Feedback Mechanisms in Digital Game-Based Language Learning: A PRISMA-Based Systematic Review

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ABSTRACT

Digital Game-Based Language Learning (DGBLL) is an important approach in language education. Yet, the role of corrective feedback, which helps connect gameplay with language learning and development by guiding learners towards improved performance, remains unclear. This systematic review therefore examined how different types of feedback influence learning outcomes in DGBLL environments. Guided by the PRISMA 2020 framework and Van der Kleij's technology-enhanced feedback framework, five peer-reviewed studies from the Web of Science and Scopus databases were analysed. The findings showed that immediate corrective feedback and multimodal feedback were the most used approaches, while metalinguistic and AI-driven feedback received limited attention. Overall, corrective feedback was found to improve vocabulary, grammar, learner engagement, and motivation. Its effectiveness depended on its relevance to learning objectives and the quality of information provided. The review also identified several research gaps, including the limited use of adaptive feedback, the lack of long-term studies, and insufficient attention to listening and reading skills. These findings provide useful insights for researchers, educators, and game designers seeking to develop more effective feedback systems in DGBLL environments.

Keywords: digital game-based language learning (DGBLL), Feedback, language learning outcomes, systematic literature review, PRISMA

INTRODUCTION

In an era of rapid digital transformation, global educational agendas increasingly emphasise the need for quality, inclusive, and equitable learning opportunities. To illustrate, the Sustainable Development Goal 4 (SDG 4) seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030, reflecting a global commitment to using education as a vehicle for sustainable development, equity, and social inclusion (UNESCO, 2025a). UNESCO's Education for Sustainable Development 2030 (ESD2030) agenda further highlights the role of innovative pedagogies and digital technologies in developing learners' competencies to address complex, interconnected global challenges. In accordance with this framework, digital game-based language learning (DGBLL) has emerged as a promising pedagogical approach that provides an engaging, learner-centred environment and addresses the SDG goals through the development of ICT skills and quality learning engagement in the learning process (UNESCO, 2025b).

Malaysia's educational policy is consistent with the global shift towards digital and innovative pedagogy. The Malaysia Educational Blueprint 2013-2025 emphasises the incorporation and application of 21st century competencies, critical and creative thinking skills, and technology-enhanced learning practices to prepare learners for the demands of an evolving labour market. Innovative and technology-enhanced learning tools such

as digital platforms are recognised as part of the national education agenda to enhance student engagement, achievement, and learning relevance across subjects, including languages (Ministry of Education Malaysia, 2023). Studies conducted in Malaysian classrooms indicate positive perspectives among learners towards digital game-based activities, suggesting higher motivation and engaged involvement in language and content learning (Ab Rahman & Kasim, 2025). This suggests that DGBLL is an approach that is both practical and engaging for achieving global and national educational goals.

Despite increasing interest in DGBLL for language education, most studies have focused on general outcomes such as motivation, participation, and overall performance, rather than exploring feedback as a key instructional element within DGBLL environments (Zakaria & Zakaria, 2025). Although systematic reviews show that DGBLL can improve learner engagement and achievement across different language contexts, including EFL classrooms, there is still very little research that systematically identifies the types of feedback used, how they are implemented, and their effectiveness (Li & Kushairi, 2025). Studies that do examine feedback tend to focus on isolated forms, such as corrective responses or basic game scores, without considering how feedback supports the development of specific language skills across various tasks and learner groups. Recent research also highlights the value of more specific feedback strategies. For instance, interactional feedback can strongly support learning in DGBLL; however, other types of feedback beyond simple corrections remain largely unexplored (Alghamdi, 2025). This lack of comprehensive investigation hinders the creation of strong theoretical and practical frameworks to guide educators, designers, and policymakers in utilising feedback effectively as part of DGBLL.

To address these gaps, the present systematic literature review adopted a PRISMA framework to synthesise evidence on corrective feedback in DGBLL for language learning. The review aimed to categorise the types of feedback, evaluate their effectiveness, and identify which language skills benefit most, particularly in pre-university contexts. Specifically, the study was conducted to answer the following questions:

1. What types of feedback have been implemented in digital game-based environments for language learning?

2. How does feedback in digital game-based environments affect language learning outcomes?

3. Which language skills benefit most from feedback in digital game-based contexts?

By consolidating current evidence, this study contributes to the literature on DGBLL and language learning while providing practical insights for educators and instructional designers. Ultimately, the findings will inform evidence-based practices that maximise the pedagogical potential of feedback within game-based learning, advancing both theory and practice in technology-mediated language education.

LITERATURE REVIEW

Trends in Feedback

Feedback is an important method for linguistic development in the field of second language acquisition (SLA). It functions as the main tool that learners can use to check their own performance, correct mistakes, and improve their learning strategies, rather than using it as a secondary effect of teaching. It is also an essential element for language learning that can immediately stimulate both learners' engagement and high levels of proficiency. Successful feedback is highly dependent on precision. When the feedback is delivered promptly and addresses specific needs, it can improve learners' grammatical accuracy, fluency, and communication skills (Li et al., 2025).

Even though feedback is commonly used in the field of SLA, the impact of feedback varies across teaching methods. Empirical data from high-impact studies suggest that different delivery styles, ranging from implicit prompts to explicit descriptive corrections, provide varied results in terms of learners' self-regulated growth (Nakata et al., 2025). Nakata et al. (2025) also suggest that immediate corrective feedback is effective for active

communication settings because it enables learners to correct themselves, which can lead to better language outcomes in real time.

Furthermore, ensuring alignment between actual feedback practices and learners' preferences is essential. Research indicates that a feedback gap can occur when corrective styles are incompatible with a learner's personal preferences (Farangi et al., 2025). In the event of a mismatch, motivation can be restrained, which can impede overall achievement. Thus, feedback should not be considered as the main solution but instead should be carefully adjusted to match the individual learner's needs and specific pedagogical goals.

Trends in Digital Game-based Learning

Digital game-based learning (DGBL) combines interactive learning with educational content to help improve learners' engagement and academic results. In recent studies conducted between 2020 and 2025, the findings indicated that DGBL can help improve motivation and participation across various subjects, including the acquisition of vocabulary and language development (Zakaria & Zakaria, 2025; Morales & Catillo, 2024). Research shows that digital games offer immersive environments where learners can practise their language skills through meaningful tasks. These contextualised experiences encourage deeper cognitive processing and help learners stay focused for long periods (Zakaria & Zakaria, 2025). Szilagyi et al. (2025) asserted that these methods often help improve memory retention and learner satisfaction, which can lessen the anxiety that many learners face when using traditional study methods.

The significance of DGBL is further emphasised by its ability to cater to personalised learning needs. Incorporating methods such as instant feedback (Szilagyi et al., 2025) and progress tracking allows for a more adaptive and interactive educational experience. This ability to become flexible makes DGBL a highly versatile tool in contemporary teaching environments. Therefore, integrating game-based elements into the curriculum is a powerful way to cater to learners' involvement and understanding.

Reviews on Feedback in Digital Game-based Language Learning

While the advantages of feedback and the rise of DGBL have been documented in past research, few studies have explored how they impact language learning outcomes. Early researchers indicate that when feedback is carefully incorporated into game mechanics through scores, hints, corrective prompts, and adaptive responses, it can significantly improve both learners' involvement and learning achievement. To illustrate, feedback that is present in a digital game environment often supports both teaching practices and learning communication. The research by Alghamdi (2025) suggested that traditional methods or conventional methods can be less effective compared to rich and context-specific feedback in games at encouraging learners to accept and use the new information.

Systematic analyses also show that the success of digital games depends heavily on how well the feedback and game design align with the actual goals of the lesson, validating the claim that feedback is a fundamental part of DGBL rather than just an extra feature (Zakaria & Zakaria, 2025; Tian & Umar, 2025). This shows a prominent gap in current literature. Even though feedback and DGBL each can promote the acquisition of language on their own, there is still a clear need for further research to identify the different types of feedback in digital games. Developing a clearer understanding of how these tools can impact different language skills can assist educators in creating more advanced instructional models and help guide future research.

Theoretical Framework: Technology-Enhanced Feedback Model in DGBLL

This systematic review utilises Van der Kleij et al.'s (2015) technology-enhanced feedback framework as shown in Figure 1, which defines feedback as a pedagogically designed process within digital learning environments. The effectiveness of feedback, as highlighted in the framework, is influenced by timing, content, mode of delivery, and adaptability. Van der Kleij (2020) emphasises learner engagement with feedback as an interactive process in which students actively analyse and use digital input to enhance performance and learning outcomes. These aspects are especially important in DGBLL since feedback is integrated into gameplay and learner engagement. Learners' motivation, cognitive engagement and language development are affected by how

feedback is delivered, as immediate corrective feedback, multimodal feedback, AI-driven feedback, and social feedback each produce different effects on learning outcomes. Guided by this framework, the present review examines how various feedback strategies contribute to vocabulary acquisition, grammatical progress, speaking proficiency, and learner engagement in DGBLL environments.

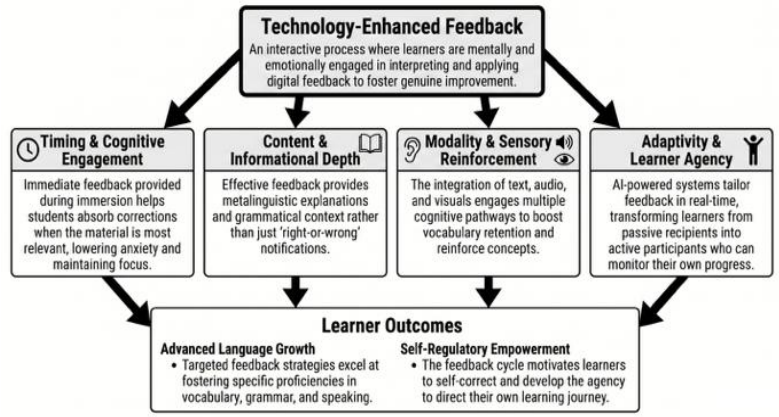

Figure 1 Technology-Enhanced Feedback Framework in DGBLL

Note. Adapted from Van der Kleij et al. (2015) and Van der Kleij (2020)

METHODOLOGY

Design of the Study

This study was conducted using a systematic literature review design, which fully adheres to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to guarantee transparency, replicability, and methodological rigour. The PRISMA Method comprises four processes: identification, screening, eligibility, and inclusion, as shown in Figure 2. Therefore, the process of the systematic review to achieve the goal of this study is as follows:

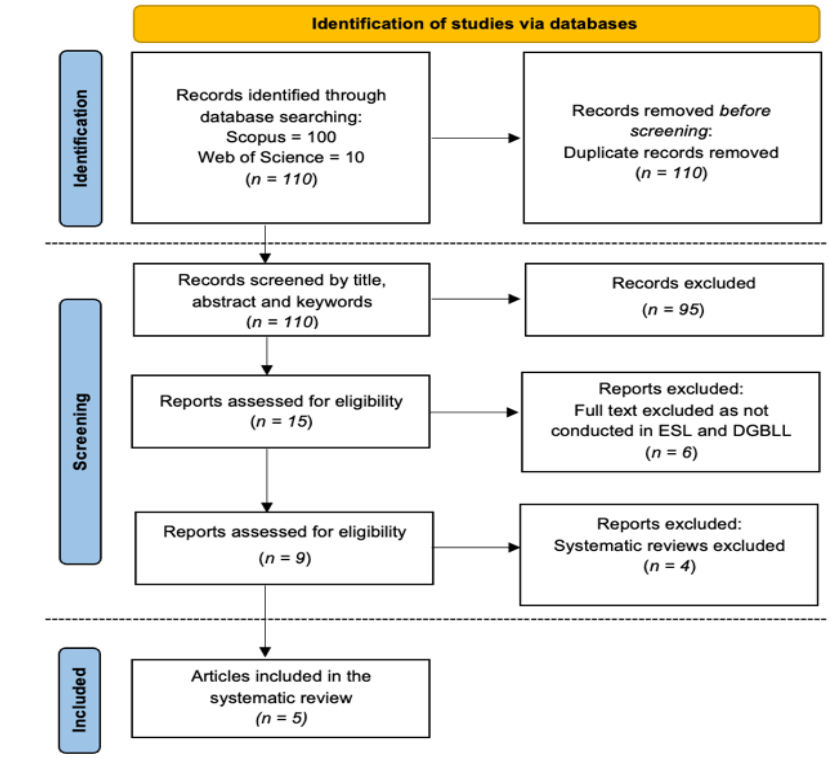

Figure 2 PRISMA systematic review adapted from Rafiq et al. (2021)

Identification

Scopus and Web of Science (WoS) were selected as the primary databases for this review as they are among the two most widely used multidisciplinary databases for indexing peer-reviewed research. Their broad journal coverage and complementary indexing improve the breadth of literature retrieval, as each database includes journals that may not be covered by the other (Mongeon & Paul-Hus, 2016; Singh et al., 2021). Furthermore, their extensive use in systematic literature reviews supports their suitability for identifying high-quality evidence (Zhu & Liu, 2020).

The key terms for this systematic review were selected to represent the key constructs related to feedback and DGBLL. The complete search strings applied to each database are given below.

Table 1 Search strings used in this study

Database	Search String
Scopus	TITLE-ABS-KEY ("feedback") AND ("digital game-based" OR "game-based learning" OR "game-integrated") AND ("english language skill*" OR "English as a second language" OR EFL OR ESL "English language learning")
Web of Science (WoS)	TS=("feedback") AND TS=("digital game-based" OR "game-based learning" OR "game-integrated") AND TS=("english language skill*" OR "English as a second language" OR EFL OR ESL OR "English language learning")

Through the identification process using the search strings, 110 articles were identified, and no duplicates were found.

Screening

The next step is the screening process, where 110 articles were screened by title, abstract, and keywords for relevance to feedback and DGBLL. From this process, 95 articles were excluded through the inclusion and exclusion criteria, as shown in Table 2. Following this, 15 articles were reviewed, and 6 articles were further excluded due to their lack of relevance to the study.

Table 2 Inclusion and exclusion criteria

Inclusion Criteria	**Exclusion Criteria**
Studies conducted between 2020 and 2026 (6-year timespan)	Studies conducted before 2020
Article from journals	Conference proceedings, review articles, book chapters, reports
The text was written in English	Text not written in English
Related to feedback and Digital Game-based Language Learning (DGBLL)	Not related to feedback and Digital Game-based Language Learning (DGBLL)

Included

Based on the inclusion and exclusion criteria, five articles were chosen: three from Scopus and two from WoS. All included studies aligned with the review's focus on feedback and DGBLL in educational settings that include universities and schools.

Table 3 Summary of selected studies

Study / Data Base	Aim	Game Type	Sample	Findings
Alshabeb (2024) (Scopus)	To investigate the impact of video games on vocabulary acquisition and identify students' perception and preferences regarding the usage of video games	Video games (vocabulary tasks embedded in gaming activities)	100 university students ranging from 18 to 24 years old	Students gained more vocabulary, reported higher engagement, motivation and lower anxiety and perceived the usage of games positively.
Pituxcoosuvarn et al. (2025) (Scopus)	To examine the use of a system that combines taboo game, speech recognition technology, and a large language model in supporting students' spontaneous speaking ability	Interactive Taboo-style speaking game integrated with automatic speech recognition and large language model prompts	Four university students who are non-native English speakers	The proposed system was shown to provide users with a positive and less anxiety-inducing language learning experience while enhancing vocabulary acquisition and pronunciation.
Syawaluddin & Aeni (2025) (Scopus)	To investigate the effectiveness of digitalised traditional games in improving students' vocabulary acquisition	Digitalised traditional board-game (Snakes & Ladders style) with vocab tasks	30 ESL primary school students with 18 boys and 12 girls, ages ranging from 8-9 years	Students showed a significant improvement in vocabulary post-test and their engagement level increased.
Kazu & Kuvvetli (2023) (WoS	To examine the effectiveness of a game-like quiz on vocabulary acquisition	Quizziz	69 EFL learners ages ranging from 12-14 years old	The experimental group outperformed control group on the vocabulary test and the students reported having higher motivation as they received rapid feedback.
Rad (2021) (WoS)	To evaluate the use of mobile-based game apps on grammar achievement and attitudes	Game-based tasks embedded into flipped learning activities	66 EFL female learners	The experimental group improved more on grammar and showed more motivation than the control group as collaborative learning made them less anxious and they engaged positively.

Data Analysis Procedure

All selected articles were exported to the Mendeley referencing software. Subsequently, thematic analysis was conducted to identify recurring patterns and themes related to the objectives of the study. The thematic analysis was conducted inductively, allowing feedback categories to emerge from the reviewed studies. Subsequently, Van der Kleij's (2020) technology-enhanced feedback framework was used as a theoretical lens to interpret the findings and explain the pedagogical significance of the identified feedback types. For the first research question, the types of feedback implemented in digital game-based language learning environments were identified based on the feedback mechanisms reported in each study. The identified feedback types were then grouped into

recurring categories that emerged from the data. For the second research question, the effects on language learning outcomes were examined. Focus was given on its impact on certain areas such as vocabulary acquisition, grammar accuracy, and speaking fluency. The final research question analysed the language skills that benefit the most from feedback in digital game-based contexts. The skills were categorised according to those clearly targeted or measured in the reviewed studies (e.g., speaking, writing, reading, and listening). The synthesis of findings from the articles is presented in the following section.

FINDINGS AND DISCUSSION

In this systematic review, the feedback types that emerged were categorised into (1) immediate corrective feedback, (2) metalinguistic corrective feedback, (3) automated and AI-driven feedback, (4) multimodal feedback, and (5) social feedback. Table 4 below shows the categories with the respective articles used in this study.

Table 4 Types, frequencies, and definitions of feedback used

Type and Frequency (n)	Studies	Explanation
Immediate corrective feedback (3)	Alshabeb (2024); Syawaluddin & Aeni (2025); Kazu & Kuvvetli (2023)	Feedback provided during a learning task or immediately after an error is made, allowing learners to notice and correct errors in real time. Immediate corrective feedback monitors performance in real-time and enables players to recognise errors and correct them instantly (Tariq & Shah, 2024; Li et al., 2025)
Metalinguistic corrective feedback (1)	*None system-embedded*; partial: Rad (2021)	Provides learners with clues and explanations about language rules, grammatical structures, and errors to help them understand and self-correct their language use, thereby promoting deeper language awareness (Ellis, 2008; Wesenberg, 2026).
Automated and AI-driven feedback (1)	Pituxcoosuvarn et al. (2024)	The use of digital systems through algorithms, artificial intelligence (AI) and natural language processing technologies to automatically provide feedback (Cavalcanti et al., 2021; Deeva et al., 2021; Lee & Moore, 2024).
Multimodal feedback (4)	Alshabeb (2024); Syawaluddin & Aeni (2025); Kazu & Kuvvetli (2023); Pituxcoosuvarn et al. (2024)	Combines multiple communication modes, such as text, visual cues, sounds, animations, and icons, to enhance learners' understanding of feedback and support improvement in their performance during gameplay (Froelich & Guias, 2021; Jiang et al., 2024).
Social feedback (1)	Rad (2021); Syawaluddin & Aeni (2025)	Refers to information, comments, or evaluations provided by teachers, peers, or other individuals that help learners reflect on their behaviours, understanding, and performance through discussion, clarification, and social interaction (Brudner et al., 2023; Alghamdi, 2025; Gorham et al., 2025).

It should be noted that several studies incorporated more than one type of feedback. Accordingly, feedback types in this review were not treated as mutually exclusive categories. Data from all the studies were coded according to the feedback types used. Each study was allowed to contribute to multiple categories of feedback types in DGBLL, underscoring its dynamic nature, as feedback can be provided through a blend of pedagogical functions, deliveries, and modalities. For instance, multimodal feedback was recurrently identified with corrective feedback. As a result, even though multimodal feedback was the most highly reported type of feedback in the

reviewed studies (n = 4), it mainly functioned as a delivery modality as opposed to being an independent pedagogical feedback mechanism. Immediate corrective feedback (n = 3), on the other hand, was identified as the dominant functional feedback, with multimodal elements commonly implemented to enhance the perceptual prominence and immediacy of corrective feedback information.

(1) Immediate corrective feedback

This review revealed that immediate corrective feedback was the most prominent feedback type in DGBLL, especially for games that focus on vocabulary building. Although multimodal feedback was identified in a larger number of studies, it frequently functioned as a delivery modality through which corrective information was communicated. As shown in Table 4, three articles (Alshabeb, 2024; Syawaluddin & Aeni, 2025; Kazu & Kuvvetli, 2023) explicitly implemented immediate corrective feedback in DGBLL environments. Alshabeb (2024) documented the implementation of immediate in-game corrective and confirmatory feedback in vocabulary-focused video games, in which learners received instant confirmation of their answers during gameplay. Comparably, Syawaluddin and Aeni (2025) also used immediate corrective feedback in their study, which digitalised the Snakes and Ladders game, allowing primary EFL learners to receive immediate responses to tasks that focus on vocabulary. Finally, Kazu and Kuvvetli (2023) also employed rapid in-game feedback through the Quizizz platform. Students indicated higher motivation, enjoyment, rapid feedback and competition. Instant indicators of correctness and competitive scoring mechanisms strengthened players' awareness of their own performance. Taken together, the three studies on immediate corrective feedback indicate that it is a frequently implemented type of feedback in DGBLL environments, particularly for vocabulary learning.

(2) Metalinguistic corrective feedback

In this review, the systematic analysis (as shown in Table 4) revealed that metalinguistic corrective feedback was not observed in any of the five studies as a system-embedded or automated feature within the digital game systems. However, some evidence of metalinguistic support was observed in Rad (2021), whose study examined a digital game-based flipped learning approach for grammar instruction. In this study, grammatical explanations were provided through reflection, discussions, collaborative activities, and teacher scaffolding rather than through the game system. In other words, explanations of the grammatical rules were human-mediated, not system-generated. Learners participated in metalinguistic reflection during group discussion sessions and teacher-led feedback, and this helped with their understanding of grammatical rules. The feedback was delivered externally to the game environment and was not embedded within the game mechanics. Therefore, these results highlight a significant omission in DGBLL design, which is the lack of an integrated, system-generated metalinguistic feedback mechanism. Because none of the reviewed designs implemented such features and preferred to opt for feedback delivered externally to the game environment, players were rarely prompted to engage in the metalinguistic reflection required for grammatical accuracy. Consequently, current DGBLL environments may fail to adequately support complex linguistic development.

(3) Automated / AI-driven feedback

The literature review further revealed automated or AI-driven feedback as an emerging but underutilised type of feedback in DGBLL. As shown in Table 4, only one out of five of the articles reviewed explicitly incorporated this type of feedback. Pituxcoosuvarn et al. (2024) developed Taboo Talks, a digital speaking game that incorporated large language models and automatic speech recognition technologies to provide learners with formative feedback in real-time during gameplay. Through prompts generated through the system and the feedback received by learners based on their spoken input, the game scaffolded language production and encouraged continued speaking practice. The AI-driven feedback served as an interactive conversational partner that directed the output of the learners rather than just providing the information, indicating whether a response was correct or incorrect. The integration of this type of feedback improved the engagement of learners and contributed to the development of productive language skills, particularly speaking. By responding to learners' verbal output, the system encouraged them to adjust and refine their language use, thus increasing their awareness of their performance. However, Pituxcoosuvarn et al. (2024) highlighted several technical limitations, such as speech recognition accuracy and the reliability of AI-generated responses. These limitations highlight the need for further refinement to improve both pedagogical effectiveness and precision of AI-driven feedback.

Overall, the findings suggest that automated and AI-driven feedback is still in the preliminary stages of adoption in DGBLL research and remains underexplored. Its application in the real world is limited compared to immediate corrective feedback. Nonetheless, the study demonstrates the potential benefits of AI-driven feedback in supporting productive language skills, specifically speaking, and highlights an important direction for the future development of adaptive and interactive feedback systems in digital game-based language learning environments.

(4) Multimodal feedback

Another type of feedback that emerged from this systematic review study was multimodal feedback. Table 4 shows that out of the six reviewed studies, four studies, namely Alshabeb (2024), Syawaluddin and Aeni (2025), Kazu and Kuvvetli (2023), and Pituxcoosuvarn et al. (2024) incorporated elements of multimodal feedback. Out of the four, two of these studies explicitly utilised multimodal feedback as part of their digital game-based interventions. Alshabeb (2024) integrated visual and contextual in-game feedback for activities that focused on vocabulary learning. In these activities, learners received immediate visual confirmation and contextual cues embedded within the game. Similarly, Syawaluddin and Aeni (2025) utilised visual board game elements and digital responses in a digital version of Snakes and Ladders. This allowed learners to interpret feedback through a combination of visual prompts and on-screen messages. What these findings show is that multimodal feedback is predominantly used to support the learning of vocabulary, or specifically in DGBLL environments where visual reinforcement and contextualisation contribute greatly to learning. In addition, the study by Kazu and Kuvvetli (2023) also implemented this type of feedback, but in a less explicit way. On their Quizizz platform, learners are provided with instant correctness indicators, animations, and competitive visual elements. Meanwhile, Pituxcoosuvarn et al. (2024) expanded the use of multimodal feedback beyond visual stimuli by integrating text-based AI prompts with spoken interaction. Visual and auditory modalities were also incorporated to support speaking practices in a game-based setting. The findings further indicate that multimodal feedback was rarely implemented as a standalone feedback type. Instead, it was most often combined with immediate corrective feedback and served as a delivery mechanism to enhance the salience and timeliness of corrective information. The studies generally employed multimodal feedback to reinforce function as opposed to providing a deeper explanatory guidance, indicating that even though modality diversity is common, the pedagogical depth of such feedback remains limited.

(5) Social feedback

From this review, social feedback was used in a small number of digital game-based language learning environments, predominantly through interactions mediated by teachers or peers strategically embedded within a hybrid of game-based instructional designs. Table 4 indicates that two of the five reviewed studies integrated social feedback, namely Rad (2021) and Syawaluddin and Aeni (2025). In the study by Rad (2021), social feedback was incorporated within a digital game-based flipped learning model for a grammar lesson where learners had to participate in activities that required collaboration and reflective discussions. At the same time, guidance and explanations in relation to grammatical rules were provided by the teachers. This type of feedback enhanced learners' metalinguistic awareness and grammatical accuracy. However, this was presented through instructional interaction instead of being embedded directly within the actual digital game system. In comparison, Syawaluddin and Aeni (2025) implemented social feedback together with immediate in-game feedback in a digitalised Snakes and Ladders game for vocabulary learning.

DISCUSSION

Types of Feedback Implemented in DGBLL

This review synthesised the current evidence on feedback mechanisms used in digital game-based language learning (DGBLL). Recent systematic reviews have generally reported that DGBLL enhances learner engagement, motivation, and language learning outcomes across a range of educational contexts (Reinhardt & Bain IV, 2026). The present review extends these findings by demonstrating that the effectiveness of DGBLL is influenced not only by game design but also by the type and design of feedback embedded within the learning

environment. In particular, immediate corrective feedback emerged as the most frequently implemented feedback mechanism, whereas adaptive AI-driven and metalinguistic feedback remain underrepresented.

To answer the first research question, the findings revealed that existing DGBLL reported in literature primarily utilised immediate corrective feedback and multimodal feedback compared to metalinguistic corrective feedback and automated/AI-driven feedback, highlighting the limited use of these two types of feedback. Social feedback was also identified but was mainly used as a secondary support mechanism.

Although multimodal feedback was identified in more studies than immediate corrective feedback, its role differed conceptually. Multimodal feedback primarily refers to the mode in which feedback is delivered, such as through text, audio, visual cues, animations, and icons. In contrast, immediate corrective feedback represents the pedagogical function of providing learners with real-time information regarding the correctness of their responses. In the reviewed studies, multimodal feedback was frequently used to support and reinforce immediate corrective feedback rather than functioning independently. Consequently, immediate corrective feedback may be considered the dominant functional feedback mechanism, whereas multimodal feedback serves mainly as a delivery method that enhances learner engagement and the salience of corrective information.

Immediate corrective feedback emerged as the dominant feedback mechanism, particularly in vocabulary-focused games. This corroborates previous research showing that prompt feedback is crucial for helping learners identify errors and engage in immediate self-correction (Li et al., 2025; Nakata et al., 2025). The predominance of immediate corrective feedback may also reflect broader trends in DGBLL design. Govender and Arnedo-Moreno (2021) observed that many DGBLL applications rely on relatively simple game design elements that prioritise rapid responses, rewards, and learner engagement. Consequently, immediate corrective feedback is easier to integrate into these game structures than more sophisticated feedback approaches, such as adaptive or metalinguistic feedback. From a theoretical perspective, this finding strongly reflects Van der Kleij's (2020) principle of timing and cognitive engagement, as digital games are designed to trigger feedback precisely when the learner is most cognitively receptive. Similarly, multimodal feedback was also commonly adopted and frequently paired with immediate feedback. This approach utilises the capabilities of digital platforms to synthesise visual, textual, and auditory elements that enhance the prominence of feedback and increase learner engagement. However, the findings indicate that multimodal feedback is seldom employed on its own or for elaborate functions, as the digital features integrated are often limited to focusing on correctness-based feedback instead of promoting deeper learning, skill development, and conceptual understanding.

In contrast, the reviewed studies revealed a lack of system integration for metalinguistic corrective feedback. Although metalinguistic explanations were provided through teacher intervention in Rad (2021), the game platform was not equipped with embedded mechanisms to generate relevant feedback. This finding highlights the gap between recommendations and their practical implementation in DGBLL environments. Van der Kleij's technology-enhanced feedback framework emphasises informational depth and metalinguistic awareness as important characteristics of effective feedback. This suggests that current DGBLL designs have not fully utilised technological capabilities to support linguistic comprehension. The absence of system-embedded metalinguistic feedback may also reflect the broader emphasis of DGBLL on maintaining gameplay and learner engagement. As noted by Govender and Arnedo-Moreno (2021), many DGBLL environments prioritise game mechanics that sustain motivation and participation rather than instructional features that promote deeper linguistic reflection. Consequently, developers may favour simpler corrective feedback that preserves game flow over more sophisticated metalinguistic explanations, which require greater instructional design and technological integration. This limitation is also evident in the limited implementation of automated and AI-driven feedback. Only Pituxcoosuvarn et al. (2024) incorporated this approach, further demonstrating that such strategies remain in the early stages of integration into DGBLL systems.

Although AI-driven feedback aligns closely with the framework's emphasis on adaptability and learner autonomy, technical and pedagogical constraints may limit its broader implementation. Beyond issues such as speech recognition accuracy and the reliability of AI-generated responses, recent research suggests that AI-supported language learning is most effective when combined with teacher scaffolding rather than functioning as a standalone instructional tool (Ma & Chen, 2025). This indicates that, despite its potential to deliver adaptive and personalised feedback, AI should complement rather than replace teacher guidance in DGBLL

environments. Similarly, social feedback was primarily implemented as a supplementary feature in hybrid learning designs, supporting learners through clarification, discussion, and affective encouragement. However, this form of feedback was rarely embedded within the digital game itself, instead relying on teachers or peers to facilitate interaction and bridge the gap between gameplay and language learning.

How Feedback Affects DGBLL Outcomes

To address the second research question, the findings indicate that feedback is an effective catalyst for DGBLL, particularly in heightening motivation and engagement, significantly lowering learner anxiety, and demonstrating measurable improvements in task-specific performance. However, the extent and nature of these effects are influenced by the specific type of feedback applied. Immediate corrective feedback was consistently linked with improvements in vocabulary acquisition and task performance. These findings are consistent with previous studies, indicating that immediate feedback facilitates learners' ability to identify errors and modify their responses in real time, particularly in form-focused activities (Nakata et al., 2025). The real-time nature of game-based environments mitigates learner anxiety, increases motivation, and promotes persistent involvement as illustrated in the DGBLL studies (Liu & Hwang, 2023; Morales & Castillo, 2024; Zakaria & Zakaria, 2025; Szilagyi et al., 2025). Multimodal feedback further enhances these outcomes by increasing learners' attention more effectively and strengthening learning through the integration of multiple sensory modalities. Nevertheless, the finding suggests that such feedback mechanisms prioritise the reinforcement of basic cognitive functions (recognition and recall) over the cultivation of profound, integrated understanding. This limitation reflects a discrepancy from Van der Kleij's (2020) emphasis on feedback that fosters learner reflection and self-regulation rather than solely verifying correctness.

AI-driven feedback has yielded positive outcomes in speaking performance through its adaptive prompts and interactive scaffolding. AI-based systems facilitated learners' output and promoted continued language production, contributing to the development of productive language skills in contrast to traditional corrective feedback. Despite the promising effects, based on evidence gathered from the lack of comprehensive studies and reported technical challenges, AI feedback is highly context-dependent and warrants further empirical investigation. As proposed by Nguyen et al. (2023) ChatGPT is currently insufficient as an autonomous instructional tool, although it is equipped with generative capabilities; the output provided needs to be verified by subject matter experts to ensure accuracy and reliability. Furthermore, while social feedback was found to significantly enhance grammar acquisition outcomes for younger learners by providing affective support and personalised explanations, it remained a secondary, external mechanism. These findings are aligned with established literature on SLA, emphasising the role of interaction and affective support in language learning. However, due to its reliance on human participants, social feedback lacks the extensibility and automated consistency of other DGBLL feedback types, limiting its application in fully digital contexts.

Language Skills That Benefit Most From DGBLL Feedback

The review clearly demonstrates that vocabulary acquisition is the language skill most positively influenced by feedback in DGBLL contexts, followed by speaking, while grammar receives relatively limited systematic support. On the other hand, reading and listening skills remain largely underexplored. Vocabulary acquisition with immediate corrective and multimodal feedback emerged as a highly effective strategy for consolidating learners' ability to recognise and remember new terms. This pattern reflects the compatibility of vocabulary tasks with game-based formats, as well as the relative ease of integrating correctness-based feedback into gameplay mechanics. This is in line with existing DGBLL studies that integrate vocabulary as the most frequently used skill in digital games for language learners (Morales & Castillo, 2024; Tian & Umar, 2025).

Similarly, speaking skills also benefit from two feedback mechanisms, AI-driven and multimodal, where learners receive adaptive prompts and real-time interaction while participating in the digital game. This feedback helps enhance learners' fluency and their willingness to speak as they are encouraged to sustain their language production. This is consistent with Van der Kleij's (2020) principle of learner agency and self-regulation. Yet, the feedback given in the digital game is only able to assist the learners in their speaking production, but not in output accuracy. Unlike vocabulary acquisition skills, the relatively small number of speaking-focused studies indicates that this area remains insufficiently explored.

Positive outcomes in grammar learning were observed only when instructions were supported by social or externally mediated metalinguistic feedback rather than system-embedded mechanisms. In the systematic review conducted by Öztürk-Taş et al. (2025), one of the challenges of gamifying grammar was the lack of immediate teacher feedback, as learners miss learning opportunities when instructors do not provide timely explanations of errors. This issue may illustrate why grammar outcomes are less consistently reported than vocabulary development, as there is a limited integration of embedded metalinguistic feedback within DGBLL environments, as mentioned by Liu and Hwang (2023).

Overall, the reviewed studies indicate that current DGBLL feedback practices emphasise timely correction and learner engagement, but limited attention has been given to metalinguistic awareness and self-regulated learning. The findings highlight that the game designs adopted in the reviewed studies tend to prioritise feedback that is easy to implement and motivating, rather than feedback that fosters sustained language acquisition. These notable findings show that there is a need for more adaptive and linguistically informative feedback mechanisms for the design of future DGBLL.

Implications for Instructional Design and Classroom Practice

The findings of this study have several implications for educators, instructional designers, and game developers involved in digital game-based language learning (DGBLL).

First, the consistent use of immediate corrective feedback across the reviewed studies suggests that providing learners with a timely response during gameplay can support vocabulary acquisition, improve engagement, and reduce learning anxiety. Therefore, educators should integrate immediate corrective feedback into digital learning activities to help learners recognise and correct errors while maintaining motivation and active participation. However, corrective feedback should be specific and informative rather than limited to indicating whether an answer is correct or incorrect.

From an instructional design perspective, the review highlights the need to move beyond simple correctness-based feedback by incorporating metalinguistic explanations into DGBLL environments. Although immediate CF effectively supports performance, it provides limited opportunities for learners to understand the linguistic principles underlying their errors. Embedding concise grammatical explanations, contextual examples, reflective prompts, and adaptive hints with digital games may encourage deeper language processing and promote longer-term language development. Such features can help learners develop metalinguistic awareness while preserving the engaging nature of game-based learning.

Finally, although AI-driven feedback remains relatively unexplored, it shows considerable potential for supporting productive skills, particularly speaking. Rather than replacing teachers, AI should be viewed as a complementary instructional tool capable of providing immediate, personalised, and adaptive feedback during gameplay. Teachers continue to play a vital role in clarifying complex language concepts, addressing misconceptions, and providing affective support that current AI systems cannot consistently replicate. Future DGBLL environments should therefore combine AI-supported feedback with teacher guidance to maximise both pedagogical effectiveness and learner engagement.

Limitations and Future Studies

This review has a few limitations that should be considered when interpreting the findings. The first limitation is that the search was limited to Scopus and Web of Science (WoS). These databases were selected due to their broad coverage of peer-reviewed journals and their widespread use in systematic literature reviews. Their inclusion supports the transparency and reproducible search process. However, although these databases provide extensive multidisciplinary coverage, relevant studies indexed exclusively in other databases may not have been captured.

Secondly, since only peer-reviewed journal articles were indexed in these databases, relevant studies published in conference proceedings, edited volumes, doctoral theses, institutional repositories, and regional journals may

not have been captured. In technology-enhanced language learning, this issue is especially important because innovative digital tools, artificial intelligence applications, and game-based platforms are often first reported in conference papers or specialised publications before appearing in indexed journals.

Finally, only five studies met the inclusion criteria. This reflects the emerging nature of research on feedback mechanisms in DGBLL, but the limit in the number of studies restricts the breadth of evidence available for comparison. As a result, the findings should be interpreted as representing current trends rather than providing definitive conclusions about the effectiveness of all feedback types in DGBLL.

In the future, systematic reviews should expand the search to additional databases, include a wider range of publication sources where appropriate, and continue examining emerging feedback approaches. Research should also develop more standardised frameworks for categorising and reporting feedback in DGBLL to improve consistency across studies. Future studies should extend beyond the current emphasis on vocabulary and grammar to explore speaking, listening, reading, and pronunciation skills while also exploring the effectiveness of AI-driven feedback systems across different learner populations and learning contexts. These efforts would contribute to a more comprehensive understanding of how feedback can be effectively designed and implemented in DGBLL environments.

CONCLUSION

This systematic review explored how corrective feedback is used in DGBLL and what impact it has on language learning outcomes. The results show that immediate corrective feedback is the most used type, especially in vocabulary-focused games, giving learners instant information about whether their answers are correct and helping them fix mistakes right away. Multimodal feedback, which combines text, audio, and visual cues, was also widely applied, often alongside immediate feedback, making learning more engaging and easier to understand. On the other hand, metalinguistic feedback, which explains the rules behind language errors, was rarely built into the game, appearing only through teacher guidance or group discussions. Other feedback types, like automated/AI-driven feedback and social feedback, were less frequent but showed promise in creating adaptive, interactive, and collaborative learning experiences.

Overall, these findings suggest that while DGBLL provides helpful feedback for vocabulary and basic language tasks, it often focuses on immediate correctness and motivation rather than a deeper understanding of language structures. System-generated metalinguistic feedback, in particular, is still lacking, limiting opportunities for learners to reflect on and internalise complex language rules. This review highlights the need for game designers and educators to think beyond quick corrections and consider incorporating a wider variety of feedback that supports meaningful learning. By doing so, digital games can become not only more engaging but also more effective for developing a full range of language skills.

Beyond identifying the feedback mechanisms currently used in DGBLL, this review demonstrates that the design of feedback is a critical yet comparatively underexplored dimension of digital game-based language learning. By synthesising evidence across existing studies, the review provides a clearer understanding of how different feedback mechanisms support language learning outcomes while identifying important gaps in the implementation of metalinguistic, adaptive, and AI-driven feedback. These findings offer practical guidance for educators, instructional designers, and game developers seeking to create more pedagogically effective DGBLL environments and provide a foundation for future research into richer, learner-centred feedback systems.

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