Costuchen, A. L., Darling, S., & Uytman, C. (2021). Augmented reality and visuospatial bootstrapping for second-language vocabulary recall. *Innovation in Language Learning and Teaching*, 15(4), 352–363. <https://doi.org/10.1080/17501229.2020.1806848>
- De Freitas, S. I. (2006). Using games and simulations for supporting learning. *Learning, Media and Technology*, 31(4), 343–358. <https://doi.org/10.1080/17439880601021967>

- Degirmenci, R. (2021). The Use of Quizizz in Language Learning and Teaching from the Teachers' and Students' Perspectives: A Literature Review. *Language Education and Technology*, 1(1), 1–11.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining gamification. *Proceedings of the 15th International Academic MindTrek Conference Envisioning Future Media Environments, Finland*, 11(1), 9–15.
- Dickey, M. (2007). Game design and learning: A conjectural analysis of how massively multiple online role-playing games (MMORPGs) foster intrinsic motivation. *Educational Technology Research and Development*, 55(3), 253–273. <https://doi.org/10.1007/s11423-006-9004-7>
- Ekici, M. (2021). A systematic review of the use of gamification in flipped learning. *Education and Information Technologies*, 26(3), 3327–3346. <https://doi.org/10.1007/s10639-020-10394-y>
- Fang, M., Tapalova, O., Zhiyenbayeva, & Kozlovskaya, S. (2022). Impact of digital game-based learning on the social competence and behavior of preschoolers. *Education and Information Technologies*, 27, 3065–3078. <https://doi.org/10.1007/s10639-021-10737-3>
- Fithriani, R. (2021). The Utilization of mobile-assisted gamification for vocabulary learning: Its efficacy and perceived benefits. *Computer Assisted Language Learning Electronic Journal (CALL-EJ)*, 22(3), 146–163.
- Gatti, L., & Catalano, T. (2015). The business of learning to teach: A critical metaphors analysis of one teachers' journey. *Teaching and Teacher Education*, 45(1), 149–160. <https://doi.org/10.1016/j.tate.2014.10.003>
- Govender, T., & Arnedo-Moreno, J. (2021). An analysis of game design elements used in digital game-based language learning. *Sustainability*, 13(12), 6679. <https://doi.org/10.3390/su13126679>
- Grund, S., Lütke, O., & Robitzsch, A. (2016). Pooling ANOVA results from multiply imputed datasets: A simulation study. *Methodology: European Journal of Research Methods for the Behavioral and Social Sciences*, 12(3), 75–88. <https://doi.org/10.1027/1614-2241/a000111>
- Ho, J. C. S., Hung, Y. S., & Kwan, L. Y. Y. (2021). The impact of peer competition and collaboration on gamified learning performance in educational settings: A Meta-analytical study. *Education and Information Technologies*, 27, 1–34. <https://doi.org/10.1007/s10639-021-10770-2>
- Hockly, N. (2015). Developments in online language learning. *ELT Journal*, 69(3), 308–314. <https://doi.org/10.1093/elt/ccv020>
- Hooshyar, D., Ahmad, R. B., Yousefi, M., Fathi, M., Horng, S. J., & Lim, H. (2016). Applying an online game-based formative assessment in a flowchart-based intelligent tutoring system for improving problem-solving skills. *Computers & Education*, 94, 18–36. <https://doi.org/10.1016/j.compedu.2015.10.013>
- Howe, K. R. (2012). Mixed methods, triangulation, and causal explanation. *Journal of Mixed Methods Research*, 6(2), 89–96. <https://doi.org/10.1177/1558689812437187>
- Huizenga, J. C., Ten Dam, G. M., Voogt, J. M., & Admiraal, W. F. (2017). Teacher perceptions of the value of game-based learning in secondary education. *Computers & Education*, 110, 105–115. <https://doi.org/10.1016/j.compedu.2017.03.008>
- Hung, H. T., Yang, J. C., Hwang, G. J., Chu, H. C., & Wang, C. C. (2018). A scoping review of research on digital game-based language learning. *Computers & Education*, 126, 89–104. <https://doi.org/10.1016/j.compedu.2018.07.001>
- Hung H., J., & Chang H. (2016). A review of trends in digital game-based language learning research. 2016 IEEE 16th International Conference on Advanced Learning Technologies (ICALT), USA, 508–512.
- Jakimovski, D., Zivadinov, R., Vaughn, C. B., Ozel, O., & Weinstock-Guttman, B. (2021). Clinical effects associated with five-year retinal nerve fiber layer thinning in multiple sclerosis. *Journal of the Neurological Sciences*, 427, 117552. <https://doi.org/10.1016/j.jns.2021.117552>
- Jia, J., & Chen, Z. (2020). Voluntary participation and natural grouping with smartphones: An effective and practical approach to implement a quasi-experiment. *International Journal of Mobile Learning and Organisation*, 14(1), 49–62. <https://doi.org/10.1504/IJMLO.2020.103935>
- Jonassen, D., Davidson, M., Collins, M., Campbell, J., & Haag, B. (1995). Constructivism and computer-mediated communication in distance education. *American Journal of Distance Education*, 9(2), 7–26. <https://doi.org/10.1080/08923649509526885>
- Kazu, İY., Bahçeci, F., & Yalçın, C. K. (2021). The Metaphorical Perceptions of Teachers on the Distance Education at Schools during the Coronavirus Pandemic. *Journal of Social Sciences*, 31(2), 702–715. <https://doi.org/10.18069/firsbed.814015>

- Kazu, İ.Y., Kazu, H., & Kuvvetli, M. (2022). Evaluation of studies on language skill areas of digital game-based foreign language learning. *Social Science Development Journal*, 7(29), 117–127. <https://doi.org/10.31567/ssd.546>
- Khodabandeh, F. (2022). Exploring the applicability of virtual reality-enhanced education on extrovert and introvert EFL learners' paragraph writing. *International Journal of Educational Technology in Higher Education*, 19(1), 1–21. <https://doi.org/10.1186/s41239-022-00334-w>
- Kiili, K. (2005). Digital game-based learning: Towards an experiential gaming model. *The Internet, and Higher Education*, 8(1), 13–24. <https://doi.org/10.1016/j.iheduc.2004.12.001>
- Kondratiuk, L., Musiichuk, S., Zuienko, N., Sobkov, Y., Trebyk, O., & Yefimov, D. (2022). Distance learning of foreign languages through virtual reality. *BRAIN Broad Research in Artificial Intelligence and Neuroscience*, 19(1), 1–21. <https://doi.org/10.18662/brain/13.2/329>
- Lakoff, G., & Johnson, M. (2008). *Metaphors we live by*. The University of Chicago Press.
- Lee, J. (2020). Problem-based gaming via an augmented reality mobile game and a printed game in foreign language education. *Education and Information Technologies*, 26(3), 3027–3031. <https://doi.org/10.1007/s10639-020-10391-1>
- Li, K., Peterson, M., & Wan, J. (2022). Digital gaming in the language classroom: Student language performance, engagement, and perception. *International Journal of Computer-Assisted Language Learning and Teaching (IJCALLT)*, 12(1), 1–25. <https://doi.org/10.4018/IJCALLT.291110>
- Li, R. (2022). Effects of mobile-assisted language learning on EFL/ESL reading comprehension. *Educational Technology & Society*, 25(3), 15–29. <https://www.jstor.org/stable/48673721>
- Lidia, A.-C., Julio, R.-T., Petra, D., & Rafael, P.-J. (2018). How to encourage recycling behaviour? The case of wasteapp: A gamified mobile application. *Sustainability*, 10(5), 1544. <https://doi.org/10.3390/su10051544>
- Liu, Z. Y., Spitsyna, N., Zubanova, S., & Vekilova, A. (2020). Using internet resources for remote language learning. *International Journal of Emerging Technologies in Learning (iJET)*, 15(13), 22–33. <https://doi.org/10.3991/ijet.v15i13.14653>
- Margarida, R., Veloso, A., Papastergiou, M., & Kordaki, M. (2010). Design of a computer game for an information technology class. *Proceedings of Videojogos*, 51–60. Lisboa: Universidade Técnica de Lisboa.
- Mellati, M., Khademi, M., & Abolhassani, M. (2018). Creative interaction in social networks: Multi-synchronous language learning environments. *Education and Information Technologies*, 23, 2053–2071. <https://doi.org/10.1007/s10639-018-9703-9>
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, California.
- Mulenga, E. M., & Marbán, J. M. (2020). Is COVID-19 the gateway for digital learning in mathematics education? *Contemporary Educational Technology*, 12(2), 269. <https://doi.org/10.30935/cedtech/7949>
- Peterson, M. (2013). *Computer games and language learning: Theoretical rationales*. In *Computer Games and Language Learning*. New York.
- Peterson, M. (2016). The use of massively multiplayer online roleplaying games in CALL: An analysis of research. *Computer Assisted Language Learning*, 29(7), 85–100. <https://doi.org/10.1080/09588221.2016.1197949>
- Pitarch, R. (2018). An approach to digital game-based learning: video-games principles and applications in foreign language learning. *Journal of Language Teaching and Research*, 9(6), 1147–1159. <https://doi.org/10.17507/jltr.0906.04>
- Pitura, J., & Pacut, E. T. (2018). Action research on the application of technology-assisted urban gaming in language education in a Polish upper-secondary school. *Computer Assisted Language Learning*, 31(7), 734–763. <https://doi.org/10.1080/09588221.2018.1447490>
- Prensky, M. (2009). Digital natives, digital immigrants Part 1. *On the Horizon*, 9(5), 1–6.
- Quizziz. (2022). Quizziz web Page “Reports” Screen. Restrictedly retrieved February, 17, 2022, from <https://quizziz.com/admin/reports>
- Ranieri, M., Rosa, A., & Manca, S. (2016). *Unlocking the potential of social media for participation, content creation and e-engagement* (pp. 223–248). Charlotte, NC, USA: IAP.
- Reinders, H. (2012). *Digital Games in Language Learning and Teaching*, (H. Reinders Ed.). Palgrave Macmillan: London.
- Schneider, S. L., & Council, M. L. (2021). Distance learning in the era of COVID-19. *Archives of Dermatological Research*, 313(5), 389–390. <https://doi.org/10.1007/s00403-020-02088-9>

- Sirotová, M., Michvocíková, V., & Rubacha, K. (2021). Quasi-experiment in the educational reality. *Journal of Education Culture and Society*, 12(1), 189–201. <https://doi.org/10.15503/jecs2021.1.189.201>
- Stockwell, G. (Ed.). (2012). *Computer-assisted language learning: Diversity in research and practice*. Cambridge University Press.
- Sun, P., Lu, X., Xu, C., Sun, W., & Pan, B. (2020). Understanding of COVID-19 based on current evidence. *Journal of Medical Virology*, 92(6), 548–551. <https://doi.org/10.1002/jmv.25722>
- Tao, Y., & Zou, B. (2021). Students' perceptions of the use of Kahoot! in English as a foreign language classroom learning context. *Computer Assisted Language Learning*, 1–20. <https://doi.org/10.1080/09588221.2021.2011323>
- Taskaya, S. M. (2021). Teacher Candidates' Evaluation of the Emergency Remote Teaching Practices in Turkey during COVID-19 Pandemic. *International Journal of Progressive Education*, 17(4), 63–78. <https://doi.org/10.29329/ijpe.2021.366.5>
- Thurmond, V. A. (2001). The point of triangulation. *Journal of Nursing Scholarship*, 33(3), 253–258. <https://doi.org/10.1111/j.1547-5069.2001.00253.x>
- Toraman, Ç., Çelik, Ö. C., & Çakmak, M. (2018). The effect of game-based learning environments on academic achievement: a meta-analysis study. *Kastamonu Education Journal*, 26(6), 1803–1811. <https://doi.org/10.24106/kefdergi.2074>
- Warschauer, M., & Healey, D. (1998). Computers and language learning: An overview. *Language Teaching*, 31(2), 57–71. <https://doi.org/10.1017/S0261444800012970>
- Wenming, Z., & Zhang, Z. (2017). On China's English teaching reform: From micro-lesson and MOOCs to flipped class. *International Journal of Emerging Technologies in Learning*, 13(1), 220–230. <https://doi.org/10.3991/ijet.v13i01.7465>
- Wu, B. (2021). Influence of MOOC learners' discussion forum social interactions on online reviews of MOOC. *Education and Information Technologies*, 26, 3483–3496. <https://doi.org/10.1007/s10639-020-10412-z>
- Xu, Z., Chen, Z., Eutsler, L., & Geng, Z. (2020). Scoping review of digital game-based technology on English language learning. *Educational Technology Research and Development*, 68(1), 877–904. <https://doi.org/10.1007/s11423-019-09702-2>
- Yang, S., & Chen, Y. (2007). Technology-enhanced language learning: A case study. *Computers in Human Behavior*, 23(1), 860–879. <https://doi.org/10.1016/j.chb.2006.02.015>
- Yang, K. H., Jiang, Z. X., Chavez, F., Wang, L. H., & Yuan, C. R. (2019). Effectiveness of a training program based on maker education for baccalaureate nursing students: A quasi-experimental study. *International Journal of Nursing Sciences*, 6(1), 24–30. <https://doi.org/10.1016/j.ijnss.2018.11.006>
- Zahariadis, T., & Voliotis, S. (2003). New trends in distance learning utilizing next generation multimedia networks. *Education and Information Technologies*, 8, 67–68. <https://doi.org/10.1023/A:1023930426132>
- Zhang, Q., & Yu, Z. (2021). A literature review on the influence of Kahoot! On learning outcomes, interaction, and collaboration. *Education and Information Technologies*, 26(4), 4507–4535. <https://doi.org/10.1007/s10639-021-10459-6>
- Zhang, J., Cogan, L. S., & Schmidt, W. H. (2020). Measuring textbook content coverage: Efficient content analysis with lesson sampling. *Educational Measurement: Issues and Practice*, 39(2), 74–84. <https://doi.org/10.1111/emip.12300>
- Zheng, D., Young, M. F., Wagner, M. M., & Brewer, R. A. (2009). Negotiation for action: English language learning in game-based virtual worlds. *The Modern Language Journal*, 93(4), 489–511. <https://doi.org/10.1111/j.1540-4781.2009.00927.x>
- Zou, D., Huang, Y., & Xie, H. (2021). Digital game-based vocabulary learning: Where are we and where are we going? *Computer Assisted Language Learning*, 34(5–6), 751–777. <https://doi.org/10.1080/09588221.2019.1640745>

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