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DIGITAL GAME-BASED LEARNING FOR GRAMMAR IN EFL CONTEXTS: A SYSTEMATIC REVIEW

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ABSTRACT

There is a need for foreign language learners to use efficient grammar learning techniques, considering the importance of grammar knowledge for learning English. Game-based language learning, particularly in grammar, has gained attention from learners, educators, practitioners, and academics due to technological advancements and its significant potential. Searching WOS, ERIC, and Scopus employing the predetermined Boolean search string, this systematic review examines the utilization of digital game-based learning in teaching and learning grammar in EFL contexts. To guarantee a systematic, transparent, and meticulous selection and analysis of pertinent literature, this study implemented the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. For this systematic review, 24 publications dating from 2010 through 2022 were analysed to highlight the foci of this field of research. In the study, Zotero was employed to eliminate duplicate articles, Rayyan facilitated the screening and selection process, and MaxQDA was used for coding the selected studies. The results indicated that quantitative methods were more commonly used than mixed and qualitative. The detailed analysis showed that the studies employed various digital game-based tools, with Kahoot! being used frequently and incorporating gamification elements, particularly feedback and competition. The analysis of cognitive, affective, and behavioural outcomes suggested that digital tools positively affect learners' achievements and performance, increase motivation and satisfaction, and significantly improve engagement in digital game-based grammar learning and teaching.

Keywords: Digital game-based learning, Gamification, Grammar, L2, Language learning.

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YABANCI DİL OLARAK İNGİLİZCE BAĞLAMINDA DİLBİLGİSİ İÇİN DİJİTAL OYUN TABANLI ÖĞRENME: SİSTEMATİK BİR İNCELEME

Hanife ÖZTÜRK-TAŞ[1], Neslihan KELEŞ[2], Elif AYDIN-YAZICI[3]

ÖZ

Yabancı dil öğrenenlerin, İngilizce öğreniminde dilbilgisinin önemi göz önüne alındığında etkili teknikler kullanması gerekmektedir. Özellikle dilbilgisi alanında oyun tabanlı dil öğrenimi, teknolojik gelişmeler ve potansiyeli sayesinde öğrenenlerin, eğitimcilerin, uygulayıcıların ve akademisyenlerin dikkatini çekmiştir. Bu sistematik incelemede, belirlenen Boolean arama dizgesi kullanılarak WOS, ERIC ve Scopus'ta yapılan araştırmalar sonucunda, İngilizceyi yabancı dil olarak öğrenenler bağlamında dijital oyun tabanlı öğrenimin dilbilgisi öğretiminde ve öğreniminde kullanımı incelenmiştir. Bu çalışma, ilgili literatürün sistematik, şeffaf ve titiz bir şekilde seçilmesi ve analiz edilmesini sağlamak üzere PRISMA 2020 (Sistematik İncelemeler ve Meta-Analizler için Tercih Edilen Raporlama Unsurları) çerçevesini uygulamıştır. Bu sistematik inceleme alanının odak noktalarını vurgulamak amacıyla 2010-2022 yılları arasında yayınlanan 24 çalışma analiz edilmiştir. Çalışmada, Zotero mükerrer makaleleri elemek için kullanılmış, Rayyan tarama ve seçim sürecini kolaylaştırmış ve MaxQDA seçilen çalışmaların kodlanma sürecinde kullanılmıştır. Sonuçlar, nicel yöntemlerin karma ve nitel yöntemlere göre daha yaygın olarak kullanıldığını göstermiştir. Ayrıntılı analiz, çalışmaların çeşitli dijital oyun tabanlı araçlar kullandığını ve özellikle geri bildirim ve rekabet gibi oyunlaştırma unsurlarını içerdiğini ortaya koymuştur; en sık kullanılan araçlardan biri ise Kahoot!'tur. Bilişsel, duyuşsal ve davranışsal sonuçların analizi, dijital araçların öğrenenlerin başarılarını ve performanslarını olumlu yönde etkilediğini, motivasyon ve memnuniyeti artırdığını ve dijital oyun tabanlı dilbilgisi öğreniminde katılımı büyük ölçüde artırdığını göstermektedir.

Anahtar Kelimeler: Dijital oyun tabanlı öğrenme, Oyunlaştırma, Dilbilgisi, İkinci dil, Dil öğrenimi.

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1. INTRODUCTION

By virtue of the expanding influence of digitalization on educational contexts, the use of information and communication technologies (ICT) has surged, with a particular interest in game-based technologies and mobile applications like Duolingo, Kahoot!, and Quizizz. The integration of various teaching and learning objectives has gained more attention in scientific research fields. It is vital to highlight that the term educational games refers to digital games that have been employed in instructional settings. Educational games are used as a teaching and learning tool in several disciplines, including math, science, history, and language learning (Zin et al., 2009). As stated by Savaş et al. (2021), digital games, especially those used for educational purposes, contain elements such as graphics, sound, animation, video, 3D objects, and augmented reality, so they not only contribute to visual and auditory learning, but also contribute to the interaction, digital feedback, and decision-making mechanisms. The researchers also emphasized that with the help of these properties, they put learners at the centre of the learning process. Similarly, Koparan (2021) indicated that in digital game-based learning environments, there is more than just fun and games; they significantly facilitate learning. By their nature, digital games can also help learners develop productive challenges. The perspectives and lifestyles of today's learners are influenced by rapidly advancing technology (Usta & Güntepe, 2019), making it difficult for them to envision a world without computers, the Internet, and video games (Prensky, 2001). The attitude that today's learners have towards their video and computer games is the complete opposite of how they generally perceive school. Yet, this is precisely the attitude we hope our learners will adopt: "engaged, competitive, cooperative, results-oriented, and actively seeking information and solutions" (Prensky, 2003, p. 1). Digital educational games are found to be compelling because they combine entertaining features with a visually pleasing environment, including high-quality graphics, effects, and music. Additionally, these games offer a structured framework, clear learning goals often framed as problems to solve, and a gaming aspect that significantly enhances learner involvement (Prensky, 2007). In a digital game environment, the learner experiences idea generation, research, examination, observation, participation, and experimentation as an active part of the process, and one of the most significant features is that the learning can be shaped by the learner. All in all, considering the tendency of the new generation to act independently and make their own decisions, this will also be a factor that encourages the learner to create an interest in the learning process (Savaş et al., 2021).

In this new digital area, it can be claimed that language learning appears to be one of the most prominent areas of focus. In the review study of Chen et al. (2021), who examined an analysis of topic modelling over 25 years in computer-assisted language learning, they noticed that mobile-assisted language learning (hereafter MALL), virtual reality, virtual world, wiki-based learning, and seamless learning are some of the subjects that are attracting more and more attention in the scientific community. Furthermore, the growth of mobile technology, video games, and virtual worlds all support ongoing studies. The review study concluded by demonstrating how academics and teachers combine various technologies, including the combined utilization of glosses/annotations and mobile technology for vocabulary development, and their implementation into a variety of contexts (Chen et al., 2021). Numerous studies have also been conducted to demonstrate how digital games affect learners' language learning outcomes. It is important to highlight that gamification is the utilization of game components outside of a game environment (Al-Dosakee & Ozdamli, 2021).

Gamification, or DGBL in both ESL and EFL contexts, has also been integrated into the learning and teaching of grammar. The incorporation of gamification in EFL grammar learning offers a joyful learning and teaching environment because grammar learning and teaching in EFL settings are seen as uninteresting and yet founded in the memorization of grammatical rules (Ardi & Rianita, 2022). A study carried out by Gülin and Arda (2011) examines the perspectives of Turkish EFL teachers in primary schools regarding the effectiveness of incorporating games in grammar instruction for learners. The findings of the study revealed that games are obviously beneficial in teaching and practising grammar, according to English teachers. Games make grammar learning entertaining and memorable through "meaningful context for practising grammar communicatively" (p. 227). Similarly, the results of the study of Zarzycka-Piskorz (2016) illustrated that games are entertaining, so most learners acknowledged that they wanted to see more games in their lectures. Language learning games can be incorporated to add diversity, break up repetition, make more engaging lessons, and motivate learners to study. It encourages learners both externally and internally. External motivators like rewards, points, and levels are present in the games, but a significant part of the game experience focuses on intrinsic motivation. Although the potential of digital gamification for student learning from several perspectives has been known, its long-term effectiveness in education remains subject to debate. As indicated by Asmolov and Ledentsov (2023), the long-term impact of gamification on social life and learning patterns is a cause for concern, as it can result in manipulation, addiction, and unhealthy behaviours when used improperly or unethically. Therefore, gamified learning needs to be implemented ethically and responsibly to maximize positive aspects and minimize potential problems. A systematic mapping study regarding the dark side of gamification indicated that indifference, loss of performance, undesired behaviours, and declining effects are the negative effects of gamification in education (Toda et al., 2018).

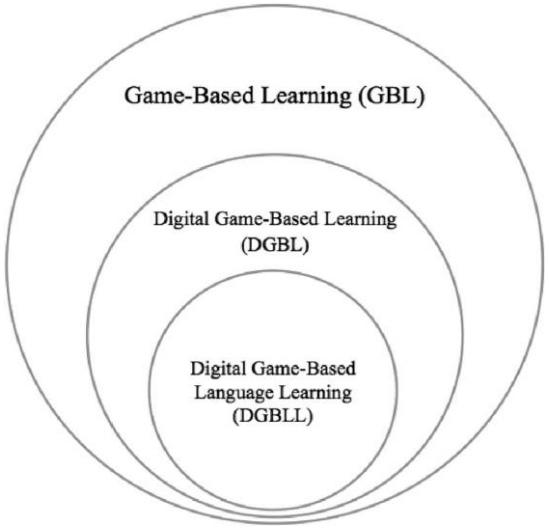
Besides, tiredness from technology was mentioned in the literature (Navarro-Espinosa et al., 2022). However, it was revealed that gamification increases student's intrinsic motivation to read and has long-term impacts. Gamified apps' long-term advantages depend on their constant use and lasting impacts. Systematic design and multiple facets determine gamification pedagogy effectiveness (Li et al., 2024).

As seen in the literature, like other methods of instruction, even though educational games have many positive impacts on the language learning process, the effective implementation of digital game-based language learning in EFL environments seems to have been somewhat troublesome due to several issues and obstacles. For instance, educational games may not be appealing to all students, and they might not be able to study because the gaming might distract them from what they are supposed to be learning (Ke, 2008). Hawlitschek and Joeckel (2017) have asserted in their study that incorporating instructional features that promote suitable cognitive processing is a primary issue with educational game design. Also, there are several technical and preparedness obstacles. Obstacles include inadequate access to digital devices or the lack of financial resources, internet connection problems, the lack of availability of suitable educational digital games, instructors' lack of knowledge about digital game-based language learning, students' lack of digital literacy, institutional ICT readiness, and large classes (Belda-Medina & Calvo-Ferrer, 2022; Dashtestani, 2022; Kaimara et al., 2021; Poshitha, 2023). As mostly suggested, the effective implementation of digital game-based language learning can be optimized by augmented instructor training and professional development (Belda-Medina & Calvo-Ferrer, 2022; Blume, 2020; Ragni et al., 2023).

It is essential to know the relationship between game-based learning (hereafter GBL), digital game-based learning (hereafter DGBL), and digital game-based language learning (hereafter DGBLL). For this reason, Hung et al. (2018) formed a figure to show an overarching and interwoven relation among them in their study. GBL is broad in scope, and it covers a diverse array of subjects such as general learning contexts or learning any subject in any context employing the game regardless of physical or digital usage of the games in an educational environment. With the advancement of technology, DGBL has appeared, and it also encompasses various learning environments, such as math learning, history learning, language learning, etc., by using digital games in an educational environment. The core or narrowest one is DGBLL. This comprises utilizing digital games to learn a new language, such as English, French, and Spanish as a second or foreign language, considering various sub-categories of these learning contexts. Therefore, the following figure (Figure 1) is noteworthy in illustrating the relationship between the focus of the current systematic review and the larger DGBL and GBL research areas.

Figure 1

DGBLL and its Relations to Other Research Contexts (Hung et al., 2018)



2. LITERATURE REVIEW

Several systematic reviews have been undertaken in various contexts related to the utilization of digital games for L2 learning, and they frequently differ in their analytical procedures along with the foci of the review. The review of pertinent recent literature showed three kinds of tendencies of published review studies. The first kind of them is the general review studies on language learning, such as second or foreign language learning gamification using virtual reality carried out by Pinto et al. (2021), employing gamification to aid in learning English as a second language (hereafter ESL) carried out by Dehghanzadeh et al. (2021), incorporating gamification in language teaching and learning carried out by Al-Dosakee and Ozdamli (2021). Another one is MALL review studies on

language learning, such as an analysis comparing games for language learning mobile versus non-mobile games for language learning carried out by Su et al. (2021) and MALL and gamification-based language learning carried out by Ishaq et al. (2021). Another review study carried out by Zou et al. (2021) involves skill-based studies on L2 learning as digital game-based vocabulary learning.

Based on 32 articles with no year restriction, Pinto et al. (2021) systematically reviewed the literature by attempting to determine whether using gaming strategies in virtual reality (VR) is advantageous for learning a second or foreign language. The findings indicate that a significant number of studies confirmed the effectiveness of using VR technologies and gaming techniques regarding foreign language learning. Furthermore, the researchers revealed that among the studies chosen, 'learning' was the dependent variable that was most evaluated, that augmented reality was the most widely used technology, that primary education and lower secondary education were the school levels that had received the most investigations, and that English was by far the most frequently used language to assess the usage of game-based technology. It is advised that these tools be utilised as a supplement rather than completely replace conventional methods for learning a second language due to the lack of focused research on this issue. In another study, a systematic review of 22 studies conducted between 2008 and 2019 by searching a synopsis of the state of the art on incorporating games in digital settings for learning ESL, Dehghanzadeh et al. (2021) found that even though the chosen studies showed that gamification enhanced both the learning outcomes and the learning experiences of learners positively, no studies identified the precise gamification components that were responsible for these effects. Additionally, positive learning outcomes of gamified learning ESL context involved enjoyment, engagement, motivation, and fun, as well as the learning outcomes of gamified learning ESL were content language learning, engagement, motivation, and satisfaction. A systematic review study which covers 103 publications in the years between 2010 and 2020 by Al-Dosakee and Ozdamli (2021) aimed at showing how gamification can be used to teach and learn new languages, as well as the current trends and initiatives. They reported that gamification can serve as a significant technique for learning and teaching languages since it can enhance the learners' motivation and make learning enjoyable. Gamification can also be seen as an additional incentive for the teaching process.

As aforementioned, there have been review studies on MALL that consider language learning. Focusing on the differences between mobile and non-mobile games about effectiveness, in their analysis of 64 prior studies published between 2000 and 2020, Su et al. (2021) evaluated four components: game types and their elements, target languages, and learning outcomes. They reached four main results from the data. The first one was that gamification, immersive, and simulation games were the most frequently utilized ones. The second one was that all games had game elements such as goals or rules. The third one was that English and Chinese emerged as the most frequently examined target languages, and the last one was that psychological/affective state and language acquisition were the most commonly discussed learning outcomes. It is important to note that the overwhelming number of studies of mobile and non-mobile game-based language learning research on language acquisition focused on mixed/integrated L2 learning (n = 23, 36%) and vocabulary learning (n = 24, 37.5%). In contrast, only one study has specifically addressed grammar learning in the context of mobile game-based language learning. This study by Reynolds and Kao (2021) investigates the impact of direct, focused written corrective feedback, teacher instruction, and digital game-based instruction on English article grammatical accuracy. Another study focusing on mobile-assisted and gamification-based language learning was conducted by Ishaq et al. (2021). Up to 60 pertinent investigations that have been published in reputable journals were chosen to evaluate them. They found that by utilizing a variety of theories, frameworks, and advanced tools, experts created a wide range of straightforward and gamified mobile applications for learning languages, as determined by the in-depth investigation. It was noticed that the majority of the applications and games created by researchers for language learning focused on vocabulary and English language learning, whereas fewer applications and games were developed for tenses (Önal et al., 2019), grammar (Chu et al., 2019; Ramadoss & Wang, 2012), and spellings (Tshering et al., 2018). This finding is in line with the study results of Su et al. (2021) to some extent. Additionally, their study also examined the evaluation and testing of several applications at various educational levels utilizing various experimental situations and a range of evaluation metrics, and they revealed that 33 out of 67 research used or created a questionnaire to get information from the chosen demographic while only six studies employed interviews and observations as part of their research. Furthermore, only five research employed discussion and other methods for data gathering, whereas 18 studies employed the mixed method approach, where questionnaires, interviews, and observations were employed as tools for data collection.

Focusing on the skill-based studies on language learning, for their systematic review study, 21 articles from SSCI journals were chosen based on particular criteria by Zou et al. (2021). Their study evaluated research on vocabulary acquisition through digital games from five angles: an overview of existing studies, vocabulary learning through digital games, theoretical frameworks, research issues and results, and study implications. The study's findings showed that 10 distinct kinds of digital games, including gamified digital books, tutorials, simulations, serious games, board, 3D virtual, role-playing, motion-sensing, adventure, and card- led the field. The results demonstrated the beneficial impacts of the games in enhancing both long-term and short-term vocabulary learning.

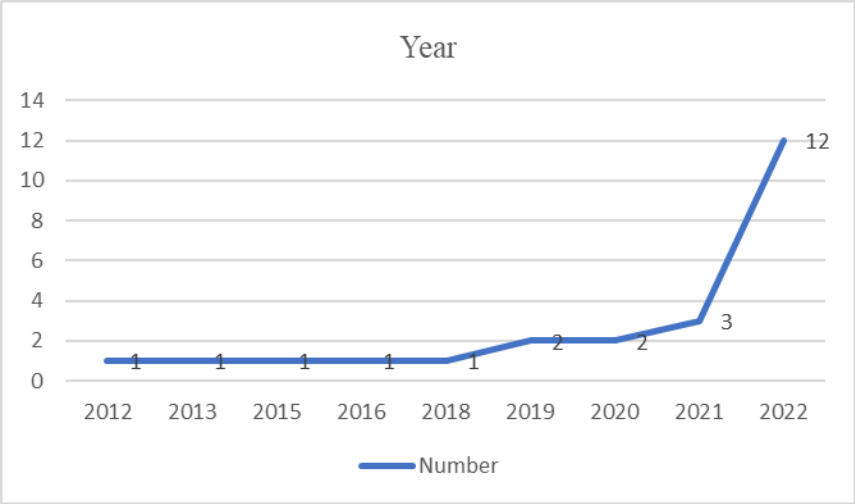
Besides this, digital games were also discovered to be helpful for pronunciation development, reading and listening comprehension, and vocabulary acquisition. Learners who learned vocabulary through games were also perceived to have a higher level of motivation, better engagement, and more interactions, but less stress level. Overall, based on those review studies, the implementation of DGBLL across various contexts proves beneficial for language learners.

2.1. Research Aim and Research Questions

This systematic review aims to investigate research to offer an in-depth analysis of gamification for grammar learning in an EFL context. It is crucial to highlight that the terms 'gamification' and 'game-based learning' were used interchangeably in the current systematic review study. This review study aims to fill the gap in the literature because there has not been a current systematic review study covering the years 2010 to 2022 on gamification of grammar learning in an EFL context. Since educational contexts have predominantly employed gamification since 2008 (Jakubowski, 2014), this systematic review limited its search timeframe from 2010 to 2022 to encompass the most relevant and recent research in the field. Table 1 shows the distribution of articles included in this systematic review, which reveals a significant increase in the number of publications over the years, with a sharp increase in 2022, reaching 12 articles. This trend suggests a growing interest in digital game-based grammar learning (hereafter DGGL) in EFL contexts in recent years.

Table 1

The Distribution of Articles Across Year



As aforementioned, there are several systematic review studies based on DGBLL regarding the general overview and synthesis of ESL and EFL learning, as well as a couple of skill-based review studies such as vocabulary learning. However, based on our current knowledge, there is no systematic review study focusing on digital games that consider grammar learning. A crucial aspect of any language is its grammar, so the learner's knowledge of grammar is vital for learning a foreign language. Accordingly, the purpose of the current study is to review pertinent DGGL literature in the EFL context and provide answers to the following questions:

1) What research methods are employed in the selected studies and at which educational levels is gamification most frequently implemented for grammar learning?
2) Which digital games have been commonly used to facilitate grammar learning?
3) What are the language learning outcomes of employing digital tools in teaching grammar to learners?

3. METHODOLOGY

3.1. Research Design/Model

The framework of this study was structured based on PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page et al., 2021). The PRISMA framework is used to ensure a transparent and systematic selection of studies in research. PRISMA offers a systematic approach for identifying, screening, and including pertinent studies, thus decreasing potential bias and boosting repeatability (Page et al., 2021). The selection procedure was represented using a PRISMA flowchart, outlining the number of studies

retrieved, screened, excluded, and included. This strategy offers a meticulous and standardized approach to evidence synthesis in systematic reviews (Moher et al., 2009). Therefore, it was employed in this study to boost the reliability of the review process and ensure comprehensive and systematic reporting of the selected literature.

3.2. Data Collection

The articles in three major databases, including Web of Science, The Education Resources Information Center (ERIC), and Scopus, were systematically reviewed. The selected databases are the most representative multidisciplinary data sources for the domain of this systematic review. ERIC is the largest and the most widely used education database (ProQuest, 2023), while Web of Science and Scopus are accepted as the most comprehensive bibliographic databases for various purposes in today's academic world (Zhu & Liu, 2020). In addition, databases such as WoS, ERIC, and Scopus support precise Boolean searching (Gusenbauer & Haddaway, 2020).

The following Boolean search string is used in selected databases without any modification to ensure the scope validity of the search. Considering the aim of the current review study, three sets of keywords were formed: (1) the abbreviated term gam* covering keywords related to games, such as game, gamification, gamified; and (2) keywords related to language, such as foreign language; as well as (3) skill-based keywords, such as grammar and grammatical. In November 2022, the search string below was employed to query the selected databases for retrieving pertinent articles:

("*game*" OR "*gamification*" OR "*gamified*" OR "*game-based*" OR "*digital game*") AND ("*grammar*" OR "*grammatical*") AND ("*foreign language*" OR "*FL*" OR "*EFL*")

The initial search was conducted by focusing on full-text and open-access research publications published mostly in peer-reviewed journals that were indexed in three identified databases. Following that, the search was limited to fields such as language, linguistics, education, foreign language, computer science, etc. The articles were removed based on filters such as publication date, document type, and publication language after being filtered considering the research areas. Then, the abstracts or full texts of the remaining publications were evaluated according to the eligibility criteria listed in Table 2. Seven inclusion and exclusion criteria were constructed to include DGBLL articles in this review.

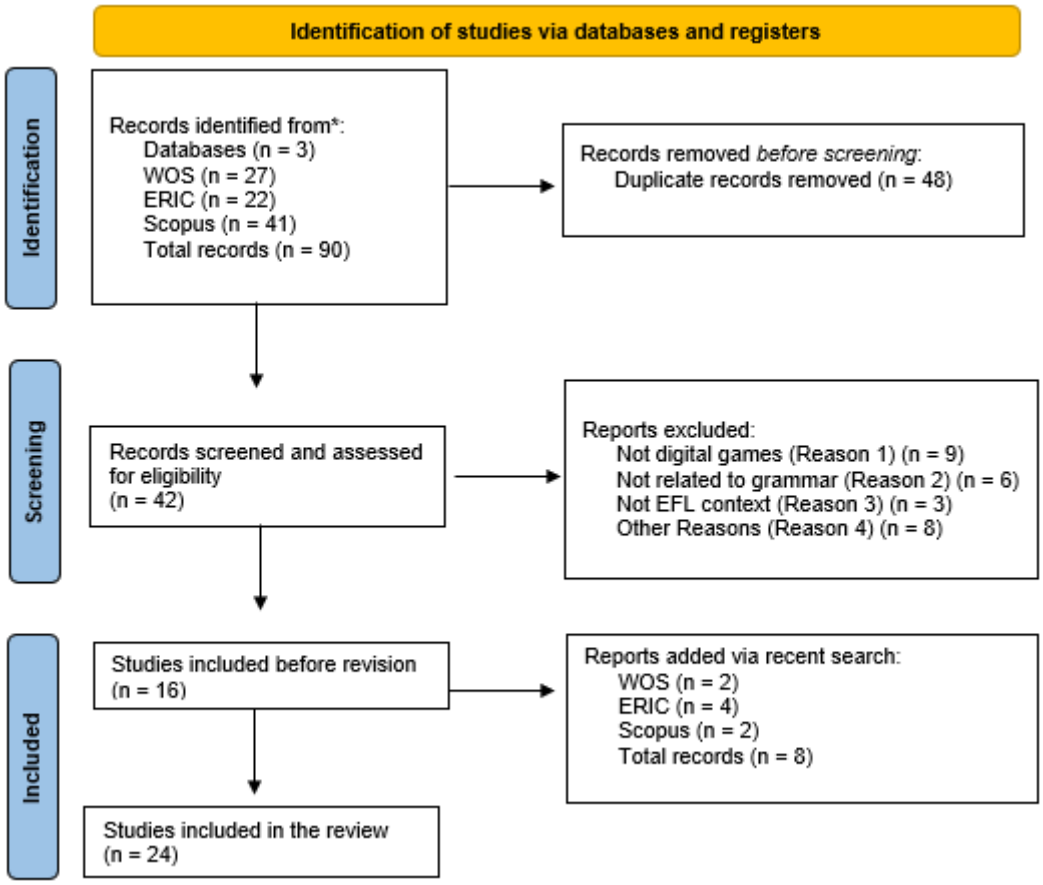
Table 2
Inclusion and Exclusion Criteria

	Inclusion criteria	**Exclusion criteria**
Year	Studies published between 2010-2022	studies published before 2010
Language	in the English language	In other languages
Context	EFL	ESL
Subject area	Grammar	Other language skills
Document Type	Journal articles	Book chapters, review studies, conference papers, dissertations

3.3. Data Screening and Selection Process

A PRISMA flowchart indicating the details about the article elimination process was created (See Figure 2). The article selection process began with 90 articles. The initial search results comprised 27 articles from Web of Science, 41 from Scopus, and 22 from ERIC. 48 duplicate articles were determined across three databases through Zotero and removed. Then, the abstracts were screened in detail. A further 26 publications were not included since they did not directly address the subject of this study. Subsequently, 16 articles underwent full-text reading for further analysis. Following this phase, the researchers searched the three databases to incorporate recently published studies, obtaining an additional 8 publications (2 from Web of Science, 2 from Scopus, and 4 from ERIC). In the final version of the current study, 24 articles were subjected to full-text reading to conduct additional analysis.

Figure 2
PRISMA Flowchart



3.4. Data Analysis

In this review, a meticulous and extensive query was conducted to provide a better understanding of how digital games are utilized to enhance grammar skills in the English language. Following screening, 24 pertinent articles that met the inclusion criteria were analysed. After thoroughly discussing and refining their approach to coding the studies, the researchers developed a coding scheme. The two researchers divided the articles to perform independent content analysis and coding. Using a predetermined coding scheme, two researchers independently reviewed articles. Throughout the process, the researchers collaborated to resolve any issues or conflicts that arose during coding, exchanging, and reviewing articles as needed. After they finished their coding process, they discussed the results of the holistic coding outcomes of all 24 articles. In particular, content and descriptive analyses were employed to address the research questions outlined earlier. The coding process of the chosen research articles was carried out using a computer-assisted qualitative data analysis software called MaxQDA.

3.5. Reliability

Ensuring the accuracy and quality of the methodological process throughout a systematic review is highly important. 'External review appraisal' is an essential aspect of systematic reviews, as it is in many proposals or academic publications to improve the quality of the review (EPPI-Centre, 2010). In this sense, the review process was followed by an external researcher who is an expert in the study field. Furthermore, during the article screening and selection process, the researchers used a free web-based program, Rayyan, developed by Ouzzani et al. (2016), since it utilizes a semi-automated blind review process and offers a high level of functionality to accelerate the initial screening of abstracts and titles.

4. FINDINGS AND DISCUSSION

The purpose of this systematic review was to examine the literature to offer a thorough study of gamification as it relates to grammar learning in an EFL context. It is crucial to emphasize that the researcher could not directly compare the findings of the present review study with those of other review studies because, based on the

researchers' knowledge, no prior research conducted DGBLL considering grammar learning or teaching in EFL settings. However, the current systematic review findings were able to indirectly compare the present findings with several review studies which focused on the general subjects of DGBLL in ESL and EFL contexts.

4.1. RQ1. What research methods are employed in the selected studies, and at which educational levels is gamification most frequently implemented for grammar learning?

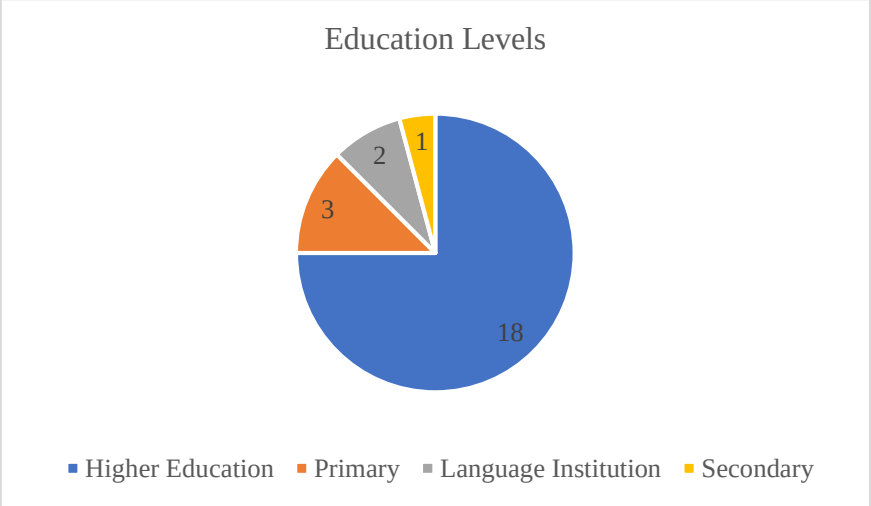
The first research question aimed to examine the selected studies' research methods and educational levels. Figure 3 illustrates the research methods employed in the included articles:

Figure 3
The Distribution of Articles According to Research Methods

The methodological findings showed that quantitative methods were more prevalent than other types of research. Out of the 24 DGGL studies, half (n=13, 54,16%) used quantitative methods with statistical processes as well as experimental design with the aid of digital game tools. The experimental design is utilised in 11 of the quantitative investigations (Lin et al., 2020; Mimouni, 2022), whereas the survey design is utilised in 2 different studies (Cornillie et al., 2012). Eleven experimental studies included sample sizes of 66, 50, 49, 113, 82, 83, 55, 598, 130, 125, and 85, and two survey studies comprised sample sizes of 2,645 and 112. Over one-third of the studies under consideration (n=9, 37,49%) used mixed methods and provided the analytical findings of both quantitative and qualitative data. Only one of the mixed-method studies specified the particular type of mixed-method design employed, and the design of this study was sequential explanatory (Fernández-Portero & Castillo-Rodríguez, 2022). A mixed-method approach was utilized in the other studies, which included both interviews and questionnaires as part of the research process. As well, two studies that employed mixed approaches did not provide specific details. The sample sizes of 7 mixed studies were 86, 95, 132, 95, 101, 68 and 48, but the number of participants was unspecified in 2 of the research. Only two research (n=2, 8,33%) in this review used qualitative methods to investigate digital game-based grammar learning-related concerns. One of them, which was carried out by Ardi and Rianita (2022), delves into how the use of the well-known DGBLL tool Kahoot! can increase student engagement when used to teach EFL grammar via gathering data through classroom observations, student reflective journals, and interviews. Similarly, another study carried out by Ebadi et al. (2021) utilized semi-structured interviews and open-ended questionnaires to collect information about students' attitudes using the online mobile application Kahoot! in an online synchronous English class. The case study design was used in both qualitative studies. The investigations had 22 and 80 participants, respectively. Overall, the preponderance of quantitative and mixed method design was observed in line with the current study by other review studies regarding DGBLL which aimed to explore different contexts of language learning in ESL and EFL settings (e.g. Hung et al., 2018). Thus, the limited application of purely qualitative methods highlights a gap in the literature. To thoroughly investigate the intricate dynamics of DGBLL environments, future research might benefit from a greater emphasis on qualitative approaches. Expanding qualitative investigations could offer deeper insights into the nuanced experiences of learners and supply a more balanced understanding of the pedagogical potential of digital games in language education.

Regarding the educational settings of these studies, the findings revealed that a significant number of the selected studies (n=18, 74,99%) were carried out in university settings (See Figure 4).

Figure 4
The Distribution of Articles According to Education Levels



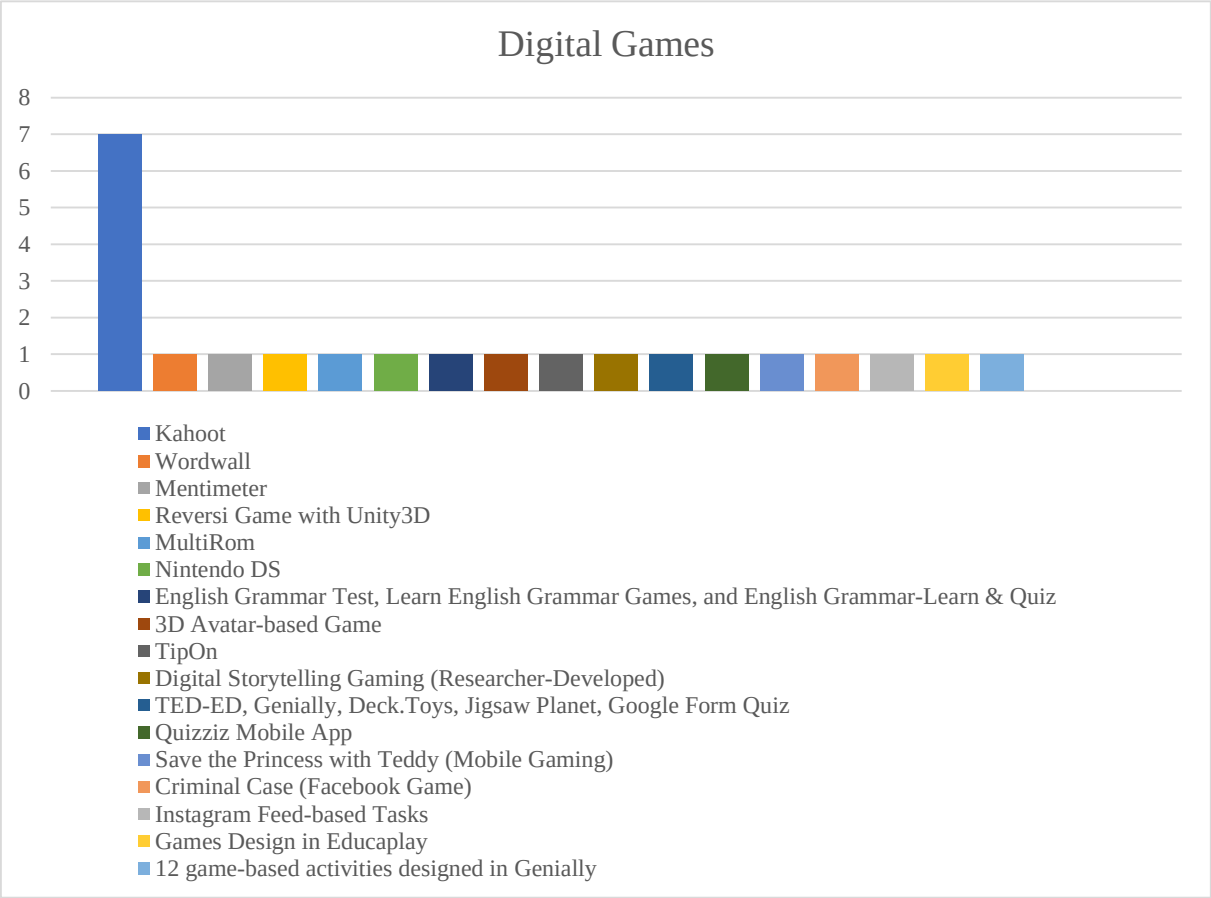
The predominance of higher education contexts indicates that the majority of testing and evaluation environments for DGGL take place in settings where learners are typically more mature and motivated. This focus on universities may be brought about by the infrastructure of technology, the available resources, and the increased importance that institutions place on creative teaching strategies (Castillo-Cuesta, 2020; Castillo-Cuesta, 2022; Dashtestani, 2022; Teng et al., 2022). Only a small number of studies involved primary or elementary school learners (n=3, 12,49%), learners in language institutions (n=2, 8,33%) and secondary school learners (n=1, 4,16%). Although it is commendable that researchers are actively involved in higher education studies, it is noteworthy that there is a significant lack of research focusing on young learners or lower educational levels. When it comes to DGBLL tools, younger learners could respond, engage, and have different demands than older learners. To comprehend these tools' broader application and create age-appropriate educational games, it is essential to investigate these tools' efficacy and adaptation across different age groups and educational stages (Fernández-Portero & Castillo-Rodríguez, 2022; Hong et al., 2022; Teng et al., 2022; Yassin & Abugohar, 2022; Zhyhadlo, 2022).

The systematic analysis of the reviewed studies suggests that digital gamification generally enhances motivation, engagement, and academic performance in the context of grammar learning and teaching across different educational levels. However, the effectiveness of gamification may vary depending on learners' proficiency levels and cognitive development. Research at the primary and secondary school levels demonstrates that grammar games and concept mapping techniques are especially advantageous for low-achieving students, enhancing grammar competency even with heightened cognitive demands. These interactive methods offer organized assistance, facilitating the comprehension of intricate language patterns for children facing difficulties (Chu et al., 2019; Lilić & Bratoz, 2019; Sadeghi & Dousti, 2013). At the university level, gamification has demonstrated the ability to enhance engagement and learning results, although its effects vary across different skill levels. University students with lower competence typically gain from structured gamified components that offer direction and motivation, while those with better proficiency may necessitate greater autonomy and intricate challenges to maintain interest (Castillo-Cuesta, 2020; Rico et al., 2015; Yassin & Abugohar, 2022; Zhyhadlo, 2022). Regarding the usage of digital gamification in language education, students usually had positive impressions. Technical problems with internet connectivity, the fast speed of games, their competitive character, and the absence of thorough feedback - all of which can demotivate and distract certain students - were also noted as some difficulties, though (Ebadi et al., 2021). These findings indicate that gamification strategies must be customized to the cognitive and linguistic requirements of learners across various educational levels (Turan et. al, 2016). Additional research is required to ascertain how gamification might be refined for varied learner profiles, guaranteeing that both struggling and advanced students can completely profit from its use.

4.2. RQ2. Which digital games have been used to facilitate grammar learning?

The second research question aimed to examine digital games and game elements in the selected studies. Figure 5 illustrates the digital games employed in the included articles:

Figure 5
The Distribution of Digital Games



The analysis of DGGL studies reveals that Kahoot! is the most frequently used tool, with 29.16% of the studies (n=7) incorporating it into their teaching and learning processes (e.g. Ardi & Rianita, 2022; Ebadi et al., 2021; Wichadee & Pattanapichet, 2018). Several factors contribute to Kahoot!'s popularity in educational settings. It is popular for its user-friendly interface, ease of access, ease of integration, mobility, time efficiency, attention-grabbing design, immediate feedback, capacity to construct interactive quizzes that foster a competitive environment (Ardi & Rianita, 2022; Ebadi et al., 2021; Mimouni, 2022; Umamah & Saukah, 2022; Yassin & Abugohar, 2022; Wichadee & Pattanapichet, 2018). Kahoot!, a gamified learning tool, has grabbed considerable attention in language learning research because of its potential to improve several areas of EFL and ESL learning. Several studies suggest that incorporating Kahoot! into grammar learning environments can enhance critical thinking, boost motivation, and minimize anxiety (Umamah & Saukah, 2022). Moreover, Kahoot! has been indicated to improve grammar learning and improvement (Wichadee and Pattanapichet, 2018). They emphasize that incorporating Kahoot! into grammar learning environments can foster a good learning environment, enhance student engagement, and produce an enjoyable learning experience (Wichadee & Pattanapichet, 2018). Incorporating Kahoot! not only meets students' need for rewards and a sense of competition but also allows them to set goals, boost their concentration skills, prompt excitement and curiosity for learning, offer engaging learning activities, and even encourage peer collaboration (Ardi & Rianita, 2022). It can be summarised from the above studies that including Kahoot! into grammar learning and teaching practices has several advantages. These benefits show how valuable digitally gamified learning tools are in contemporary education settings, fostering a more dynamic and productive learning environment.

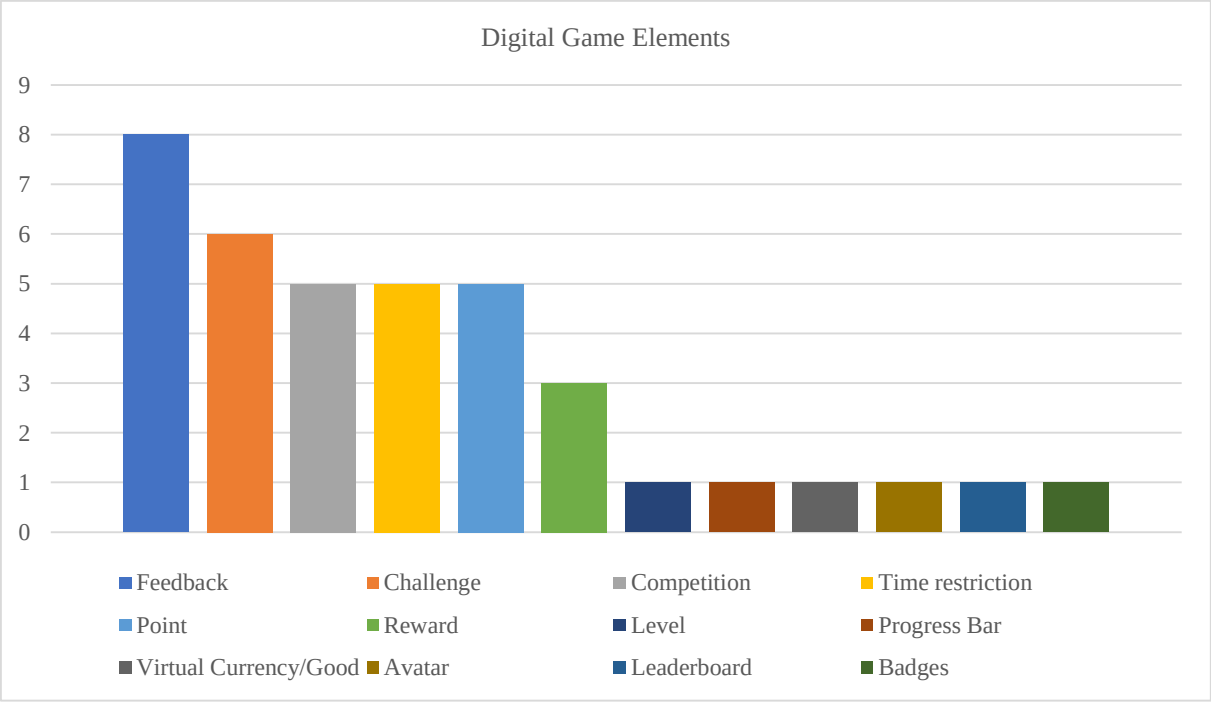
Besides Kahoot!, several game apps or tools are used. English Grammar Test, Learn English Grammar Games, and English Grammar-Learn & Quiz apps, which are used in the study of Rad (2021), and Practise English Game, which is used in the study of Rico et al. (2015), are among the tools used in grammar learning. As the last example of ready-made tools, Chen et al. (2022) handle the Reversi game. In their study, the three-tier test and the Reversi game are two parts of the Personalized entertaining three-tier test (PET3) implemented utilizing Unity3D. In addition to these ready-made tools, some researchers develop their own activities and tools in their study. For instance, Cornillie et al. (2012) decided to design a completely immersive 3D avatar-based game utilizing a game development kit that has been offered by a well-known Flemish professional role-playing game (RPG) developer

in order to enhance the possible tension between corrective feedback and a game environment. Similarly, Hong et al. (2022) developed TipOn to give users of computer-supported systems access to a practice and drill game mode; that is, it is a sort of gamification to drill and improve English grammar using the tool. In the study, learners can use TipOn to submit their assigned questions to the gamifying system to generate games with various game variants such as Whack-A-Mole, Shooting Bees, Hot Air Balloons etc. Moreover, several social media platforms are employed for teaching grammar. One example is Facebook, and the Facebook detective game "Criminal Case" is adapted for use in the study's experimental application of problem-solving scenarios. In the study, learners are encouraged to further polish their output and adjust their grammar, vocabulary, and pronunciation in order to produce proper utterances through interactional feedback from their respondents and meaning-based negotiation (Terriche, 2016). Another one is Instagram, and the goal of the researchers is to examine the impact of Instagram feed-based tasks on grammar learning for EFL learners (Teng et al., 2022). In brief, the whole analysis of handled digital game-based tools in selected studies shows that grammar learning in EFL settings may be readily gamified with basic digital tools by using a variety of digital learning environments. A comparison of the findings with those of other review studies confirms the use of various digital game tools in language learning contexts (e.g. Dehghanzadeh et al., 2021; Ishaq et al., 2021).

The second research question aimed to examine also digital game elements in the selected studies. Figure 6 illustrates the digital game elements employed in the included articles:

Figure 6

The Distribution of Digital Games Elements



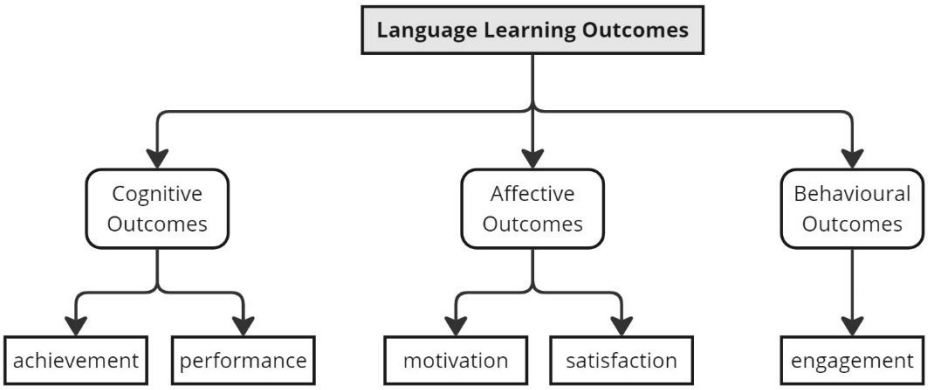
The studies under consideration employed diverse game elements for grammar learning in digital surroundings within EFL contexts. The commonly utilized game elements for gamifying grammar learning in EFL contexts are feedback, challenges, competition, time restrictions, points, and rewards respectively. Studies have revealed that certain game mechanics, such as points, levels, awards, leaderboards, and a range of shapes and colours, are included in educational game tools and resources to evoke particular feelings and states, such as reward, challenge, achievement, competitiveness, and positive emotions. These elements or components support the development of students' motivation to learn, sense of accomplishment, and engagement in the classroom (Zhyhadlo, 2022). For example, as noted by Ardi and Rianita (2022), six key factors were highlighted as contributing to the boosted student engagement in the EFL grammar class incorporating Kahoot!: goal-setting encouragement, improved task focus, enthusiasm and interest in learning, a fun learning environment, opportunities for peer collaboration, and satisfying students' needs for rewards and competition. The incorporation of the competition element into the Kahoot! learning surroundings has been demonstrated to considerably enhance the enjoyment of the learning process (Wichadee & Pattanapichet, 2018). Besides other elements, it is valuable to emphasize the feedback as one of the prominent game elements for gamifying grammar learning in EFL contexts. This well-known element is utilized in the study of Ardi & Rianita (2022), Bahari, (2022), Cornillie et al. (2012), Mimouni (2022), Rad (2021), Sadeghi & Dousti (2013), and Yassin & Abugohar (2022). This element in DGGL serves several functions.

To illustrate, it is helpful to learners to receive immediate corrections, guide them, and give encouragement, all of which contribute to a more active, interactive and successful learning process (Liu & Hwang, 2023). Several studies provide evidence for the value, efficacy and practicality of feedback elements in gamified grammar learning and instruction. For instance, Ardi and Rianita (2022) underline how immediate feedback in digitally gamified grammar exercises or activities supports learners in attaining their learning goals. In a similar vein, Sadeghi and Dousti (2013) suggest that feedback from digital game tools occurs without the teacher's presence, allowing students to learn from their mistakes in a stress-free environment, and students' confidence and learning ability are boosted as a result of this environment. Cornillie et al. (2012) provide evidence that in an immersive educational game, language learners frequently found the corrective feedback helpful component. To some extent, in accordance with the present findings, a previous review study which was conducted by Dehghanzadeh et al. (2021) demonstrated that level, leaderboard, reward, point, challenge, and feedback components were most frequently employed, whereas virtual credits, avatars, chunking, medal, warning signal, curiosity were the least often employed game features for gamifying LESL surroundings.

4.3. RQ3. What are the language learning outcomes of employing digital tools in teaching grammar for learners?

To provide a comprehensive understanding of the multifaceted benefits of incorporating digital tools into grammar teaching, the main outcomes are categorized as cognitive, affective, and behavioural aspects as shown in Figure 7.

Figure 7
Language Learning Outcomes



The cognitive outcomes suggested by the reviewed articles showed that digital tools have a positive impact on students' achievement and performance. In this line, 18 studies reported positive learners' outcomes of academic performance and grammar learning (e.g. Hong et al., 2022; Mimouni, 2022; Rad, 2021; Rico et al., 2015; Sadeghi & Dousti, 2013; Yassin & Abugohar, 2022; Wichadee & Pattanapichet, 2018). Thoroughly, Castillo-Cuesta (2020) summarised that digital games were found to be beneficial in assisting learners to improve their ability to use grammar considering modals, gerunds, and infinitives. Also, they displayed an improvement in their vocabulary knowledge, specifically on the issues linked to jobs and education. Similarly, Lin et al. (2020) revealed that context-related function error rates among learners led to a decrease following the contextual DGBLL technique, which can be a key sign of the learners' progress in learning English grammar.

Concerning the effective outcomes of digital tools for learners, several reviewed studies highlighted their potential to enhance students' motivation and satisfaction. To exemplify, Zhyhadlo (2022) concluded that including gamification elements seemed to enhance learners' sense of achievement, interest in learning, and motivation for progress. Along similar lines, in the study of Rico et al. (2015), high levels of satisfaction were observed for grammar exercises on account of using gamification. Within this context, the positive feedback and interactive nature of gamification have fostered a supportive learning environment in which learners are eager to practice grammar concepts. The significance of this satisfaction lies in its reflection of learners' enjoyment and perceived usefulness of the digital tools. This, in turn, can improve their overall learning experience and their willingness to participate in ongoing learning activities. Subsequent studies may go deeper into the precise processes by which digital gamification impacts motivation and perspectives about grammar learning. Improved implementation techniques and the development of educational tools with game-like features can result from an understanding of how a range of gamification strategies affect distinct learner profiles and educational surroundings.

As for behavioural outcomes of the digital tools, some studies have demonstrated that gamification substantially enhances student engagement (e.g., Fernández-Portero & Castillo-Rodríguez, 2022; Rico et al., 2015; Yurieva et

al., 2021). Based on recent studies, DGBLL has been found to increase student engagement and motivation, both of which are important factors in a thriving learning environment (Nadeem et al., 2023). DGBLL is flexible means of instruction since digital games enhance learning outcomes by providing interactive environments and appealing to different learning styles (Turner et al., 2018). In their study, Yurieva et al. (2021) established that online technologies which involve digital gamification were employed to promote consistent engagement in English language use. As the study's findings indicated by Rico et al. (2015), digital gaming enhances the learning process by increasing enjoyment, maintaining learners' engagement through perpetual activities, and expanding learning opportunities outside the traditional classroom. This provides greater flexibility and introduces new ways for students to interact. A study by Rad (2021) also suggests that learner engagement is effectively increased via DGBLL. The cooperative learning component of the PCaRD digital game-based flipped learning approach boosts student engagement in the classroom, making it very effective. Thus, learners participating in this learning approach demonstrated increased engagement in learning grammar, which helped them comprehend grammar rules better. In this regard, digital gaming improves learning by fostering interest and enjoyment by providing options for cooperative and interactive learning beyond those found in traditional techniques (Rad, 2021; Rico et al., 2015; Sylvén & Sundqvist, 2012).

EFL students and teachers generally have positive perceptions and attitudes towards the use of digital games. Studies prove that EFL students perceive the use of digital games positively, especially regarding ease of use, with no noticeable differences between male and female students (Umamah & Saukah, 2022). Students demonstrate positive feelings towards the use of digital games, Kahoot, and Instagram feed-based tasks, as these methods add fun to the classroom atmosphere and the learning process, improve collaborative activities, and boost motivation (Ebadi et al., 2021; Teng et al., 2022). Besides, the use of Genially games is perceived as beneficial for enhancing students' knowledge of grammar, specifically for recognising and using correct grammatical structures (Castillo-Cuesta, 2020). Overall, the studies indicate that the use of digital games for grammar is well-received by EFL students and can enhance their grammar gain while providing a more engaging learning experience (Ebadi et al., 2021; Rad, 2021; Wichadee and Pattanapichet, 2018). In addition, teachers and pre-service teachers generally perceive the use of digital games in language teaching contexts positively. Teachers recognise the positive effects of DGBL, including the enhancement of critical thinking, problem-solving, and collaborative learning (Dashtestani, 2022). Teachers appreciate the potential that DGBL offers to enhance the interaction and relevance of language classes concerning students' real-life situations (Dashtestani, 2022). Pre-service English teachers display a positive attitude towards learning grammar-related knowledge via complex games, riddles, and puzzles (Fernández-Portero & Castillo-Rodríguez, 2022). The findings seem to suggest educational stakeholders, such as teachers and students, are prone to the integration of DGBL in language instruction and learning (Umamah & Saukah, 2022).

Although digital gamification in grammar teaching and learning is captivating, some negative effects that need to be addressed have the potential to ensure its success. The main issues are distraction, loss of focus, and potential cognitive overload since game-like components like background music, constant alerts and competitive elements might impede students' cognitive processing and attention (Ebadi et al., 2021; Mimouni, 2022). Furthermore, the limited time allocation for answers on websites like Kahoot could affect evaluation accuracy, therefore hindering students from proving their complete comprehension. Limited time allocation may cause some students to lack the time needed to effectively consider and react (Castillo-Cuesta, 2020; Ebadi et al., 2021; Fernández-Portero & Castillo-Rodríguez, 2022). Lack of teacher feedback is another problem since it could lead to missed learning chances when students do not get quick explanations for wrong answers (Ebadi et al., 2021; Umamah & Saukah, 2022). Moreover, digital gamification might have a negative impact on students' self-confidence since public scoreboards might deter underperformance among lesser achievers (Ebadi et al., 2021). Classroom management issues also surface, especially in big classes where keeping discipline can be challenging (Ebadi et al., 2021). Moreover, the default multiple-choice structure of many gamified quizzes may hinder the assessment of higher-order thinking skills, therefore lowering their instructional usefulness (Mimouni, 2022). Yassin and Abugohar (2022) advised language teachers to emphasize the outcomes and try to get past the issues of applications in language education. These issues underline the need for careful digital gamification applications. By balancing competitiveness, offering helpful feedback, and applying different evaluation techniques to encourage deeper cognitive involvement, teachers should make sure that game components enhance rather than impede learning. All in all, it can be suggested that the negative aspects of gamification, particularly with grammar learning, are scarcely reported; and thus, further study is required to identify the primary negative effects linked to its implementation.

Several studies compare DGBLL and traditional classroom language instruction, considering the effectiveness of these in enhancing grammar learning. All these studies indicated that digital gamification in grammar learning was more successful than traditional classroom language instruction methods. As mentioned by Rico et al. (2015), digital gamification enhanced the enjoyment of learning, maintained students' engagement through ongoing activity, and facilitated learning beyond traditional classroom settings, hence boosting flexibility and providing new opportunities for interaction. Also, Wichadee and Pattanapichet (2018) stated that in the past, paper-based

exercises were the only way to assess students' understanding of lessons. When compared to the traditional style of learning, digital games are now preferred for exercises and quizzes, as students are more tech-savvy and motivated to learn. This innovative approach creates a competitive and fun learning environment. Briefly, DGBLL and traditional teaching methods present unique strategies for grammar learning and teaching, each possessing specific benefits and drawbacks. Comparing grammar learning via DGBLL with traditional methods reveals notable disparities in achievement, engagement, and learner motivation. Digital game-based learning improves grammar instruction by fostering engagement, motivation, contextual understanding, and skill development (Lin et al., 2020; Rad, 2021; Umamah & Saukah, 2022; Yurieva et al., 2021). Notwithstanding these advantages, its influence may be constrained by resources, accessibility issues and its supplementary role rather than being a primary teaching tool in specific educational contexts (Dashtestani, 2022; Umamah & Saukah, 2022; Poshitha, 2023; Yassin & Abugohar, 2022). Conversely, traditional methods, while less engaging, provide a structured and established framework for grammar instruction. Combining both methodologies could yield a more balanced and effective learning grammar experience.

An investigation of the long-term effects of DGBLL considering grammar learning is essential. Studies that have been subjected to this systematic review have revealed that only a small number of studies were performed to explore the long-term effects of DGBLL considering grammar learning. To illustrate, a study conducted by Sadeghi and Dousti (2013) suggests that the long-term effects of integrating technology-driven grammar games may have a significant influence on young EFL learners' grammar gain. While the immediate impact may not show significant differences, the longer the exposure, the better the learners perform in delayed post-tests. This implies that maximizing the length of exposure is crucial for improving young learners' grammar gain. There is still a scarcity of research on the long-term effects of DGBLL, particularly concerning grammar gain. Prolonging exposure to digital gamification of grammar learning may yield greater certainty evidence regarding its long-term effects on student performance, as suggested by Rico et al. (2015) and Lin et al. (2020).

5. CONCLUSION

On the whole, this study sought to enhance the scarce knowledge about DGGL in EFL contexts through an examination of the research methodologies used, the types of digital games implemented, and the student cognitive, affective and behavioural outcomes reported in the current literature on DGGL. The present systematic review has unveiled several significant findings. Firstly, it was found that quantitative methods were more commonly employed compared to mixed and qualitative designs, with a significant number of studies being conducted in university settings, underscoring the emphasis on higher education in this research domain. Secondly, the review's findings align with existing literature, showing that most studies incorporated ready-made tools into their grammar learning or teaching processes, with Kahoot! being the most frequently used, although some researchers also developed their own activities and tools. Gamification elements, including feedback, challenge, competition, time restrictions, points, and rewards, were widely employed to enhance grammar learning in EFL digital environments. Thirdly, concerning cognitive, affective, and behavioural outcomes, the reviewed articles indicated that digital tools positively influence students' achievement and performance, boost motivation and satisfaction, and significantly enhance engagement through DGGL.

In the realm of digital gamification in grammar learning, this study has highlighted several facets that may have been overlooked in previous studies in the field. Future research could concentrate on examining the sustained impact that DGBLL has on grammar retention over longer periods. This is because there has been relatively little research conducted on the long-term impacts of DGBLL. The constraints of DGBLL could also be investigated in subsequent studies, and strategies could be established to address these issues to ensure that digital gamification is effective in grammar instruction. Moreover, the limited discussion on the articles and the lack of direct comparisons between DGBLL and traditional approaches can impede further conclusions, whereas experimental comparisons across grammar learning may strengthen the evidence and clarify DGBLL's effectiveness. Even though we were only able to review articles written in English in the current study, there may have been pertinent publications in other languages. Also, the selected databases may bring about another limitation; therefore, it is advised that more articles from various databases be added in the future. This study investigated grammar learning solely by focusing on digital games; that is, this can be a limitation, so future studies can compare physical games and digital games or serious games and digital games while considering grammar learning in the EFL context.

This study offers pedagogical implications to facilitate the implementation of DGBLL as a means to improve grammar learning. Language teachers need to integrate various game genres and elements, and they should employ the motivational aspects fundamental to digital games to meet different learning styles and settings. Moreover, persistent investigation and development of frameworks and techniques in DGBLL study are essential to maintain constant growth and integration of teaching practices to address the changing requirements of language learners in a constantly changing digital world.

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ÇALIŞMANIN ETİK İZNİ

Yapılan bu çalışmada "Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi" kapsamında uyulması belirtilen tüm kurallara uyulmuştur. Yönergenin ikinci bölümü olan "Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler" başlığı altında belirtilen eylemlerden hiçbiri gerçekleştirilmemiştir. Bu çalışma etik kurul izni gerektirmemektedir.

ARAŞTIRMACILARIN KATKI ORANI

1.yazarın araştırmaya katkı oranı %50, 2. yazarın araştırmaya katkı oranı %30'dır. 3. Yazarın araştırmaya katkı oranı %20'dir.

Yazar 1: Araştırmada literatür araştırması, metodoloji, veri seti, analiz, tartışma kısmında katkısı bulunmaktadır.

Yazar 2: Araştırmada analiz, tartışma kısmında katkı sağlamıştır.

Yazar 3: Araştırmada analiz, tartışma kısmında katkı sağlamıştır.

ÇATIŞMA BEYANI

Araştırmada herhangi bir kişi ya da kurum ile finansal ya da kişisel yönden bağlantı bulunmamaktadır. Araştırmada herhangi bir çıkar çatışması bulunmamaktadır.