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Google Sites-Based Interactive Learning Media to Improve Junior High School Students' English Vocabulary Mastery: A Literature Review

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Abstract: *This study aims to analyze and synthesize previous research on the use of Google Sites and interactive learning media as a foundation for improving junior high school students' English vocabulary mastery. This study employed a literature review method with a descriptive qualitative approach. The data consisted of 23 journal articles published between 2020 and 2026 and retrieved through Google Scholar, the Garuda Portal, and the Directory of Open Access Journals (DOAJ). The articles were selected based on their relevance to Google Sites, interactive learning media, English language learning, and vocabulary mastery. The data were analyzed by selecting relevant information, categorizing articles according to similar topics, comparing the findings, and constructing a narrative synthesis. The findings indicate that interactive learning media can improve students' vocabulary mastery, motivation, engagement, and learning independence. Google Sites has the potential to support vocabulary learning by integrating text, images, pronunciation audio, videos, example sentences, interactive exercises, and assessments into an accessible platform. However, studies specifically developing interactive Google Sites media to improve junior high school students' English vocabulary mastery remain limited. Therefore, the media should be developed according to students' characteristics and evaluated in terms of validity, practicality, and effectiveness.*

Keywords: *Google Sites; Interactive Media; Junior High School Students; Vocabulary Mastery*

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1. INTRODUCTION

English is a crucial subject for students to master in order to face the development of science, technology, and global communication (Nurlita et al., 2024). English language proficiency is determined not only by an understanding of grammar but also by a broad vocabulary (Hafman, 2022). Vocabulary is a fundamental element that supports listening, speaking, reading, and writing skills. Students with limited vocabulary tend to have difficulty understanding texts, following instructions, conveying ideas, and constructing sentences in English (Meturan et al., 2021). Therefore, vocabulary mastery needs to be developed in a planned manner starting in junior high school (SMP). At SMP, students begin to be exposed to more diverse and complex English language materials. Students are not only required to recognize word meanings but also to understand spelling, pronunciation, word classes, and their use in sentences and communication (Ramdhan & Luwiti, 2025). However, studies conducted in Indonesian junior high schools have documented the continued use of translation and memorization in vocabulary instruction Miranda & Arianti (2024) found that translation was the most frequently used vocabulary teaching strategy at SMPN 264 Jakarta.

This learning pattern provides limited opportunities for students to interact directly with the vocabulary they are learning. As a result, students can memorize words quickly but struggle to use or recall them in

different contexts. This situation highlights the need for learning media that can present vocabulary visually, auditorily, contextually, and interactively. Learning media not only serves as a means of conveying information but can also attract attention, increase motivation, and provide opportunities for independent practice (Nurhidayati et al., 2023). Well-designed media can help students connect word form, meaning, pronunciation, and usage through more concrete learning experiences. Vocabulary mastery involves more than recognizing word meanings. According to Nation (2022), vocabulary knowledge encompasses three interconnected dimensions: form, meaning, and use. These dimensions include understanding a word's written and spoken forms, its meaning, and its appropriate use in grammatical and communicative contexts. Furthermore, Mayer (2020) Cognitive Theory of Multimedia Learning (CTML) explains how learners process and integrate verbal and visual information to construct meaningful knowledge. Drawing on these two theoretical perspectives, Google Sites has the potential to support vocabulary learning by integrating written words, illustrations, pronunciation audio, videos, contextualized example sentences, and interactive exercises. Such integration may provide opportunities for students to develop vocabulary knowledge across the dimensions of form, meaning, and use through structured multimedia learning experiences. In line with the Cognitive Theory of Multimedia Learning (Mayer, 2003), Google Sites can be used to integrate text, illustrations, pronunciation audio, videos, and example sentences within a single platform, while interactive exercises can provide additional opportunities for students to practice and apply vocabulary in meaningful contexts.

The integration of digital technology into vocabulary instruction offers opportunities to address the limitations of conventional learning approaches. Various instructional media, including visual materials, digital flashcards, gamified applications, audiovisual resources, and web-based platforms, provide different ways of presenting vocabulary and facilitating learning activities. These technologies can support the presentation of written and spoken word forms, contextualized meanings, pronunciation models, and opportunities for vocabulary practice. However, the educational value of digital media depends on how effectively their features align with vocabulary learning objectives, students' characteristics, and instructional strategies. Therefore, the selection and integration of learning technologies should emphasize meaningful interaction, contextual vocabulary use, and opportunities for practice and feedback rather than technological novelty alone.

Among the available digital platforms, Google Sites offers a flexible web-based environment for organizing and delivering multimedia learning resources. The platform allows teachers to combine textual explanations, images, pronunciation audio, videos, contextualized examples, and embedded interactive activities within an accessible learning environment. These features may support vocabulary instruction by connecting different aspects of word knowledge and facilitating independent learning. Nevertheless, the availability of multimedia features does not automatically guarantee improvements in vocabulary mastery. Their educational potential needs to be examined in relation to instructional design, learner needs, accessibility, and evidence from previous research. A critical synthesis of existing studies is therefore necessary to identify relevant design principles, methodological limitations, and areas requiring further investigation.

Although Google Sites has been explored as a digital learning platform across different educational levels and subject areas, evidence specifically addressing its application to English vocabulary learning among junior high school students remains limited within the reviewed literature. Previous studies on vocabulary instruction at this educational level have primarily examined visual media, flashcards, gamified applications, and other interactive learning approaches, while Google Sites research has frequently addressed different student populations or learning outcomes. This gap highlights the need for a critical synthesis that examines the potential of interactive digital media and the relevance and limitations of existing evidence for junior high school vocabulary instruction. Therefore, this literature review analyzes 23 journal articles to identify the features of interactive digital media associated with vocabulary learning outcomes, examine the empirical evidence regarding Google Sites for English

vocabulary learning, particularly among junior high school students, and formulate instructional design and evaluation implications based on previous research. By integrating these perspectives, the review aims to provide an evidence-informed framework for designing and evaluating Google Sites-based interactive vocabulary learning media that incorporates multimedia resources, contextualized practice, and meaningful learner engagement.

2. METHOD

This study employed a structured narrative literature review with a descriptive qualitative approach, informed by the Scale for the Assessment of Narrative Review Articles (SANRA) (Baethge et al., 2019). Literature was retrieved from Google Scholar, the Garuda Portal, and the Directory of Open Access Journals (DOAJ), covering publications from 2020 to 2026. The search employed combinations of "Google Sites," "interactive learning media," "English vocabulary mastery," and "digital vocabulary learning," using Boolean operators. The provisional selection-flow figures, pending verification, comprise 148 records from Google Scholar (90), Garuda (37), and DOAJ (21). After removing 25 duplicates, 123 records underwent screening, with 84 excluded. Of 39 full-text articles assessed, 16 were excluded due to topic irrelevance (7), insufficient methodological information (5), or ineligible publication types (4), leaving 23 articles for the final synthesis. Studies directly examining junior high school english vocabulary learning were distinguished from indirect evidence involving other educational levels or subjects.

Data were collected through document analysis and organized by authorship, research objectives, methods, participants, instructional media, and findings. The 23 articles comprised seven development studies, six quasi-experimental studies, four classroom action studies, two pre-experimental studies, three descriptive studies, and one one-shot experimental study. Methodological strength was considered according to research design, with controlled studies distinguished from descriptive and uncontrolled studies to avoid overstating effectiveness; formal study-level quality appraisal remains necessary. The findings were synthesized thematically to examine interactive media features, evidence concerning Google Sites, and instructional design implications for junior high school vocabulary learning, guided by Mayer's (2021) multimedia learning theory and Nation's (2022) vocabulary knowledge framework.

3. RESULT AND DISCUSSION

The literature review identified 23 empirical studies examining Google Sites, interactive digital media, vocabulary instruction, and technology-supported learning strategies. The studies comprised seven research and development studies, six quasi-experimental studies, four classroom action research studies, two pre-experimental studies, three descriptive studies, and one one-shot experimental study. Nine studies specifically investigated Google Sites, although their educational contexts and learning objectives varied. To account for these differences, the findings were interpreted by distinguishing direct evidence concerning junior high school English vocabulary learning from indirect evidence involving other educational levels, language skills, and subject areas. The synthesis was organized into five themes: Google Sites-based learning, visual and audiovisual media, gamified learning applications, technology-integrated instructional strategies, and implications for interactive media design. Table 1 summarizes the characteristics and principal findings of the 23 studies.

Table 1. Thematic Synthesis of Previous Studies on Interactive Media and Vocabulary Learning

Theme	Representative Studies	Main Findings	Evidence Limitations
Google Sites-based learning	Adzkiya & Suryaman (2021); Astika et al. (2025); Fatiha et al. (2026); Qurrata'ain et al. (2025)	Google Sites supported multimedia presentation, accessibility, and positive learner responses. Some studies reported improved learning outcomes.	Evidence largely came from educational levels or learning outcomes outside junior high school English vocabulary.
Visual and audiovisual media	Aulia et al. (2024); Rahmah et al. (2025); Cokro & Raihana (2025); Evelina et al. (2024)	Visual materials, flashcards, instructional videos, and webpages were associated with positive vocabulary learning outcomes and engagement.	Differences in interventions, research designs, and outcome measures limit direct comparisons.
Gamified applications	Lature (2025); Sibuea et al. (2025); Permatasari et al. (2025); Pegarro & Maghuyop (2025)	Duolingo, Quizlet, and Wordwall supported vocabulary practice through repetition, retrieval, and interactive activities.	Several studies lacked strong experimental controls or long-term retention measurements.
Media-integrated learning strategies	Achmad & Hidayati (2025); Banjarnahor et al. (2025); Kusuma et al. (2025); Alawiyah et al. (2025)	Combining digital resources with active instructional strategies was associated with favorable learning outcomes and participation.	Findings differed in educational contexts, learning objectives, and methodological strength.
Instructional design implications	Synthesis across the 23 studies	Multimedia integration, contextualized practice, interactive activities, feedback, and accessible navigation emerged as relevant design considerations.	Direct evaluation of an integrated Google Sites-based vocabulary learning intervention for junior high school students remains necessary.

Table 2 presents the results of the analysis of previous research on Google Sites, interactive media, and English vocabulary mastery.

Table 2. Results of Previous Research Analysis on Google Sites, Interactive Media, and English Vocabulary Mastery

Researcher(s)	Research Objective	Educational Level / Subject	Research Design	Principal Findings
(Achmad & Hidayati, 2025)	Improving the vocabulary mastery of tourism students through the integration of Blogger.com and Vocabulary Self-Collection Strategy (VSS).	Vocational high school / English vocabulary	Classroom action research	Mean scores increased from 60.88 to 91.88; improved participation was reported.
(Adzkiya & Suryaman, 2021)	Describes the use of Google Sites in English learning for elementary school students.	Elementary school / English	Descriptive qualitative	Reported accessible multimedia presentation and positive learning experiences.
(Alawiyah et al., 2025)	Analyzing the influence of the Google Sites-based Cooperative Learning method on reading ability and learning motivation.	Vocational high school / Reading comprehension	Quasi-experimental	Experimental and control post-test scores were 49.41 and 40.29, respectively; experimental N-gain was 0.17.
(Astika et al., 2025)	Developing an interactive English module based on Google Sites for DKV SMK students.	Vocational high school / English	R&D (ADDIE)	Expert validation reached 90%; student responses were positive.
(Banjarnahor et al., 2025)	To improve first-grade elementary school students' vocabulary mastery using interactive media through the PBL model.	Junior high school / English vocabulary	Pre-experimental	Mean vocabulary scores increased from 54.86 to 79.80.
(Cokro & Raihana, 2025)	To develop instructional video media to improve vocabulary mastery in Expository Text material.	Elementary school / English vocabulary	Classroom action research	Learning mastery increased from 38.95% to 81% across cycles.
(Devitriana & Wijirahayu, 2025)	To examine the effect of Kahoot on students' vocabulary mastery and learning motivation.	Senior high school / English vocabulary	R&D (ADDIE)	Material and media validation reached 96% and 95%; N-gain was 0.73.
(Evelina et al., 2024)	To develop webpage-based learning media to improve vocabulary learning among seventh-grade EFL students.	Senior high school / English vocabulary	Descriptive qualitative	Reported motivation, participation, and vocabulary retention benefits; connectivity constraints were identified.
(Fatiha et al., 2026)	To develop interactive Google Sites-based learning media to improve elementary school students' English learning outcomes.	Junior high school / English vocabulary	R&D (ADDIE)	Media and material validation reached 96% and 93%; positive user experiences were reported.
(Hidayat et al., 2023)	To develop Google Sites-based learning resources to improve students' conceptual mastery and science process skills.	Elementary school / English	R&D (4D)	Expert validation reached 95%; a significant pre-test–post-test difference was reported ($p = .001$).
(Kusuma et al., 2025)	To determine the effectiveness of Brain-Based Learning in improving junior high school students' vocabulary mastery.	Elementary school / Electrical circuits	R&D (ADDIE)	Expert validation scores ranged from 4.30 to 4.69; N-gain was 0.50.
(Lailiyah & El-Yunusi, 2024)	To optimize English language learning using interactive Google Sites media.	Junior high school / English vocabulary	Quasi-experimental	Experimental and control post-test means were 90.6 and 82.6, respectively ($p < .05$).
(Lature, 2025)	To improve vocabulary mastery using the Duolingo application.	Elementary school / English	Descriptive qualitative	Reported practical implementation and increased student participation.
(Pegarro & Maghuyop, 2025)	To determine the effectiveness of Digital Wordwall in improving senior high school students' vocabulary skills.	Senior high school / English vocabulary	Classroom action research	Learning mastery increased from 55% to 80% across cycles.
(Permatasari et al., 2025)	To improve EFL students' vocabulary mastery through the Quizlet application.	Senior high school / Vocabulary	One-shot experimental	Reported improvements in word meaning, usage, and figurative language.
(Qurrata'ain et al., 2025)	To determine the effectiveness of Google Sites as a vocabulary learning platform in language education.	EFL learners / Vocabulary	Classroom action research	Reported benefits of retrieval practice, spaced repetition, and collaborative activities.

Researcher(s)	Research Objective	Educational Level / Subject	Research Design	Principal Findings
(Aulia et al., 2024)	To examine the effect of picture media on eighth-grade junior high school students' vocabulary mastery.	University / English vocabulary	Pre-experimental	Reported significant pre-test–post-test differences (t = −9.62, p < .05).
(Rahmah et al., 2025)	To analyze the effectiveness of flashcard games in improving seventh-grade junior high school students' vocabulary mastery.	Junior high school / English vocabulary	Quasi-experimental	Experimental and control post-test means were 79.42 and 67.31, respectively (p < .001).
(Sibuea et al., 2025)	To determine the effectiveness of Duolingo in improving seventh-grade junior high school students' vocabulary mastery.	Junior high school / English vocabulary	Quasi-experimental	Reported a significant vocabulary learning difference (t = 3.21).
(Suryadi et al., 2020)	To examine the effects of Google Word Coach and vocabulary mastery on students' speaking skills.	Senior high school / Speaking skills	Quasi-experimental factorial	Reported an interaction effect on speaking outcomes (F = 5.23, p = .025).
(Sutanti et al., 2025)	To examine the effect of Augmented Reality on seventh-grade junior high school students' vocabulary mastery.	Junior high school / English vocabulary	Quasi-experimental	Reported vocabulary scores increased from 59.80 to 82.00 (p = .001).
(Wahyudi et al., 2023)	To develop Google Sites media to improve elementary school students' motivation and Indonesian language learning outcomes.	Elementary school / Indonesian language	R&D	Reported learning motivation increased from 61.24% to 78%.
(Wulandari & Huda, 2025)	To develop interactive Google Sites-based learning media for computer network material in vocational high school.	Vocational high school / Computer networks	R&D (ADDIE)	Students reported ease of use (93%) and improved understanding (90%).

Google Sites-Based Learning Media

Among the 23 reviewed articles, nine studies examined the implementation or development of Google Sites across different educational levels and subject areas. These studies generally reported positive findings concerning multimedia integration, accessibility, usability, and student engagement. Adzkiya and Suryaman (2021) and Lailiyah and El-Yunusi (2024) described Google Sites as a practical platform for presenting English learning materials through multimedia resources. Similarly, Astika et al. (2025) reported 90% expert validation for an interactive English module, while Fatiha et al. (2026) obtained 95% media validity and reported statistically significant differences in learning outcomes. However, expert validation and positive user responses primarily indicate the acceptability and feasibility of instructional media rather than independently establishing their effectiveness in improving vocabulary mastery. The available evidence also highlights differences in educational contexts and learning objectives. Qurrata'ain et al. (2025) reported significant improvements in vocabulary scores following Google Sites implementation among university students. Nevertheless, the pre-experimental design and differences in learner characteristics limit the applicability of these findings to junior high school students. Alawiyah et al. (2025) examined Google Sites combined with Cooperative Learning for reading comprehension, whereas Hidayat et al. (2023), Wahyudi et al. (2023), and Wulandari and Huda (2025) investigated its application in other subject areas. These studies provide indirect evidence regarding platform flexibility and instructional design but cannot establish its effectiveness for junior high school English vocabulary learning. Therefore, the central gap is not the absence of positive Google Sites findings, but the limited direct evidence examining its vocabulary-specific application and outcomes among junior high school students.

Visual and Audiovisual Media for Vocabulary Learning

Studies involving visual and audiovisual media provide more direct evidence concerning vocabulary instruction at the junior high school level. Aulia et al. (2024) reported an increase in students' mean vocabulary scores from 54.86 to 79.80 following the implementation of picture-based media. Similarly, Rahmah et al. (2025) found higher post-test scores among students using flashcard games than among those in the comparison group (79.42 versus 67.31). Sutanti et al. (2025) also reported favorable vocabulary outcomes following the application of Augmented Reality. Although these findings suggest the potential value of visual representations, their interpretation should consider differences in experimental controls, participant characteristics, and intervention procedures. In particular, improvements observed in a single-group design cannot be attributed exclusively to the learning media.

Additional evidence was provided by Cokro and Raihana (2025), whose instructional video development study reported an N-gain of 0.73, and Evelina et al. (2024), whose vocabulary learning webpage received 96% media validation and 93% material validation. The latter study is particularly relevant because it involved seventh-grade students and focused on vocabulary learning, although its platform was not Google Sites. From Nation's (2022) framework, these findings suggest that visual and audiovisual resources may support different dimensions of word knowledge, including written and spoken forms, meaning, and contextual use. Mayer's (2021) multimedia learning theory further provides a rationale for combining verbal and visual representations in a coordinated manner. Nevertheless, the reviewed studies did not consistently measure all dimensions of vocabulary knowledge separately, making it difficult to determine which features contributed most strongly to specific learning outcomes.

Gamified Applications in Vocabulary Instruction

Gamified learning applications represent another prominent approach to vocabulary instruction. Lature (2025) reported an increase in learning mastery from 55% to 80% across classroom action research cycles using Duolingo. Sibuea et al. (2025) also reported a statistically significant difference in vocabulary learning outcomes associated with Duolingo implementation. These findings suggest that structured practice, repeated exposure, and interactive activities may support vocabulary learning. However, classroom action research and quasi-experimental designs provide different levels of evidence, and their results should not be interpreted as equally strong demonstrations of causal effectiveness. Other applications emphasize different forms of learner interaction. Permatasari et al. (2025) discussed Quizlet in relation to retrieval practice, spaced repetition, and collaborative learning, while Devitriana and Wijirahayu (2025) reported favorable student motivation and participation when using Kahoot, alongside internet connectivity constraints. Pegarro and Maghuyop (2025) examined Digital Wordwall for vocabulary skills, although its one-shot experimental design limits causal interpretation. Suryadi et al. (2020) investigated Google Word Coach and reported significant findings related to speaking skills; consequently, this study provides indirect rather than direct evidence of vocabulary improvement. Collectively, these studies identify repetition, retrieval activities, feedback, and learner participation as potentially useful instructional features. Nevertheless, evidence concerning long-term vocabulary retention and the independent contribution of gamification remains limited.

Integration of Digital Media and Learning Strategies

The reviewed literature indicates that the pedagogical strategies accompanying digital media deserve attention alongside technological features. Achmad and Hidayati (2025) integrated Blogger.com with the Vocabulary Self-Collection Strategy and reported an increase in mean vocabulary scores from 60.88 to 91.88. This approach encouraged students to identify, collect, and learn vocabulary relevant to their interests and learning needs. Similarly, Banjarnahor et al. (2025) combined interactive media with Problem-Based Learning and reported improved learning mastery across classroom action research

cycles. Although both studies reported favorable outcomes, their designs and educational contexts limit the extent to which improvements can be attributed specifically to the digital platforms.

Further evidence was provided by Kusuma et al. (2025), who reported higher post-test vocabulary scores in a junior high school group receiving Brain-Based Learning than in the comparison group (90.6 versus 82.6). Alawiyah et al. (2025) also examined the integration of Google Sites with Cooperative Learning, although the outcome concerned reading comprehension rather than vocabulary mastery. These findings suggest that active learning, contextualized tasks, collaboration, and opportunities for vocabulary practice may complement digital resources. However, outcomes from combined interventions cannot establish whether improvements result primarily from the media, instructional strategies, or their interaction. Accordingly, Google Sites should be considered a potential platform for facilitating structured learning activities rather than an instructional intervention whose effectiveness is guaranteed by its technological features.

Instructional Design and Evaluation Implications

The thematic synthesis provides an evidence-informed basis for designing Google Sites-based vocabulary learning media for junior high school students. Drawing on Nation's (2022) framework, instructional content should address three interconnected dimensions of vocabulary knowledge: form, meaning, and use. Activities targeting form may include written vocabulary, spelling exercises, and pronunciation audio, while activities targeting meaning may integrate illustrations, definitions, and contextual examples. Vocabulary use may be supported through sentence construction, contextualized exercises, and communicative assignments. Consistent with Mayer's (2021) multimedia learning theory, these elements should be organized coherently to facilitate meaningful processing and avoid unnecessary cognitive demands. The reviewed studies also suggest the potential relevance of interactive quizzes, retrieval practice, feedback, and collaborative activities, although their relative contributions require further empirical investigation.

Practical implementation should also consider learners' characteristics and technological accessibility. Google Sites can function as a central platform for organizing multimedia resources and embedding interactive activities, but its instructional value depends on content quality, navigation, device compatibility, and internet availability. A proposed design should therefore prioritize clear learning objectives, simple navigation, smartphone accessibility, appropriately sized multimedia resources, and meaningful learning activities. These considerations are particularly relevant because several reviewed studies identified technical constraints, while others involved educational settings that differed substantially from junior high school vocabulary classrooms.

The methodological diversity of the 23 studies also has important implications for future evaluation. Development studies primarily provide evidence of media feasibility and user acceptance, whereas classroom action research, descriptive studies, and uncontrolled pre-test–post-test designs offer limited grounds for causal conclusions. Quasi-experimental comparisons provide more informative evidence of learning differences, although potential confounding factors remain relevant. Moreover, differences in participants, subject areas, interventions, and outcome measures prevent meaningful pooling of the reported results. The absence of a completed formal risk-of-bias appraisal further limits confidence in the overall evidence. Consequently, the findings should be interpreted as a basis for identifying promising instructional features rather than as definitive proof of effectiveness.

Future research should develop and evaluate Google Sites-based vocabulary learning media specifically for junior high school students. Evaluation should include expert validation, usability and practicality assessments, and appropriately designed comparisons of vocabulary learning outcomes. Assessment instruments should measure word form, meaning, and use, alongside motivation, engagement, and vocabulary retention where feasible. Controlled comparisons, larger samples, and delayed assessments would provide stronger evidence regarding learning outcomes and sustained

vocabulary knowledge. The principal contribution of this review is therefore an integrated conceptual direction linking multimedia design, vocabulary knowledge, and interactive learning strategies with evidence-informed evaluation requirements. Rather than demonstrating the effectiveness of a product already developed, the synthesis identifies instructional features and methodological priorities that can guide future Google Sites-based vocabulary learning research.

4. CONCLUSION AND RECOMMENDATION

This literature review of 23 journal articles indicates that interactive digital media integrating multimedia resources, gamification, contextualized activities, and feedback have the potential to support English vocabulary learning. Google Sites provides a flexible platform for incorporating these features, particularly in addressing vocabulary knowledge related to form, meaning, and use. However, empirical evidence specifically examining Google Sites-based interactive media for junior high school English vocabulary learning remains limited, as existing studies predominantly involve different educational levels, subjects, and learning outcomes.

Future research should develop Google Sites-based vocabulary learning media tailored to junior high school students through a Research and Development (R&D) approach, including expert validation, practicality assessment, and controlled effectiveness testing. Further evaluation should consider vocabulary retention, student engagement, and accessibility. This review is limited by heterogeneous research designs, the inclusion of indirect evidence, and the absence of formal risk-of-bias assessment. Therefore, its findings provide an evidence-informed foundation for future media development rather than definitive evidence of effectiveness.

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