



Game-Based Learning for Primary English Language Education: A Systematic Literature Review

Vinsensia Suldianti

vinsensia.suldianti-2023@fib.unair.ac.id

Airlangga University, Indonesia

ABSTRACT

Learning English language through game-based method is beneficial, particularly for beginners. Game-based learning techniques, like gamification, serious games, and mobile games, can enhance language proficiency in areas like grammar, vocabulary, and reading comprehension. This systematic literature review critically synthesizes past literature to create an understanding of the application and effectiveness of GBL strategies for English language learning. Criteria were proposed in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) declaration and guidelines, and after final scrutiny, 5 articles were shortlisted for review. The findings shown that GBL techniques, like gamification, serious games, and mobile games, can enhance language proficiency in areas like grammar, vocabulary, and reading comprehension. The findings of this systematic review can help language instructing institutions to emphasize game-based learning to enhance the motivation, students' personalized learning experiences, and achievement in the learning process. Furthermore, it can be helpful for instructors of the English language, and they can realize the importance of GBL in for Primary English Language Education.

Keywords: Game-based learning, English Language, Primary education, Systematic literature review

INTRODUCTION

Game-based learning is one of the most popular interactive learning techniques. It also provides engaging approaches for cultivating the skills that students require to thrive in today's dynamic society (Han et al., 2027). The incorporation of game-based learning (GBL) into educational settings marks a substantial departure from traditional teaching methods, especially in the context for young learners. Incorporating game elements, like challenges, leaderboards, levels, and rewards, gives students a sense of accomplishment and satisfaction and encourages them to keep going with their studies.

Numerous studies have demonstrated that interactive learning, in which students actively participate in the process of learning, is more successful in reaching the desired learning outcome, especially in topics centered on developing specific skills (Tangkui & Keong, 2020; Mustapha & Mohamad, 2024). These qualities facilitate the integration of game-based learning across a range of educational contexts and academic levels, such as primary education. By incorporating elements of games, such as challenge and feedback, GBL creates engaging and interactive learning experiences for primary school students, making learning more enjoyable, fun, and effective (Goumaridou et al., 2021; Hanna et al., 2021; Fraga-Varela et al., 2021). Thus, it will be essential to determine whether prevailing gamification techniques can meet the specific learning requirements of primary education (PE).

In order to obtain evidence of the impact of the game-based approach for PE, a lot of research was conducted. In recent years, several literature review studies have sought to approach GBL from different perspectives or with different focuses (Fernando & Premadasa, 2024; Guan et al., 2024; Sun et al., 2024; Videnoiik et al., 2023; Vankúš, 2021; Tokac et al., 2019; Fotaris et al., 2017; Hanei et al., 2016; Hung et al., 2016). Some reviews highlight concerning the positive impacts and outcomes of computer games at PE level (i.e. Hanei et al., 2016), some focus on macro trends and micro development of GBL studies (i.e., Guan et al., 2024; Videnoiik et al., 2023), some reported findings on a teacher' scaffolding strategies used within game-based (i.e., Sun et al., 2024), some reported findings on a particular subject (i.e., Fernando & Premadasa 2024; Vankúš, 2021; Tokac et al., 2019; Fotaris et al., 2017; Hung et al., 2016). However, there is a notable lack of studies focusing on the analysis of the systematic reviews regarding the game-based learning influence on learning activities and the role of students in PE and also the most popular GBL studies. To create pedagogical interventions that truly increase students' academic performance while simultaneously capturing their interest, a detailed analysis of the impact of gamification in educational contexts is necessary. This gap in literature underscores the need for rigorous and systematic research that not only explains the extent of the learning activities and the role of students in PE but also identifies what games are used to learn English in PE studies during the past decade and explains the advantages and disadvantages of those game.

This literature review combines the findings from papers published during the period from 2015 to 2024 (10 years). The objective of the study was to provide insight into current research concerning the game-based approach, focusing on games used to learn English in PE, learning activities, and the role of students, as well as implementing GBL to identify current trends and define future research. Starting from this, the research questions are:

RQ1: What games used to learn English in Primary Education?

RQ2: How does GBL improve learning activities and the role of students during the game?

METHOD

To provide a solid foundation for our research on GBL to teaching ESL in primary education, we conducted a systematic literature review to identify, analyze, and evaluate all relevant materials. In order to guarantee the validity of a Systematic Literature Review (SLR), criteria were proposed in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) declaration (Page et al., 2021), and guidelines were supplied by Sinoara et al. (2016). Following the guidelines provided in (Torres-Carrion et al., 2018), a systematic literature review was conducted. The three main steps of the initial process are planning, carrying out, and reporting the findings. The main steps in the review process include creating research questions, determining which research projects require evaluation, developing inclusion and exclusion standards, and scanning the literature for answers to the research questions.

Literature Selection

In order to fulfill the research objective, an exclusive selection of articles linked to articles in the GBL for teaching ESL in primary education was chosen. For this purpose, inclusion and exclusion criteria were established, which are presented in [Table 1](#).

Table 1: Inclusion and exclusion criteria for the review

Criteria	Inclusion	Exclusion
Years	2015-2024	Outside range
Subject Area	Social Sciences & Art and Humanities	Other's subject area
Document Type	Article	Other's publications
Area of the study	Game-based learning for English Language	Other's area
Population	Primary school students	Students from other educational levels
Type of research	Empirical studies, experimental study, and findings.	Other's type of research
Language	English	Publications in other languages.
Accessibility	Open Access	Restricted or paywalled

The selection of studies for the current study was made according to a set of inclusion and exclusion criteria. The number of articles that were included and excluded during the screening and review processes is shown in Figure 1. During the full-text screening, articles that did not meet the inclusionary and exclusionary criteria were further excluded. For articles that met criteria, specific information was collated from each selected article, including the year of publication, study objectives, study design, participants' backgrounds, materials and procedures, and study limitations. Similar to the initial screening phase, discrepancies between the authors were resolved through discussions and consensus. The accumulated evidence was synthesized qualitatively. In addition to providing an overview, this review will assess the extent of the learning activities and the role of students at PE but also identifies what games are used to learn English in PE studies during the past decade and critically assess the advantages and disadvantages of those game.

Data collection and filtering

The studies published in Social Sciences Citation Index (SSCI) journals are extensively and rigorously peer-reviewed based on strict academic criteria, which often results in achieving higher impacts in the field (Duman et al., 2015). A comprehensive search was conducted from 2015 until 2024 for original research studies that report game-based learning for teaching ESL or EFL in primary education. These searches were used in the Scopus database to identify potential sources and restricted on the basis of the language the articles were written in. Each article was screened based on its title and abstract. Articles not meeting the inclusion and exclusion requirements were excluded during full-text screening.

The specific information of each article selected to meet the criteria included the year of publication, purpose of the study, design, background of participants, materials and procedures, and study limitations. In the collected evidence, the data was qualitatively synthesized to determine the effects of game-based learning on student engagement and the most popular game-based learning in primary education. The Boolean phrases used are: "game-based learning" OR "digital game-based learning" AND "primary education" OR "elementary education" OR "grade school" AND "english language" OR "ESL" OR "EFL" AND "empirical studies" OR "experimental study" OR "findings".

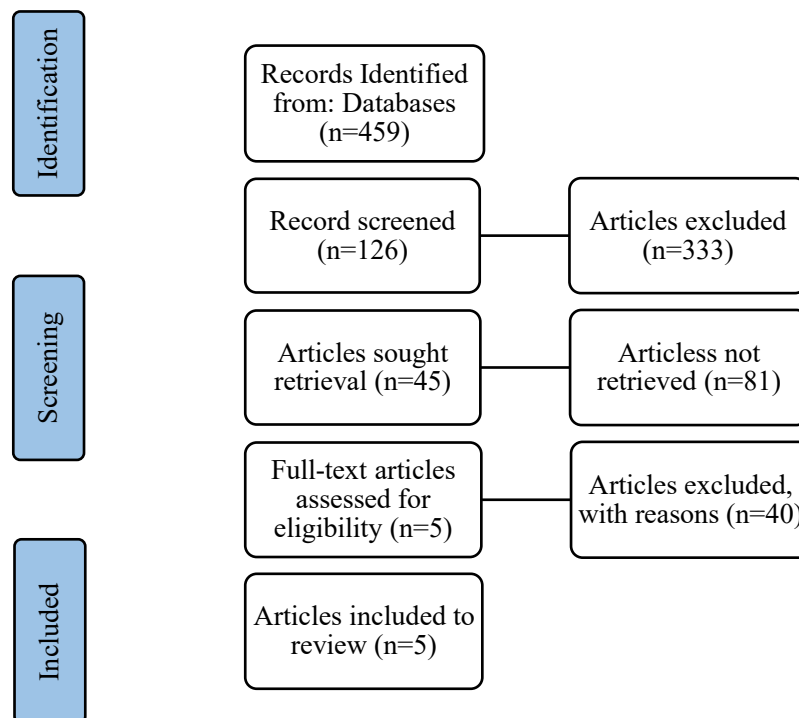


Figure 1. The screening and filtering process GBL studies

In total, 316 articles were collected and based on the PRISMA flow chart (Page et al., 2021), presented in [Figure 1](#). Three phases were developed: identification, screening, and inclusion. Of these, 331 references were removed as they did not match the inclusion criteria. This process resulted in 126 items for closer inspection. Reasons for that were publishing outside the range ($n = 14$), other subject areas ($n = 105$), not article type ($n = 24$), not English language ($n = 3$), and not open access ($n = 133$). After accessing the full texts of these items, another 81 items were removed because there were no reasons for that; they were not the right target population, not the correct study area for English learning, and not about GBL. Final synthesis and analysis included forty-five ($n = 45$) that were assessed based on the research questions. After the above-mentioned process and as a result of reviewing studies for eligibility, there finally remained a total of six ($n=6$) studies to be reviewed.

Results and Discussion

The review aimed to create insights into the utilization of game-based learning for English language learning in primary education. Therefore, the emphasis was mainly paid to literature focusing on GBL in learning the English language. The results highlighted that two focused on learning activities and the role of students and games used to learn English for primary education. This literature review analyzed different studies on game-based learning in primary English language education. Table 2 summarizes key characteristics of these studies, such as year of publication, research design, main findings, limitations, and inference. The purpose of this review was to identify effective practices and inform future research in game-based language learning. Table 2 shows a summary of the study characteristics and key findings.

Year published

Among the 5 articles considered for the review, one articles were published in 2019 (Oct), one in 2020(May), one in 2021 (May/11), one in 2022 (Aug/6), and on in 2024 (Jan/17). Most of the studies did not focus on any single country; thus, the review has not classified the country of origin.

Focus, aim, and approach

All five studies focused on game-based English language learning in primary education, but the research design of the studies was different depending on the nature. They followed pre-test/post-test design (i.e., 5/5) (Chowdhury, M., et al., 2024; Li, X., et al., 2022; Serra, J., & Gilabert, R. 2021; Idris, M. I., et al., 2020; Ongoro, C. A., & Mwangoka, J. W. 2019), mix method (i.e., 1/5) (Chowdhury, M., et al., 2024, experimental study (i.e., 1/5) (Ongoro, C. A., & Mwangoka, J. W. 2019), quasi-experiment (i.e., 1/5) (Li, X., et al., 2022), pre-experimental (i.e., 1/5) (Idris, M. I., et al., 2020). One out of 5 focused on English vocabulary and reading comprehension (Chowdhury, M., et al., 2024). Others focused on English reading Skill (Li, X., et al., 2022; Serra, J., & Gilabert, R. 2021), grammar learning (Idris, M. I., et al., 2020), and English language learning (Ongoro, C. A., & Mwangoka, J. W. 2019).

Study design and sample

Among the 5 studies considered for review, one was Quasi-experimental, one mix-method with Quantitative (Pre-test–post-test) and Qualitative (semi-structured interviews), one pre-experimental, one experimental, and one focused on pre-post testing. The number of participants (i.e., students of primary education) ranged from 8 to 13 years old.

Outcomes

The outcomes of the studies revealed that game-based learning can accelerate the language learning process. Both teachers and students can benefit from it. Furthermore, the outcomes highlighted that it positively impacted students' learning experience, increased students' engagement and motivation, leading to better learning outcomes (Ongoro & Mwangoka, 2019), provided an interactive and engaging learning experience and improved students' ability to learn language skills (Li, X., et al., 2022), and students also were engaged in creating their own games (Chowdhury, et al., 2024). Furthermore, research showed that educational gaming among younger generations incorporated into classroom instruction could enhance students' language reading skills (Chowdhury, 2024; Li et al., 2022; Serra & Gilabert, 2021). The game can motivate struggling English learners by requiring them to complete language tasks that improve their grammar (Idris et al., 2020; Chowdhury et al., 2024).

Moreover, the results demonstrated that incorporating educational gaming into classroom instruction for younger generations could enhance students' language reading skills (Chowdhury, 2024; Li et al., 2022; Serra & Gilabert, 2021) and educational digital games increase students' learning motivation (Chowdhury, 2024; Li et al., 2022; Serra; Li et al., 2022). In addition, the studies also reported that using games in language learning makes it easy for beginners to access and learn, especially for English language skills (Chowdhury et al., 2024; Li et al., 2022; Serra & Gilabert, 2021; Idris et al., 2020; Ongoro & Mwangoka, 2019).

Discussion

In primary education, there aren't many empirical studies on GBL research, to start. This is consistent with Zainuddin et al.'s (2020) discovery that, of the 45 gamification studies they reviewed, only five were directed towards elementary school students; the majority, however, were directed towards adults or students pursuing higher education. Play, however, is fundamental to children's education regardless of how technology advances. Teachers, educational experts, and scientists must set standards for the constructive integration of games in addition to modeling positive and meaningful use of games, given that children today spend a lot of time on various digital devices and experience both increased sleep problems and fewer sleep hours.

It was also found that language subjects, especially English language, were much less attended compared with other subjects, such as science, astronomy, visual literacy, social science, or math and geometry. Such a finding resonated with Fernando & Premadasa (2024), which reported that 82% out of 34 studies focused on GBL's impact on multiple disciplines reported positive results in implementing gamification and GBL in the learning process, which

includes increased motivation, engagement, and student performance. They also highlight the great potential of gamification and game-based learning in educating Generation Alpha, who are very familiar with technology. It is needed to explore the full potential of gamification in meeting the learning needs of this digital generation, particularly in terms of developing innovative game mechanics and more adaptive learning environments.

Various gamified techniques have been introduced into the educational process more frequently to help students learn languages. In order to teach languages in the classroom, educators have looked into using 3D game simulations, phone games, and serious games. In this sense, the review shared three ideas. Gamification is the process of integrating games into a learning environment that isn't already gamified, like a classroom (Li et al., 2022; Idris et al., 2020; Ongoro & Mwangoka, 2019). Game-based learning is the process of incorporating computer or mobile games into the educational process (Chowdhury et al., 2024). In order to facilitate simulations during the learning process, serious games aimed to integrate real games into the classroom (Serra & Gilabert, 2021).

In learning the English language, games afford strong motivation for student engagement in learning, thus affecting their emotional, social, and cognitive development (Bang et al., 2023; Sun et al., 2023). Incorporating various games or phone-based games into the classroom enhances students' grammar learning, articulates alphabetical sounds, and other English language skills in the learning process (Chowdhury et al., 2024; Serra & Gilabert, 2021; Ongoro & Mwangoka, 2019).

Table 2. Summary of included studies

No.	Autors	Title	Research design	Main findings	Limitations	Inference
1	Chowdhury et al. (2024)	Digital game-based language learning for vocabular development	Mix method: Quantitative (Pre-test–post-test) and Qualitative (semi-structured interviews)	There were significant improvements in vocabulary and reading comprehension and fostering intrinsic motivation students.	Only small sample size was selected	Students experienced notable improvements in their language skills and also highlighted the importance of engagement and creativity in learning.
2	Li et al. (2022)	Using gamification to facilitate students' self-regulation in e-learning: A case study on students' L2 English learning.	Quasi-experiment with a pre-test–post-test design.	Active users showed significant improvement in their English reading scores and significantly improved the self-regulated learning (SRL) interest and self-efficacy of student.	Time and devices.	Gamified e-quizzes can be effective in enhancing students' self-regulated learning (SRL) skills, particularly for those with lower SRL levels
3	Serra & Gilabert. (2021)	Algorithmic versus teacher-led sequencing	Pre-test–post-test design.	All learners made progress in reading skills, but no	Lack of a control group	Content in serious games can be delivered by both algorithms and

		in a digital serious game and the development of second language reading fluency and accuracy.		significant differences were found between the two sequences in relation to the development of reading skills.		teacher interventions and by a combination or alternative use of the two
4	Idris et al. (2020)	Game-based learning platform and its effects on present tense mastery: Evidence from an ESL classroom.	Pre-experimental (one-group pre-test–post-test design)	Statistically significant improvement and increased number of students achieving high scores	None noted	Kahoot! is an effective tool for enhancing grammar learning, specifically present tense verbs, for young ESL learners
5	Ongoro & Mwangoka. (2019)	Effects of digital games on enhancing language learning in Tanzanian preschools	Experimental study (control group and experimental group) and closed-ended questionnaire	Gamified language learning prototype was effective in improving preschoolers' ability to articulate alphabetical sounds.	None noted	The research supports the integration of gamified learning systems in Tanzanian preschools to enhance language acquisition outcomes.

RQ1: What game are used to learning English in Primary Education?

Various types of games used to learn English in primary education, such as Scratch (a programming platform), Oxford Achiever (a gamified e-learning system), iRead, Kahoot!, and TALSQ. For the first, Chowdhury et al. (2024) studies reported programming platform, Scratch. Scratch is a programming platform developed by the Massachusetts Institute of Technology Media Lab that allows users to create interactive stories, digital games, and animations using a block-based programming language. It provides a development environment where users can host their projects, play games, and share ideas with others in the community. Scratch is designed to be accessible and engaging, making it a valuable tool for fostering creativity and digital literacy among learners. Scratch offers several advantages as a learning tool, including free accessibility, support for creative learning, development of digital skills, and flexibility in accommodating various learning styles. However, this platform also has some drawbacks. Technical challenges, time and instruction limitations, as well as the lack of standardized assessment tools, can hinder the learning process.

Li et al. (2022) reported on a gamified e-learning system, Oxford Achiever (OA). Oxford Achiever (OA) is designed for L2 English learning and incorporates various gaming elements such as challenges, level-ups, points systems, leaderboards, dashboards, trophies, and

avatars. Oxford Achiever (OA) is an e-learning system that combines gamification elements to enhance student motivation and engagement in English language learning. The system also provides targeted practice and personalized feedback, allowing students to track their progress through a range of exercises in reading, writing, listening, speaking, grammar, and vocabulary across different levels of difficulty. Research results show that OA successfully improved academic performance, particularly in reading skills, and developed better independent learning strategies among students. However, this system also has several challenges, such as the lack of engagement from inactive users and the potential dependency on game elements.

Serra & Gilabert. (2021) reported on a digital learning tool, iRead. The iRead system is a digital learning tool designed to develop language skills through game-based activities. With various features such as games, an e-reader, and teacher tools, iRead offers a personalized learning experience for each student. This system automatically adjusts the difficulty level of the learning materials based on the students' performance. One example of an interesting game is "Navigo: The Pyramid of the Lost Words," which invites students to solve puzzles to improve their reading skills. Although iRead has advantages such as personalized learning, interactivity, and the ability to track student progress, this system also has some drawbacks. Dependence on technology, lack of social interaction, and the effectiveness of adaptive methods that still need further research are some important considerations in the implementation of this system.

Idris et al. (2020) reported on the game-based learning platform Kahoot!. Kahoot! is a game-based learning platform designed to make the learning process more enjoyable and interactive. Launched in 2006, this platform has proven effective in increasing student motivation and engagement, especially in language learning. With gamification features such as leaderboards and points, Kahoot! encourages active student participation and creates a more engaging learning experience. The flexibility and accessibility of this platform also make it a versatile tool in various learning contexts. However, the dependence on internet connectivity and the potential limitations in generalizing research findings are important considerations.

Ongoro & Mwangoka. (2019) reported on a gamified language learning prototype designed for Tanzanian Preschoolers Alphabetical Listening Sound Quiz (TALSQ). The Tanzanian Preschoolers Alphabetical Listening Sound Quiz (TALSQ) is a gamified language learning prototype designed to enhance language learning among Tanzanian preschoolers. It incorporates game dynamics and mechanics to make learning more engaging and fun. The application includes features such as multiple-choice questions, audio pronunciations of alphabetical sounds, and supportive feedback mechanisms to aid in the articulation of sounds. With an engaging gamification approach and a child-friendly interface, this application successfully enhances children's motivation and involvement in learning. In addition, the app's content that is relevant to the local culture also adds value. However, TALSQ still faces several challenges, such as children's difficulty in articulating English sounds and the lack of adequate feedback.

RQ2: How does GBL improve learning activities and the role of students during the game?

All studies have reported how that game can improve learning activities and the role of students. First, the use of Scratch in Digital Game-Based Language Learning (DGBLL) improves students' learning activities and the roles in several ways. The game-based learning approach fosters active student engagement, promoting ownership and autonomy in the learning process. Collaborative efforts among students enhance communication skills and teamwork. The creative and critical thinking involved in game design deepens students' understanding of vocabulary and reading comprehension. By contextualizing learning and embracing an iterative process, students develop a growth mindset and resilience. These combined factors contribute to a more dynamic and interactive learning environment, empowering students to take an active role in their education.

The second is a gamified e-learning system, Oxford Achiever, which transforms students' learning experiences by actively engaging them through game elements like challenges and leaderboards. It promotes self-regulated learning by encouraging goal setting and self-monitoring. Additionally, the system motivates students and fosters a sense of community through social interaction and personalized feedback. By shifting the focus from passive learning to active engagement, Oxford Achiever empowers students to take ownership of their learning journey, leading to improved academic outcomes.

The third is the iRead system, which improves students' learning activities and the roles during the game by providing an interactive and engaging environment that promotes active participation. Students are involved in various game-based activities that require them to solve puzzles and complete challenges related to language skills, which enhances their engagement and motivation to learn. The system's adaptive nature allows it to adjust the difficulty of tasks based on individual performance, ensuring that students are appropriately challenged and supported. Additionally, the use of multimedia elements, such as auditory feedback, helps students improve their pronunciation and listening skills, further enriching their learning experience. This combination of interactivity, personalization, and multimedia support fosters a more effective learning environment, allowing students to take on active roles as they navigate through the game and apply their language skills in context.

The fourth is Kahoot! improves students' learning activities and roles during the game by engaging them in a dynamic and interactive environment that promotes motivation and attention. The platform allows learners to participate actively in the learning process, making grammar learning entertaining and enjoyable. This engagement helps to lower their affective filters, enhancing their overall learning experience. Additionally, Kahoot! provides a meaningful context for communicative grammar practice, encouraging students to focus on the game as an activity rather than the language itself, which can lead to unconscious language acquisition.

The fifth is the Tanzanian Preschoolers Alphabetical Listening Sound Quiz (TALSQ), which improves students' learning activities and roles during the game by providing multiple opportunities for engagement through a gamified approach. The program allows children to hear sounds, see pictures, and interact with letters simultaneously, which enhances their learning experience. This aligns with Piaget's preoperational cognitive theory, facilitating a more effective learning environment. Additionally, the use of multiple-choice questions in the quiz format allows children to demonstrate their understanding and skills more effectively than open-ended questions. The interactive nature of the game encourages children to participate actively, fostering a sense of confidence as they continue to try and master the concepts presented.

CONCLUSION

This systematic literature review identifies high-quality studies in the area of GBL in PE over a 10-year period from 2015 to 2024. Initially, 459 papers were identified, but after applying the Boolean and screening by the abstract, this was reduced to 5 high-quality empirical papers. All the papers explore the learning activities and the role of students at PE but also identify what games are used to learn English in PE studies during the past decade and critically assess the advantages and disadvantages of those games.

Literature evidence suggests that game-based learning (GBL) can improve learning outcomes, motivation, and student engagement in primary English language instruction. Numerous studies have shown that GBL techniques, like gamification, serious games, and mobile games, can enhance language proficiency in areas like grammar, vocabulary, and reading comprehension. The review also examined various game-based platforms and tools, such as Scratch, Oxford Achiever, iRead, Kahoot!, and TALSQ. All of these games enhance

learning activities by promoting active participation, collaboration, personalized learning experiences, and achievement in the learning process, empowering students to take charge of their education. Each offering unique strengths and limitations. These approaches frequently result in students demonstrating a high level of ambition and success in learning English grammar and vocabulary. Including games in the educational process is a good way to capitalize on this competitive urge. Students are inspired to pursue excellence when they participate in game-based activities that promote healthy peer competition.

This review is not without its limitations. Firstly, because the language restriction may have led to the exclusion of relevant studies that are not published in English or are listed in indices other than those included in the search; and secondly, because the review focused on primary education, when there may be equally significant experiments in the use of GBL in other grades of education. Not only focusing on English language learning, it can use different topics, for example using Mandarin language. It would be better to use more than one database to get more data.

Furthermore, this review identified several opportunities for future research on the GBL. First of all, future studies should concentrate on creating more creative GBL techniques for beginners in language learning. Secondly, given its richness, maybe it should be conducted to investigate and provide crucial information on the effectiveness and effect sizes of GBL. Thirdly, it would be interesting to examine the most popular GBL studies for language learning over the last ten years and summarize their advantages and disadvantages in order to inform upcoming GBL teaching practitioners and researchers.

REFERENCES

- A., & Premadasa, H. S. (2024). Use of gamification and game-based learning in educating Generation Alpha. *Educational Technology & Society*, 27(2), 114-132.
- Alam, T.M., Mushtaq, M., Shaukat, K., Hameed, I.A., Sarwar, M.U., & Luo, S. (2021). A novel method for performance measurement of public educational institutions using machine learning models. *Applied Sciences*, 11(19), 9296.
- Al-Azawi, R., Al-Faliti, F., & Al-Blushi, M. (2016). Educational gamification vs. Game based learning: Comparative study. *International Journal of Innovation, Management and Technology*, 7(4), 132–136. <https://doi.org/10.18178/ijimt.2016.7.4.659>
- Baek, Y., & Touati, A. (2020). Comparing collaborative and cooperative gameplay for academic and gaming achievements. *Journal of Educational Computing Research*, 57(8), 2110–2140. <https://10.1177/0735633118825385>.
- Bang, H. J., Li, L., & Flynn, K. (2023). Efficacy of an adaptive game-based math learning app to support personalized learning and improve early elementary school students' learning. *Early Childhood Education Journal*, 51(4), 717-732. <https://doi.org/10.1007/s10643-022-01332-3>
- Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., ... & Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, 94, 178-192.
- Chowdhury, M., Dixon, L. Q., Kuo, L. J., Donaldson, J. P., Eslami, Z., Viruru, R., & Luo, W. (2024). Digital game-based language learning for vocabulary development. *Computers and Education Open*, 6, 100160.
- Chu, M. W., & Fowler, T. A. (2020). Gamification of formative feedback in language arts and mathematics classrooms: Application of the learning error and formative feedback (LEAFF) model. *International Journal of Game-Based Learning (IJGBL)*, 10(1), 1-18.
- Daniel L.F., Aldo G., Pedro P. A., Edmundo T. (2021). Comparing Traditional Teaching and Game-Based Learning Using Teacher-Authored Games on Computer Science Education. *IEEE Transactions on Education*. <https://doi.org/10.1109/TE.2021.3057849>

- Debrenti, E. (2024). Game-Based Learning experiences in primary mathematics education. In *Frontiers in Education* (Vol. 9, p. 1331312). Frontiers Media SA.
- del Moral Pérez, M. E., Guzmán Duque, A. P., & Fernández García, L. C. (2018). Game-based learning: Increasing the logical-mathematical, naturalistic, and linguistic learning levels of primary school students. *Journal of New Approaches in Educational Research*, 7(1), 31-39.
- Douglas B. Clark, Emily E. Tanner-Smith, Stephen S. Killingsworth. (2016). Digital Games, Design, and Learning: A Systematic Review and Meta-Analysis. *Educ. Res.* 86 (1) 79–122. <https://doi.org/10.3102/0034654315582065>
- Duman, G., Orhon, G., & Gedik, N. (2015). Research trends in mobile assisted language learning from 2000 to 2012. *ReCALL*, 27(2), 197–216.
- Fernando, P. A., & Premadasa, H. S. (2024). Use of gamification and game-based learning in educating Generation Alpha. *Educational Technology & Society*, 27(2), 114-132. [http://dx.doi.org/10.30191/ETS.202404_27\(2\).RP03](http://dx.doi.org/10.30191/ETS.202404_27(2).RP03)
- Fokides, E. (2018). Digital educational games and mathematics. Results of a case study in primary school settings. *Education and Information Technologies*, 23(2), 851–867. <https://doi.org/10.1007/s10639-017-9639-5>
- Fotaris, P., Pellas, N., Kazanidis, I., & Smith, P. (2017). A systematic review of augmented reality game-based applications in primary education. *Memoriasdel XI Congreso Europeo en Aprendizaje Basado en el Juego Graz* (pp. 181–191).
- Fraga-Varela, F., Vila-Couñago, E., & Martínez-Piñeiro, E. (2021). The impact of serious games in mathematics fluency: A study in Primary Education. *Comunicar*, 29(69), 125–135. <https://doi.org/10.3916/c69-2021-10>
- Gounaridou, A., Siamtanidou, E., & Dimoulas, C. (2021). A Serious Game for Mediated Education on Traffic Behavior and Safety Awareness. *Education Sciences*, 11(3), 127. <https://doi.org/10.3390/educsci11030127>
- Greipl, S., Moeller, K., & Ninaus, M. (2020). Potential and limits of game-based learning. *International Journal of Technology Enhanced Learning*, 12(4), 363-389.
- Guan, X., Sun, C., Hwang, G. J., Xue, K., & Wang, Z. (2024). Applying game-based learning in primary education: A systematic review of journal publications from 2010 to 2020. *Interactive Learning Environments*, 32(2), 534-556.
- H.-Y. Sung, G.-J. Hwang, C.-J. Lin, T.-W. Hong, Experiencing the Analects of Confucius: An experiential game-based learning approach to promoting students' motivation and conception of learning, *Comput. Educ.* 110 (2017) 143–153. <https://doi.org/10.1016/j.compedu.2017.03.014>
- Hainey, T., Connolly, T. M., Boyle, E. A., Wilson, A., & Razak, A. (2016). A systematic literature of game-based learning empirical evidence in primary education. *Computers & Education*, 102, 202–223. <https://doi.org/10.1016/j.compedu.2016.09.001>
- Hanna, H., Abdul, S. L., Cruz, A. D. B. D., Manalo, Z. T., Papna, F. M. L., & Falle, J. A. (2021). Game-based Activity Method: A Case of Grade 5 Students. *Indonesian Journal of Teaching in Science*, 1(1), 13–16. <https://doi.org/10.17509/ijotis.v1i1.41186>
- Hsu, C. C., & Wang, T. I. (2018). Applying game mechanics and student-generated questions to an online puzzle-based game learning system to promote algorithmic thinking skills. *Computers & Education*, 121(4), 73–88. <https://doi.org/10.1016/j.compedu.2018.02.002>
- Huang, P.S., Chiu, P.S., Huang, Y.M., Zhong, H.X., & Lain, C.F. (2020). Cooperative mobile learning for the investigation of natural science courses in elementary schools. *Sustainability*, 12(16), 6606.
- Hung, H. T., Chang, J. L., & Yeh, H. C. (2016). 2016 IEEE 16th International Conference on Advanced Learning Technologies (ICALT).

- 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.
- Idris, M. I., Said, N. E. M., & Tan, K. H. (2020). Game-based learning platform and its effects on present tense mastery: Evidence from an ESL classroom. *International Journal of Learning, Teaching and Educational Research*, 19(5), 13-26.
- Jääskä, E., Aaltonen, K. & Kujala, K. (2021). Game-Based Learning in Project Sustainability Management Education. *Sustainability*. <https://doi.org/10.3390/su13158204>
- Jan L. Plass, B.D. Homer, C.K. Kinzer, Foundations of Game-Based Learning, *Educational Psychologist*. 50 (4) (2016) 258–283. <https://doi.org/10.1080/00461520.2015.1122533>
- Kaldarova, B. (2023). Applying game-based learning to a primary school class in computer science terminology learning. *Front. Educ.* (Lausanne). <https://doi.org/10.3389/feduc.2023.1100275>
- Li, X., Xia, Q., Chu, S. K. W., & Yang, Y. (2022). Using gamification to facilitate students' self-regulation in e-learning: A case study on students' L2 English learning. *Sustainability*, 14(12), 7008.
- Mayer, R. E. (2016). What should be the role of computer games in education?. Policy Insights from the Behavioral and Brain Sciences, 3(1), 20-26. <https://doi.org/10.1177/2372732215621311>
- Meletiyou-Mavrotheris, M., & Prodromou, T. (2016). Pre-Service Teacher Training on Game-Enhanced Mathematics Teaching and Learning. *Technology, Knowledge and Learning*, 21 (3), 379–399.
- Mustapha, N. A., Iberahim, H., & Mohamad, S. J. A. N. S. (2024). Beyond the Norm: Leveraging Carrots and Sticks to Fuel Post-graduate Students' Enthusiasm in Class. *Semarak International Journal of Innovation in Learning and Education*, 1(1), 43-53.
- Nadolny, L., Valai, A., Cherrez, N. J., Elrick, D., Lovett, A., & Nowatzke, M. (2020). Examining the characteristics of game-based learning: A content analysis and design framework. *Computers & Education*, 156, 103936.
- Ojobor, R. C., Babarinde, E. T., & Fagbemi, V. O. (2020). Audio-visual resources in library: An enhancing tool for effective teaching and learning in primary schools in Nsukka LGA. *Library Philosophy and Practice*, 1A-16.
- Omid Noroozi, H. Dehghanzadeh, E. Talaee. (2020). A systematic review on the impacts of game-based learning on argumentation skills. *Entertainment Computing*. <https://doi.org/10.1016/j.entcom.2020.100369>.
- Ongoro, C. A., & Mwangoka, J. W. (2019). Effects of digital games on enhancing language learning in Tanzanian preschools. *Knowledge Management & E-Learning*, 11(3), 325-344.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *bmj*, 372. <https://doi.org/10.1136/bmj.n71>
- Pho, A., & Dinscore, A. (2015). Game-based learning. *Tips and trends*, 2.
- Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of GBL. *Educational Psychologist*, 50(4), 258-28.
- Sáez López, J. M., Sevillano-García García, M. L., & Pascual Sevillano, M. Á. (2019). Application of the ubiquitous game with augmented reality in Primary Education. *Comunicar*, 27.
- Saxena, M., & Mishra, D. K. (2021). Gamification and gen Z in higher education: A systematic review of literature. *International Journal of Information and Communication Technology Education*, 17(4), 1–22. <https://doi.org/10.4018/IJICTE.20211001.0a10>

- Schrader, C. (2023). Serious games and game-based learning. In *Handbook of open, distance and digital education* (pp. 1255-1268). Singapore: Springer Nature Singapore.
- Serra, J., & Gilabert, R. (2021). Algorithmic versus teacher-led sequencing in a digital serious game and the development of second language reading fluency and accuracy. *British Journal of Educational Technology*, 52(5), 1898-1916.
- Sinoara, R. A., Antunes, J., & Rezende, S. O. (2017). Text mining and semantics: a systematic mapping study. *Journal of the Brazilian Computer Society*, 23, 1-20.
- Sun, L., Chen, X., & Ruokamo, H. (2021a). Digital game-based pedagogical activities in primary education: A review of ten years' studies. *International Journal of Technology in Teaching and Learning*, 16(2), 78–92.
- Sun, L., Kangas, M., Ruokamo, H., & Siklander, S. (2023). A systematic literature review of teacher scaffolding in game-based learning in primary education. *Educational Research Review*, 40, 100546.
- Sun, L., Ruokamo, H., Siklander, P., Li, B., & Devlin, K. (2021b). Primary school students' perceptions of scaffolding in digital game-based learning in mathematics. *Learning, Culture and Social Interaction*, 28.
- Tangkui, R., & Keong, T. C. (2020). Enhancing pupils' higher order thinking skills through the lens of activity theory: Is digital game-based learning effective?. *International Journal of Advanced Research in Education and Society*, 2(4), 1-20.
- Tokac, U., Novak, E., & Thompson, C. G. (2019). Effects of game-based learning on students' mathematics achievement: A meta-analysis. *Journal of Computer Assisted Learning*, 35(3), 407–420. <https://doi.org/10.1111/jcal.12347>
- Torres-Carrion, P. V., Gonzalez-Gonzalez, C. S., Aciar, S., & Rodriguez-Morales, G. (2018). Methodology for systematic literature review applied to engineering and education. In 2018 IEEE Global Engineering Education Conference (EDUCON) (pp. 1364–1373). <https://doi.org/10.1109/EDUCON.2018.8363388>
- Vankúš, P. (2021). Influence of game-based learning in mathematics education on students' affective domain: A systematic review. *Mathematics*, 9(9), Article 986. <https://doi.org/10.3390/math9090986>
- Videnovik, M., Bogdanova, A. M., & Trajkovik, V. (2023). Game-based learning approach in computer science in primary education: a systematic review. *Entertainment Computing*, 100616.
- Vlachopoulos, D., & Makri, A. (2017). The effect of games and simulations on higher education: A systematic literature review. *International Journal of Educational Technology in Higher Education*, 14(22). <https://doi.org/10.1186/s41239-017-0062-1>
- Yeboah, R., Amponsah, K. D., Commey Mintah, P., Sedofia, J., & Kwarteng Donkor, P. B. (2023). Game-based learning in Ghanaian primary schools: listening to the views of teachers. *Education 3-13*, 1-15.
- Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational research review*, 30, 100326. <https://doi.org/10.1016/j.edurev.2020.100326>