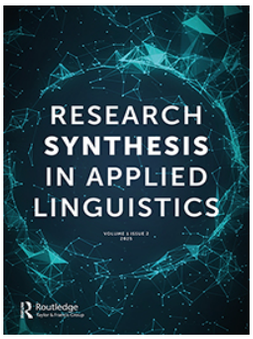

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Location-Based Games for Language Learning: A Scoping Review

Donald Richardson & Blair Matthews

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LOCATION-BASED GAMES FOR LANGUAGE LEARNING: A SCOPING REVIEW

Author	Journal	Year
Donald Richardson Blair Matthews	Research Synthesis in Applied Linguistics	2025

WHAT CAN I LEARN FROM THIS SECONDARY RESEARCH?

This scoping review offers a comprehensive overview of the current research on location-based games for language learning, including their design, implementation and effectiveness.

KEY TERMS

Location-based games

Games that use the player's physical location as part of the gameplay (e.g., Pokémon Go)

CONTEXT

Learning of languages in a range of contexts

WHAT EVIDENCE IS SUMMARISED?

19 studies

WHAT DOES IT FIND?

Location-based games for language learning are an emerging area of research with a steady publication rate over the past eight years.

- Most studies focus on university students and there is a need for more research in other language learning contexts.
- There is a need for more theoretical grounding and more consistent methodologies in research on location-based games for language learning.
- More free, user-friendly tools are required to facilitate the development of games by practitioners.

HOW CAN I USE THE FINDINGS IN MY TEACHING?

By incorporating the insights from this scoping review into your teaching practices, you can:

- Make language learning more engaging and interactive for your students.
- Learn about the latest evidence on how location-based games can support language learning.
- Adapt and apply game-based strategies to suit your learners' needs and improve outcomes.

RESEARCH SYNTHESIS IN APPLIED LINGUISTICS
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Location-Based Games for Language Learning: A Scoping Review

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ABSTRACT

Location-based games for language learning is an emerging and innovative domain that has gained momentum over the past twenty years. Such games situate learning in real-world locations, incorporating interactive elements such as collaborative tasks and location-specific prompts, often supported by digital resources like augmented reality. This scoping review maps current research on location-based games for language learning, examining their role in language acquisition, key features of the games and how their effectiveness is assessed. Following PRISMA guidelines, we formulated research questions, identified relevant publications and analysed data from six databases, resulting in 19 included studies. Each study was coded for key characteristics such as data collection methods, intervention types and theoretical frameworks. Our findings show a variety of approaches to implementing location-based games in language learning. While some studies examine their effects on engagement and motivation, others explore language pragmatics and the co-construction of meaning in social interactions. However, inconsistencies in methodological approaches, participant numbers and theoretical underpinnings limit the comparability of findings. We recommend further studies grounded in robust theoretical frameworks across a variety of geographical locations, language learning settings and learner demographics to build on existing work and advance understanding of how location-based games can enhance language learning.

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Location-based games; language learning; augmented reality; game-based learning; place-based learning

Introduction

The use of games in language learning has shown significant promise, with both digital and non-digital formats enhancing language skills in interactive and engaging ways (Cornillie 2022; Pegrum 2019; Reinders and Wattana 2012; Reinhardt 2019). Location-based games stand out due to their ability to provide immersive, contextually rich environments for language practice that align with current theories of second language

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acquisition (SLA) by emphasising localised, contextual learning and meaningful connections to the real world (Godwin-Jones 2016).

What distinguishes location-based games from other kinds of game is their appropriation of the local environment as a game board and the extent to which mobile devices are used to facilitate gameplay (de Silva and Sutko 2009). Their emergence in the early 2000s was influenced by two key factors: the increased accessibility and affordability of mobile devices in many parts of the world and the US government's decision to make accurate GPS signal data available to the public in 2000 (Leorke 2018). The release of the iPhone 3G in 2008 was another key milestone, particularly in the context of education (Sykes 2022). This meant that players no longer needed customised devices to play and could begin to access game content using smartphone applications.

As a result, a range of location-based games were created to support learning in subjects such as science, history and geography (e.g., Ardito et al. 2012; de Silva and Sutko 2009; Klopfer and Squire 2007), and free platforms like ARIS and TaleBlazer were developed to enable teachers and game designers to create location-based games without requiring advanced coding skills.

Mentira was one of the first games specifically designed for language learning (Holden and Sykes 2012). The game centred around a murder-mystery adventure designed for learning Spanish at the University of New Mexico, USA. The ARIS app situated the game's narrative in Los Griegos, a mainly Spanish-speaking Albuquerque neighbourhood. Players visited physical locations where GPS-triggered quests required them to interact with virtual characters in Spanish using augmented reality (AR). It was intended to facilitate student engagement with the Spanish language and culture in an immersive way, rather than being another tool to help memorise and recite language forms (Holden and Sykes 2012). Despite its innovative design, Mentira ultimately became obsolete and unplayable over time (Holden, Sykes, and Thorne 2017). However, it paved the way for other projects and sparked interest in exploring the potential of location-based games for language learning.

TaleBlazer, also developed in the USA at the Massachusetts Institute of Technology (MIT), is an open-source AR game editor that allows users to create and play location-based games on iOS and Android devices. Unlike ARIS, which focuses on storytelling, TaleBlazer uses a role-based structure where characters interact within the game world. Regarding language learning, it has been used to create immersive experiences where players take on different roles, engage in contextualised language use and practice communication in authentic settings (Cervi-Wilson and Brick 2018).

The release of Pokémon GO in the summer of 2016 significantly raised the profile of location-based games, moving them beyond small-scale educational projects into the mainstream. At its peak, Pokémon GO had over 230 million active players, and more than eight years after its launch, it remains a key source of revenue for Niantic, the company behind it (Sensor Tower 2024). Pokémon GO also brought AR to the forefront of public attention as a leisure activity and its popularity highlighted the potential of AR in educational contexts, including language learning (Godwin-Jones 2016; Sykes 2022).

While playing a location-based game, language learners use the target language to navigate through a city, engage with local landmarks and interact with virtual characters. These immersive environments allow learners to practice vocabulary, grammar and

conversational skills in real-world contexts (Sydorenko et al. 2019; Tran, Kajimura, and Shibuya 2023). Moreover, by embedding language tasks in physical settings, learners can make connections between the language they are learning and their immediate environment, thus enhancing retention and comprehension (Thorne and Hellermann 2017). The interactive and collaborative nature of location-based games also fosters greater learner engagement and motivation, which are key factors in successful language acquisition (Pegrum 2019; Sydorenko et al. 2019).

The educational potential of location-based games aligns with broader arguments about the role of mobile-assisted language learning. As Reinhardt (2019) observes, mobile technologies can enable both location-dependent and location-independent learning, increasing learners' exposure to the target language in meaningful contexts. Location-based games build on this potential by integrating gameful, place-based content into everyday life, allowing learners to engage with language in situated, immersive environments that foster deeper learning.

Existing Reviews of Location-Based Games in Language Learning

Although location-based games have received increasing attention in the language learning literature (e.g., Holden and Sykes 2012; Pegrum 2019; Tran, Kajimura, and Shibuya 2023), the body of empirical research remains relatively small and has yet to be comprehensively mapped through a dedicated scoping review. In recent years, a number of systematic literature reviews have focused on the use of digital games in language learning (e.g., Hung et al. 2018; Xu et al. 2020) and the integration of augmented reality into educational contexts, including language teaching (e.g., Fan, Antle, and Warren 2020; Fitz-Gerald et al. 2013; Özçelik, Ekşi, and Baturay 2022; Shadiev and Liang 2024). However, despite some overlap, they provide few insights into how location-based games have been used for language learning. Similarly,Lee's (2022) review of context-aware technology in foreign language learning emphasises its broader application without attempting an in-depth exploration of location-based games. Even Ribeiro et al.'s (2021) detailed review of location-based mobile games in education, which confirms the widespread use of mobile location-based games in educational contexts makes no mention of their use in the context of language learning.

Given the lack of focused reviews of location-based games for language learning within the fields of educational technology and digital game-based learning (DGBL), Durán and Moreno's (2019) systematic literature review of English teaching using mobile serious games with geolocation features serves as a useful reference point. Their study notes how location-based games enhance leaner motivation and engagement, particularly through elements which encourage competition and communication. They also stress the importance of clear learning objectives and effective feedback for balancing enjoyment with educational value.

However, their review has several limitations that affect its relevance and applicability. As a systematic literature review, it focuses on synthesising findings from a relatively narrow range of studies, applying strict inclusion criteria. Furthermore, it is now somewhat outdated as it mainly covered older games created before the hugely significant release of Pokémon Go in 2016. These limitations mean it is unable to provide a broad overview of the latest research in this area. Additionally, the review lacks

methodological transparency, making it difficult to assess the rigour of its approach. There is little detail on how studies were analysed, coding procedures remain unclear and key conclusions are not explicitly linked to specific studies. Distinguishing between evidence-based findings and broad generalisations is therefore challenging.

Aside from methodological concerns, Durán and Moreno's (2019) review also has a narrow scope as it focuses exclusively on English language learning, and overlooks theoretical frameworks, technological tools and research methodologies used in the field. Finally, as the paper was published in Spanish, it may not have reached a broader international audience, potentially limiting its influence on researchers and practitioners working outside the Latin American educational contexts for which it was intended.

As outlined above, various reviews touch on aspects of location-based games. However, none have provided a dedicated scoping review of their role in SLA. While existing reviews offer insights into related areas such as mobile-assisted language learning, augmented reality or digital game-based learning, they rarely address location-based games as a distinct category within language education. This leaves a significant gap in our understanding of their role and potentialin language learning. Given the evolving nature of the field and the increasing integration of mobile technologies and augmented reality, there is a clear need for a structured scoping review that maps the existing research, identifies trends and gaps and lays the groundwork for future, more focused investigations.

Methodology

After reviewing available methodologies (Chong and Plonsky 2023), the research team decided that a scoping review was the most suitable approach for mapping the breadth of research on location-based games for language learning. Scoping reviews differ from other kinds of research synthesis as they take a more inclusive and systematic approach to study selection (Chong and Reinders 2022). They aim to outline the breadth and depth of a field or topic rather than evaluate the quality of the studies it includes (Hillman, Selvi, and Yazan 2021). This makes them an effective way to establish the size and scope of the research literature in a given field and provide readers with a broad overview of its focus. Unlike systematic reviews, which focus on assessing the quality of evidence in response to narrowly defined research questions, scoping reviews aim to address broader or more exploratory research questions to provide a structured mapping of available studies (Arksey and O'Malley 2005; Hillman, Selvi, and Yazan 2021). They are a particularly effective means of exploring emerging or dynamic areas of research that have not been extensively reviewed (Chong and Reinders 2022; Munn et al. 2018), especially those where it is difficult to visualise the range of material that might be available (Arksey and O'Malley 2005). Given that reviews on location-based games for language learning are limited and their use in language learning is still evolving, a scoping review is a suitable way of providing a comprehensive overview of recent research on the topic.

In carrying out this review, we followed the methodological framework for conducting qualitative research synthesis in TESOL and Applied Linguistics developed by Chong and Plonsky (2021) and the guidelines for conducting systematic reviews outlined in Arksey and O'Malley (2005) (Figure 1). To ensure alignment with best practices for review

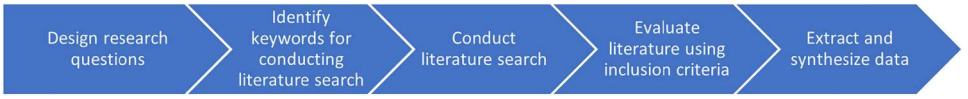

Figure 1. Methodological framework.

preparation, methodological rigour and transparent reporting of evidence, we also referred to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al. 2021) as well as the Synthesis Methods and Reporting Tool (SMART), a framework designed for research syntheses in applied linguistics (Chong 2025).

Our scoping review protocol is registered and has been published in the International Database of Education Systematic Reviews (IDESR) (Richardson and Matthews 2024). Two revisions were made: to refine one of the research questions and to clarify the inclusion and exclusion criteria.

Stage 1: Design Research Questions

Our research questions reflect the focus of the review on both methodological research and practical applications of location-based games for language learning.

1. What are the publication trends, sources, geographical locations and target languages in research on location-based games for language learning?
2. What are the different types and features of location-based games used for language learning?
3. How is the effectiveness of location-based games in language learning examined in research?

Stage 2: Identify Keywords for Conducting Literature Search

This review has benefited from insights provided by experts in SLA and research synthesis methodologies. For instance, the keywords in the search string were developed in consultation with a university academic liaison librarian to reflect our focus on location-based games specifically designed for language learning.

While scoping reviews do not typically involve quality appraisal of primary studies, Hillman, Selvi, and Yazan (2021) suggest that some level of quality assessment is nevertheless important. Therefore, to ensure a robust selection of comparable studies, we included only peer-reviewed journal articles, book chapters, books and conference papers that focused on location-based games designed for language learning.

We limited our search to studies published from July 2016 to July 2024 as the release of Pokémon Go marked a significant milestone in the development of location-based games. This time frame also prioritises contemporary research as older studies may not reflect the latest developments in game design and technology.

To obtain a comprehensive range of scholarly outputs and address inconsistencies in terminology, the search string incorporates multiple variations of each term enclosed in brackets. The Boolean operator OR was used between synonyms of each concept, and the

Boolean operator AND was used to combine the search terms for each of the three main concepts (location-based, games and language learning). The related terms (location based, geolocation, urban, location aware, urban, street and pervasive) cover the variety of terms that have been used to refer to location-based games (Leorke 2020). Similarly, a range of terms are used to capture the various language learning contexts in which such games are played (second language learning, second language learner, ESL, EFL, TESOL, language teaching, language teacher and bilingual education. Finally, the truncated term gam* covers game related keywords.

A search string of 22 terms structured around three main concepts was agreed: location, language learning and games. The exact search terms are outlined below. Some adjustments were made to ensure compatibility with the specific search databases used.

```
"location based" OR geolocation OR "location aware" OR urban OR street OR pervasive OR
  ubiquitous OR "place based" OR serious)
AND
("language learning" OR "language learner" OR "language acquisition" OR "vocabulary acquisition"
  OR "second language learning" OR "second language learner" OR ESL OR EFL OR TESOL OR
  "language teaching" OR "language teacher" OR "bilingual education")
AND
gam*
```

We were conscious that the use of broad search terms such as "language learn*" gam* and "TESOL" might retrieve publications that did not directly address the key focus of this study. However, this approach was necessary to ensure a comprehensive review, even if it meant filtering out some irrelevant results. Following the approaches of Chong and Reinders (2022) and Visonà and Plonsky (2019), we refined the results of this broader search strategy using rigorous inclusion and exclusion criteria (Table 1) to ensure that the selected studies focused specifically on location-based games for language learning and not location-based games in general.

Stage 3: Conduct Literature Search

A scoping review should be both systematic and as comprehensive as possible (Cacchione 2016). With this in mind, relevant literature was searched in both an exploratory and a focused way. An exploratory search was undertaken of six electronic databases (Scopus, JSTOR, Web of Science, LearnTechLib, ERIC and IEEEXPLORE) in accordance with the modified version of the steps outlined by Chong and Reinders (2022) (see Figure 2). We selected these databases as they provide extensive coverage of a wide range of peer-reviewed research and conference proceedings in both social sciences and computer science. Scopus, Web of Science and JSTOR capture broad scholarly discussions in the social sciences, while IEEE Xplore and LearnTechLib specialise in educational technology and computing, both of which are significant given the widespread use of technology in location-based games. ERIC was included to ensure representation of educational research. The exploratory search helped refine search terms and ensure that relevant disciplines were adequately represented before conducting a targeted manual search of key journals and authors.

As noted by Arksey and O'Malley (2005), manually searching key journals is a useful way of identifying publications that may be missed in database and reference list

Table 1. Inclusion and exclusion criteria.

Criteria	Include	Exclude	Rationale
Time Frame	Publications published between July 2016 (the launch of Pokémon Go) and July 2024.	Publications before July 2016.	We aim to outline the latest publications in the field of location-based games for language learning, particularly following the launch of Pokémon Go in July 2016, which raised awareness of location-based games and highlighted their potential for educational contexts.
Language	Publications are written in English.	Publications are written in languages other than English.	English is the only language that is shared among research team members and is used in most international journals.
Type of publication	Publications belong to one of the following types: peer-reviewed journal articles, book chapters, books or conference papers.	Publications that focus solely on descriptions of practice.	Publications that are purely descriptive are likely to lack in-depth information on conceptual frameworks and supporting research evidence.
Study Context	There is a clear focus on the use of location-based games for language learning purposes.	Studies that are about games which are not location-based and/or studies related to location-based games not used in a language learning context.	We intend to include publications that can provide information about the current state of research on the use of location-based games in language learning.

searches. With this in mind, a focused, manual literature search was conducted in several journals relevant to the field such as *Language Learning and Technology (LLT)* and *Computer Assisted Language Learning* (CALL), as well as the conference proceedings of the *International Conference on Games Based Learning* and the *European Conference on Game Based Learning*. These sources specialise in high-quality, relevant research on technology-enhanced and game-based learning.

Stage 4: Evaluate Literature using Inclusion Criteria

Closely adhering to our inclusion and exclusion criteria (Table 1), we first screened the titles and then the abstracts, reducing the initial total of 372 publications (after duplicates were removed) to 35. 24 peer-reviewed articles, seven conference papers and four book chapters were retained for full text screening (Figure 3). To manage and track duplicates, we used an Excel spreadsheet to record the various data sources, applied the search filters and documented the results from each database search. This allowed us to efficiently identify and track duplicates across multiple databases. A summary of the database search results is presented in Appendix B. The detailed tracking sheet is provided as supplementary material (Richardson and Matthews 2025), available online at https://doi.org/10.17630/f721abd5-c67d-4f79-b697-297be33ee969.

At this point, there was some discussion between the reviewers as to whether to include four publications which, while clearly dealing with location-based games for language learning, were descriptive in nature and did not involve primary research or empirical data collection. An expert in research synthesis was consulted and it was agreed that the publications should be rejected on the grounds that they were mainly descriptive and lacked in-depth information on conceptual

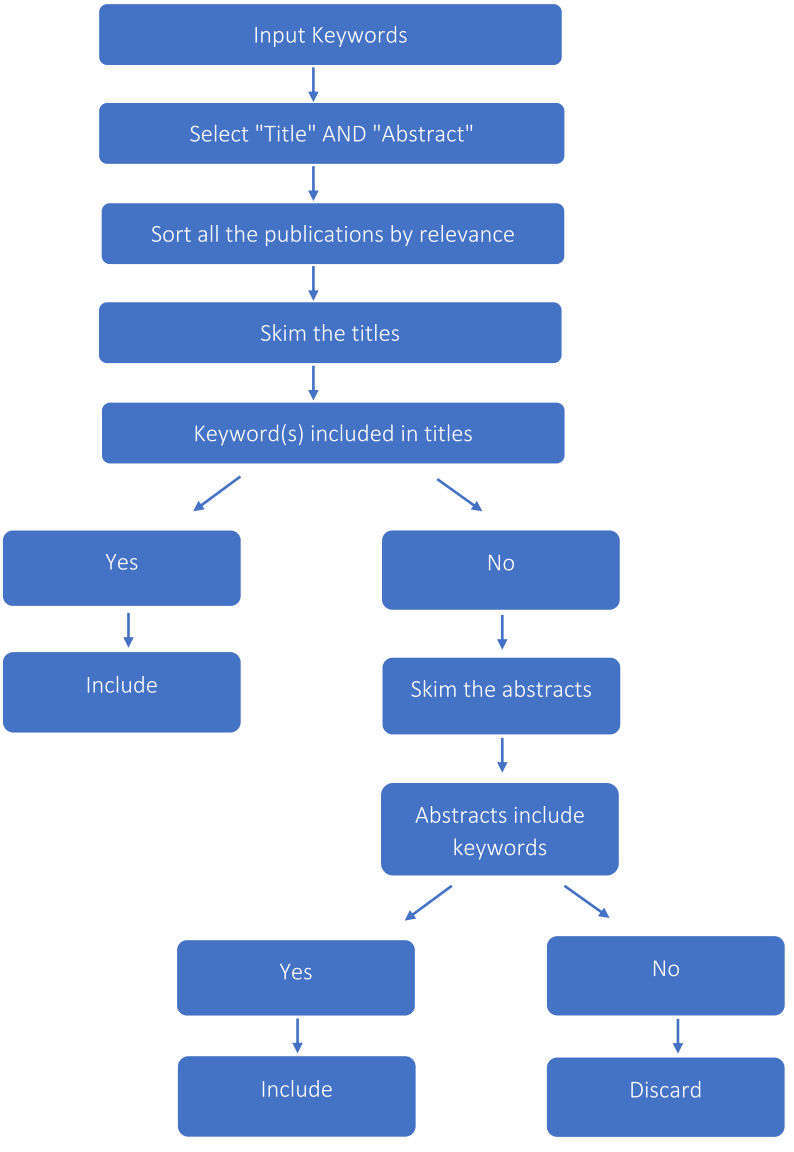

Figure 2. Search procedure.

frameworks and supporting research evidence, a key inclusion criterion for the scoping review.

Furthermore, we explored other relevant studies by reviewing citations in identified publications and examining further works by authors we had already included. This led to the inclusion of four previously unidentified papers (two articles, one book chapter and one conference paper). All the additional publications had a connection to Portland State University's *503 Design Collective,* making it a particularly rich source of research in this area.

We acknowledge that some relevant publications on location-based games for language learning may have been overlooked, particularly when the authors deviated

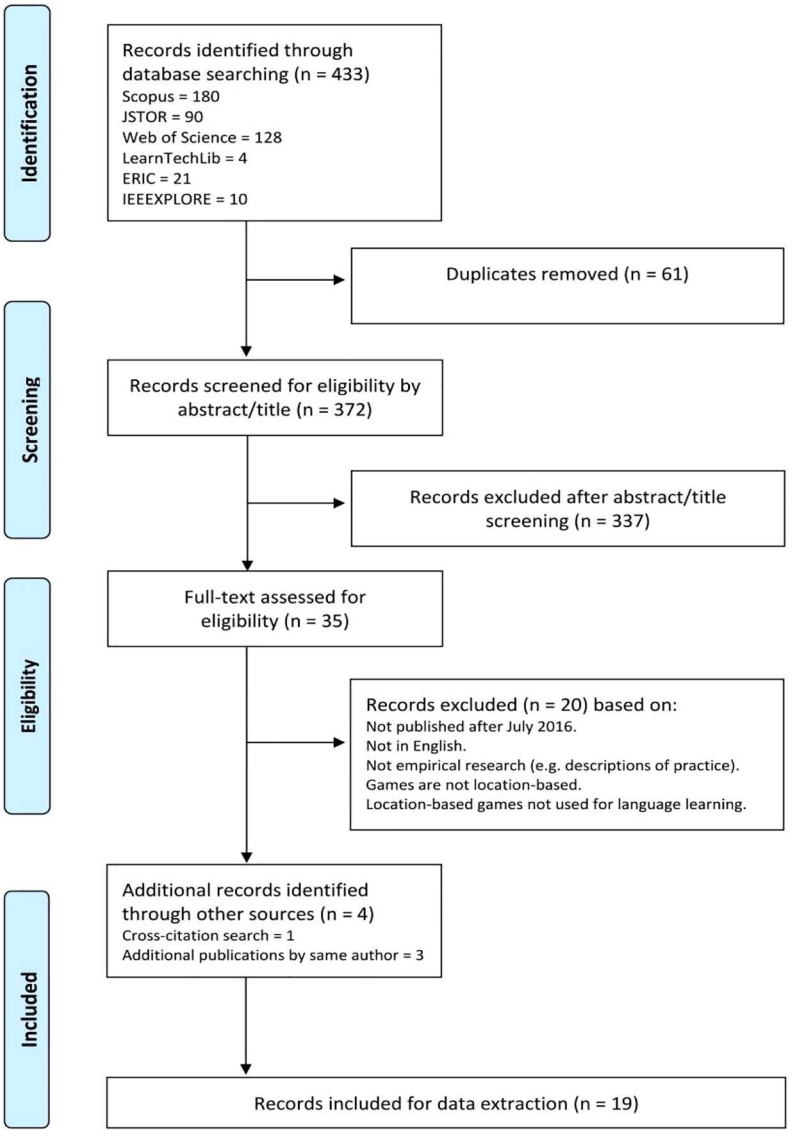

Figure 3. Search strategy.

from the most common nomenclature of "location-based game". However, we are confident that our thorough search strategy, along with our diligence in cross-referencing citations, has yielded a representative sample of the available publications on location-based games for language learning during the specified time period.

Stage 5: Extract and Synthesise the Data

Applying a consistent approach to reporting the findings means that comparisons can be made across intervention types (Arksey and O'Malley 2005). A data extraction form was developed, informed by our three research questions and drawing on previous scoping

reviews in TESOL (Chong and Reinders 2022; Hillman, Selvi, and Yazan 2021; Visonà and Plonsky 2019) and DGBL (Hung et al. 2018; Ribeiro et al. 2021; Xu et al. 2020). The coding scheme (Table 2) includes bibliographic and design features, as well as substantive features related to theoretical frameworks and methodology, and open variables concerning the relevance and implications of the publication.

Before commencing full data extraction, the coding scheme was reviewed and refined through discussions between the authors via MS Teams. To ensure its suitability, an initial trial coding was conducted on a small subset of studies. This process confirmed that the scheme effectively captured the relevant information and no major revisions were necessary. As a result, the same coding framework was applied consistently across all included studies.

Data extraction was carried out by the first reviewer, who completed the extraction for all selected publications. The second reviewer then independently coded a subset of studies. In accordance with the approach recommended by Levac, Colquhoun, and O'Brien (2010) for conducting a scoping review, additional meetings were held throughout the process to discuss and refine the coding framework, ensuring consistency and addressing any challenges that arose. Coding was repeated on an additional subset of the sample to further refine the process, leading to one initial code being removed. This iterative process was informed by similar approaches (Hillman, Selvi, and Yazan 2021; Hopkyns and Hillman 2024), where the reviewers independently coded their respective samples before comparing and resolving discrepancies. After these further

Table 2. Methodological and reporting characteristics.

Variable	Values
Basic Information	
Author(s)	Open
Year	From July 2016 – July 2024 (since Pokémon Go's release)
Journal/Source	Open (e.g., Modern Language Journal, TESOL Quarterly)
Title	Open (various titles relevant to location-based games for language learning)
Study Characteristics	
Type of Publication (TP)	Peer-reviewed journal article, book, book chapter or conference paper
Research Focus (RF)	Location-based games for language learning (e.g., language acquisition, mobile learning)
Methodology (M)	Qualitative, quantitative, mixed methods
Theoretical Framework (TF)	Open (e.g., constructivism, situated learning theory)
Intervention Type (IT)	Open (e.g., prototype location-based games, augmented reality applications, gamified storytelling)
Context (C)	Open (e.g., university, school, workplace)
Content and Findings	
Research Questions (RQ)	1. What are the publication trends, sources, geographical locations and target languages in research on location-based games for language learning? 2. What are the different types and features of location-based games used for language learning? 3. How is the effectiveness of location-based games in language learning examined in research?
Summary (S)	Open (key takeaways from each study e.g., benefits of location-based games, challenges in implementation)
Results (R)	Open (findings related to game mechanics, learner engagement, learning outcomes)
Implications (I)	Open (how the findings advance understanding of location-based games for language learning e.g., pedagogical implications, future research directions)
Relevance	
Relevance (Rel)	Open (assessment of how the study contributes to location-based language learning research)

reviews and discussions, the first reviewer revisited the data to address any outstanding concerns. The final set of 19 completed data extractions was securely stored on a university-managed OneDrive with institutional security measures.

Following data extraction, further analysis was conducted across all research questions. This involved manually synthesising data from the descriptive codes to identify meaningful patterns and themes. For example, evaluation tools were categorised by type and their frequency of use summarised. We calculated frequencies and percentages for variables such as Target Language, Methodology, Theoretical Framework and Context. In line with Levac, Colquhoun, and O'Brien's (2010) recommendation, our approach involved both a descriptive numerical summary and a thematic analysis to provide a comprehensive view of the studies. This iterative process of reviewing summaries and results, alongside frequent author discussions, enabled us to move beyond descriptive coding towards an interpretive synthesis. These steps also helped us to structure and clarify the final reported findings. The numerical summary, which includes tables and charts, is presented in the findings section, while the thematic analysis and interpretive discussion of the results are provided in the discussion.Table 2 outlines the coding scheme used in this review. A summarised version of the dataset is included in Appendix A and contains selected variables across all 19 studies. The complete dataset, including all extracted variables and detailed notes, is available as supplementary material (Richardson and Matthews 2025) online at https://doi.org/10.17630/f721abd5-c67d-4f79-b697-297be33ee969.

Although the overall sample size is similar to those in other scoping reviews of L2 research in DGBLL (e.g., Özçelik, Ekşi, and Baturay 2022; Ragni et al. 2023), it remains modest when compared to the 37 studies in Shadiev and Liang's (2024) review of mobile language learning in authentic environments or the 59 in Xu et al.'s (2020) review of digital game-based technology in English language learning. Nevertheless, 19 studies still provide a solid basis for identifying patterns, trends and gaps in this emerging area of research.

In the following section, we present findings that map out the scope, nature and characteristics of research into location-based games for language learning, structured around our research questions.

Results

RQ1 – What are the publication trends, sources, geographical locations and target languages in research on location-based games for language learning?

To address this question, we analysed the publication year, publication type (e.g., journal article, conference paper), source, country in which the study was conducted, educational context (school or university) and the target language of the intervention. These variables provide a descriptive overview of the research landscape and contextual background.

Number of Publications

The publication of studies was relatively evenly distributed throughout the time period of our review (Figure 4), with 10 studies (53%) published between 2016 and 2019 and nine (47%) between 2021 and 2024, resulting in an average of approximately three per year.

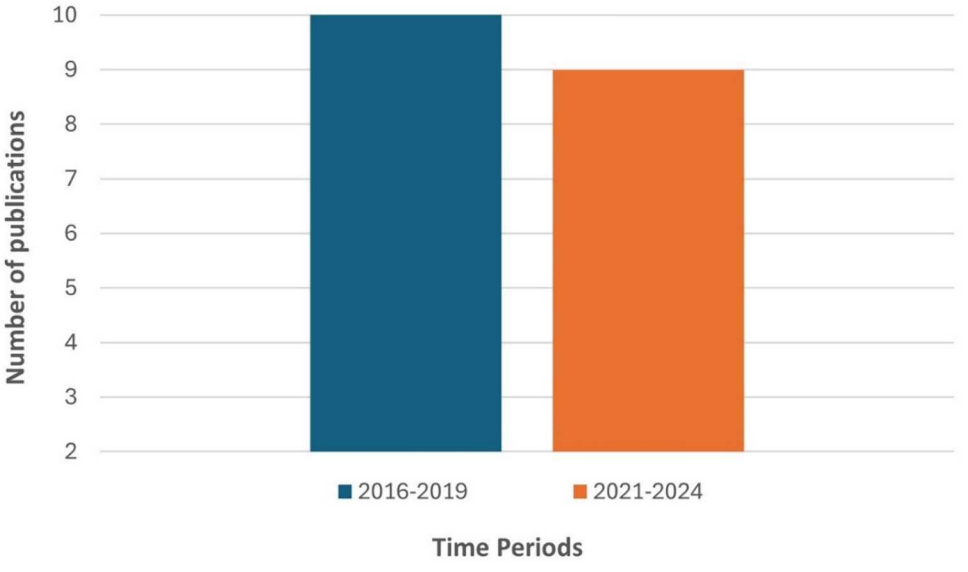

Figure 4. Number of publications.

No studies were published in 2020, the first year of the COVID-19 pandemic with its related restrictions.

Publication Sources

Of the 19 publications identified, the sample included 16 journal articles, two book chapters and one conference paper (Table 3). Most articles were published in high-ranking publications, with 10 (53%) in Quartile 1 journals, indicating they are among the top

Table 3. Publication sources.

Journal	Ka	Quartile
Classroom Discourse	1	1
Computer Assisted Language Learning	2	1
Education and Information Technologies	1	1
Frontiers in Education	1	2
International Journal of Mobile Learning and Organisation	1	2
Linguistics and Education	1	1
Modern Language Journal	3	1
Multimedia Tools and Applications	1	1
Multimodal Technologies and Interaction	1	2
Sustainability	1	2
TESOL Quarterly	1	1
Universal Access in the Information Society	1	3
No Quartile		
Chapter in *Conversation Analytic Research on Learning-in-Action: The Complex Ecology of Second Language Interaction 'in the wild'*	1	N/A
Chapter in *Innovative language teaching and learning at university: integrating informal learning into formal language education*	1	N/A
PSU McNair Scholars Online Journal	1	N/A
XVIII International CALL Conference	1	N/A

Ka = number of study reports

performers in their respective fields. Notable examples include *Computer Assisted Language Learning* (two articles, 10.5%) and *Modern Language Journal* (three articles, 16%). Four studies (21%) appeared in Quartile 2 journals, such as *Frontiers in Education* and *Sustainability*, reflecting solid, albeit lower, rankings. Only one article (5%) was published in a Quartile 3 journal (*Universal Access in the Information Society*) and one (5%), published in the *PSU McNair Scholars Online Journal*, lacked a ranking as it primarily features student research published by undergraduate students participating in the Portland State University McNair Scholars Program.

The sample also comprised three chapters from books (16%) and one conference proceeding (5%), which were not subject to quartile rankings but nonetheless contributed valuable insights. They included a chapter in *Conversation Analytic Research on Learning-in-Action: The Complex Ecology of Second Language Interaction 'in the wild'* (Hellermann, Thorne, and Haley 2019) and a paper presented at the *XVIII International CALL Conference* (Thorne and Hellermann 2017).

Study Locations

Studies were conducted in Taiwan (10.5%), South Korea (10.5%), as well as in Poland, China, Iran, Canada, the UK and Japan (each 5%) (Figure 5). Overall, the majority of research comes from the United States (48%), with eight of the nine studies conducted there emanating from Portland State University (e.g., Hellermann, Thorne, and Fodor 2017; Hellermann, Thorne, and Haley 2019; Thorne, Hellermann, and Jakonen 2021), where the *503 Design Collective*, a team of students, staff and community members, has been exploring the role of social interaction in mobile digital technology, place-based learning and augmented reality (503 Design Collective n.d.).

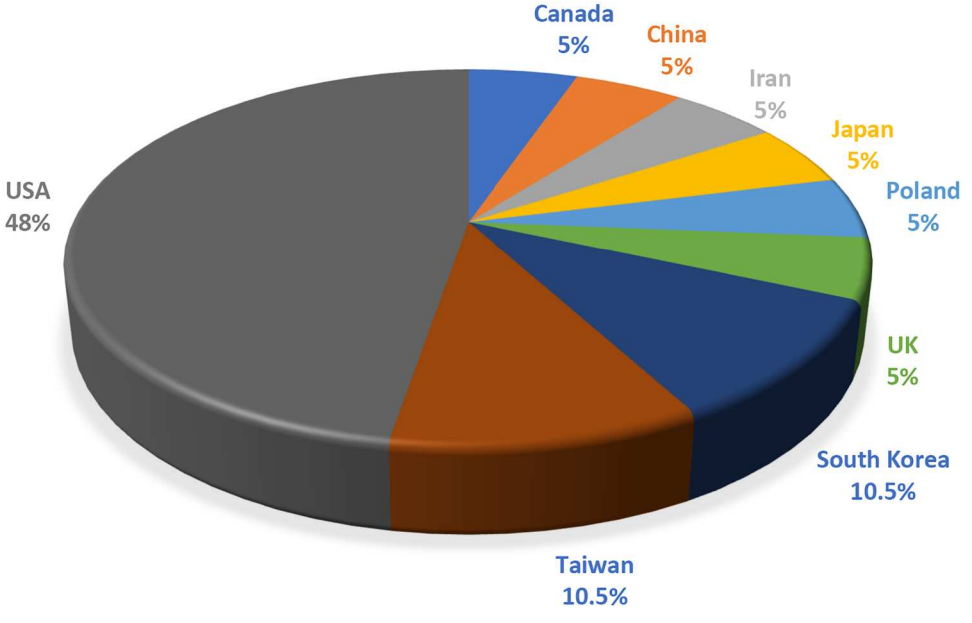

Figure 5. Study locations.

Target Languages

Most the games described in the publications selected for this review were used to teach English. Of the 19 publications, 11 (58%) focused exclusively on English language learning (Figure 6). Five studies (26%) explored a single other language such as French, German, Italian, Persian or Japanese. The remaining three studies (16%) adopted a multi-language approach (Hellermann, Thorne, and Haley 2019; Thorne and Hellermann 2017; Thorne, Hellermann, and Jakonen 2021). The *ChronoOps* game played in these studies allowed participants to choose from six language settings. Unlike the other studies, the authors were not concerned with which language was being used but instead focused on exploring aspects of participant interaction as players engaged with the game in small groups using English, French, German, Japanese, Spanish or Hungarian.

RQ2 – What are the different types and features of location-based games used for language learning?

To address our second research question, we identified and classified the types and features of location-based games for language learning in the studies. This included where the games were played, the number of participants, any tools that were part of gameplay, the language proficiency levels of the participants and the game mechanics involved (such as collaborative tasks or narrative-driven missions). This analysis provides insight into the ways in which location-based games have been designed for language learning purposes. Table 4 summarises these features across the 19 publications selected for this review.

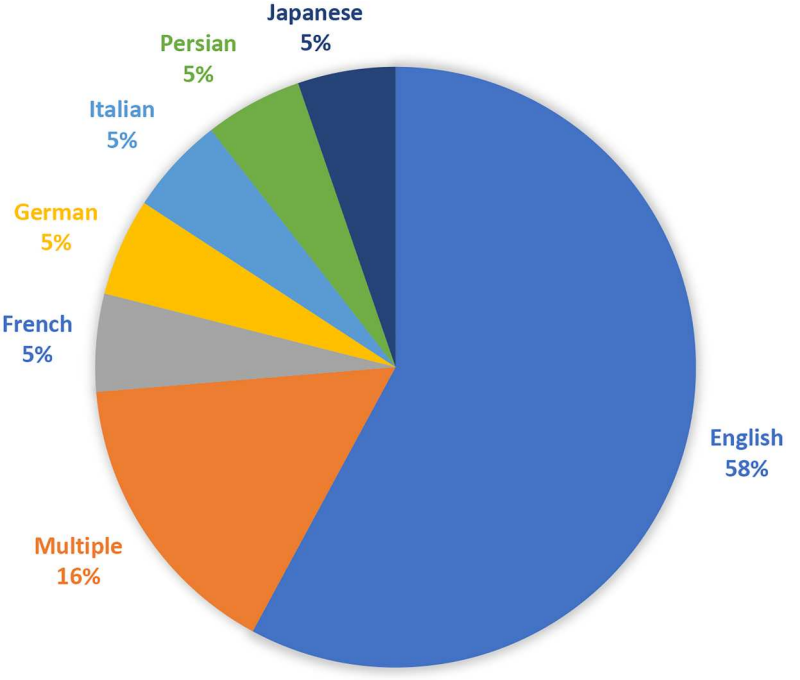

Figure 6. Target languages.

Table 4. Gameplay features.

Gameplay location	Number of participants	Tools/apps used	Proficiency levels	Game mechanics
Various locations in Coventry, UK	7	TaleBlazer	Elementary level Italian learners	Players navigate their physical environment, interacting with virtual characters and objects to solve a time travel mystery.
Tainan Confucius Temple, Taiwan	137	Open Data Kit (ODK)	Likely intermediate	Students interact with content, answer questions, and complete tasks using game mechanics like throwing dice and competing for points.
Portland State University, USA	75	ARIS	Not specifically mentioned	Participants navigate the campus, engaging with sites related to green technology and reporting findings through oral presentations.
Portland State University, USA	60	ARIS	Mixed levels (beginners and advanced)	Participants engage in green technology site exploration in small groups, with the activity not assessed by instructors.
Portland State University, USA	3	ARIS	Not specifically mentioned	One group of English language learners navigates the campus, engaging with sites related to green technology.
Campus of an unspecified university in the south of Taiwan	35	HP Reveal	At least elementary level	Students create and share interactive content, enhancing their English-speaking skills through video uploads and task completion.
Campus of an unspecified university in South Korea	42	ARIS	Intermediate to advanced (TOEIC scores indicated)	Participants engage in a murder mystery game combining augmented reality and printed materials focusing on reading comprehension.
Campus of an unspecified university in South Korea	40	7scenes	Not specifically mentioned	Students create and play digital storytelling games by brainstorming and designing scenarios collaboratively.
Campus of a university in central China	98	ARIS	Not specifically mentioned	Participants explore the campus in a scavenger hunt, answering environment-themed questions through clues.
Imam Khomeini International University, Iran	11	ARCore, Unity, MapBox, Android SDK	Intermediate level Persian language learners	Participants engage with an AR game designed to foster engagement and effective language acquisition through interactive activities.
Portland State University campus, USA	12	ARIS	Varying levels of proficiency (German language learners)	Participants engage in a scavenger hunt, exploring the campus and answering clues related to the game's themes.
University of Victoria, Canada	58	1AR	Varying levels (beginners, intermediate, advanced)	Participants navigate the campus, interacting with characters and completing language tasks to enhance their French skills through collaboration.
Krakow, Poland	22	Mobile devices	Ranged from elementary to upper intermediate	Participants follow maps and receive instructions, completing activities like interviews and puzzles at historic sites.
Portland State University, USA	12	ARIS	Intermediate to advanced	Students navigate the campus, finding and reporting on green

(*Continued*)

Table 4. Continued.

Gameplay location	Number of participants	Tools/apps used	Proficiency levels	Game mechanics
				technologies through oral reports in small groups.
Portland State University, USA	12	ARIS	Intermediate to advanced	Students navigate the campus, finding and reporting on green technologies through oral reports in small groups.
Portland State University, USA	Not specified	ARIS	Not explicitly mentioned	Participants engage in the *ChronoOps* game in small groups, navigating the campus and reporting on green technologies.
Portland State University, USA	Not specified	ARIS	Not explicitly mentioned	Participants engage in the *ChronoOps* game in small groups, navigating the campus and reporting on green technologies.
Kyoto, Japan	12	MiniHongo app	Beginner to elementary level	Participants engage with contextual vocabulary through activity-based lessons while moving around the city.
University of Hawai'i at Mānoa, USA	15	ARIS	Intermediate to advanced	Participants complete quests and engage in dialogues using AR, blending virtual tasks with real-world exploration.

Gameplay Contexts

A key feature of the publications is the number that were conducted at universities. As shown in Table 4, 16 of the 19 studies (84%) took place on university campuses, including five (26%) at Portland State University. Other campuses included the University of Victoria (5%), a university in southern Taiwan (5%), two universities in South Korea (10.5%), Imam Khomeini International University in Iran (5%) and the University of Hawai'i at Mānoa (5%). In contrast, only three studies (16%) explored gameplay outwith university settings: the *ImparApp* game in the United Kingdom (Cervi-Wilson and Brick 2018),the *Mobile Instructional Play Game* study at the Tainan Confucius Temple in Taiwan (Chang, Shih, and Chang 2017) and an urban gaming project in Krakow, Poland (Pitura and Terlecka-Pacut 2018).

Number of Participants

Participant numbers across the studies varied widely (Figure 7), from as few as seven (Cervi-Wilson and Brick 2018) and three (Thorne and Hellermann 2017) to substantial cohorts of 98 (Mei and Yang 2019) and 137 (Chang, Shih, and Chang 2017) . 10 of the 19 games (53%) were played in small groups of three to five. For example, Zheng et al.'s (2018) study involved five groups of three participants who played the *Guardians of the Mo'o* game on the campus of the University of University of Hawai'i at Mānoa.

The sizeable number of studies (42%) carried out at Portland State University all explored player interaction in *ChronoOps* as they worked in groups of three using location-aware mobile devices to navigate the campus and engage with sites related to green technology. In two studies (10.5%) involving this game, the total number of participants was not stated (Thorne and Hellermann 2017; Thorne, Hellermann, and Jakonen 2021).

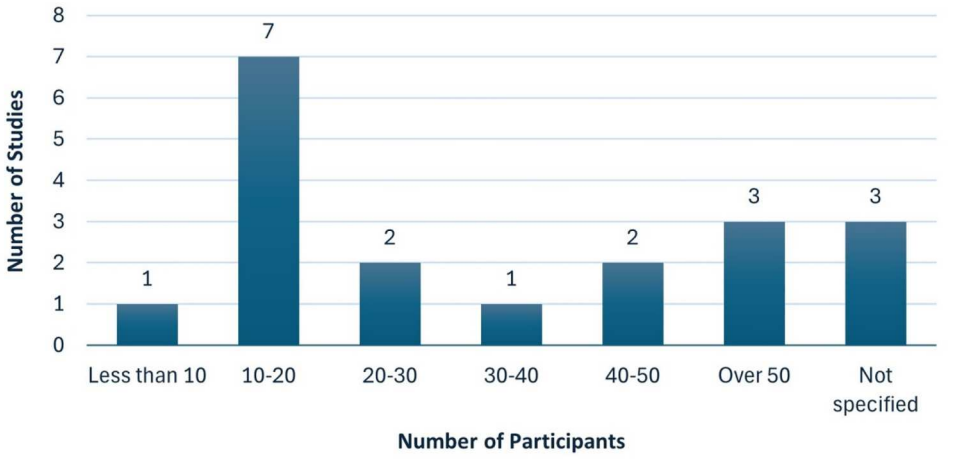

Figure 7. Number of participants.

Tools and Applications Used

Various tools and applications were used throughout the studies (Table 4). The ARIS platform was employed in 11 studies (58%). This free, off-the-shelf tool, now discontinued, allowed users to design interactive, task-based language learning experiences without requiring any coding skills. The significant number of games created with ARIS can be attributed to its low cost, its ease of use and the fact that it was used in all eight studies (42%) conducted at Portland State University, which, as already mentioned, was a major centre of activity.

Another three studies (16%), conducted elsewhere, used ARIS to create the games. Lee (2022) developed an augmented reality campus murder mystery game using the platform, whilst Mei and Yang (2019) designed an AR-based scavenger hunt where participants explored their campus and followed clues to answer 24 environment-themed questions. The third game, The *Guardians of the Mo'o*, used ARIS to allow players to complete quests and engage in narrative dialogues with QR codes placed at key points of interest on campus at the University of Hawai'i at Mānoa (Zheng et al. 2018).

Different tools, 7Scenes, TaleBlazer and HP Reveal, were used to create games in three additional studies (each 5%). TaleBlazer and 7Scenes facilitated AR based storytelling functionality similar to ARIS (Cervi-Wilson and Brick 2018; Lee and Park 2020), while HP Reveal aided the creation of augmented reality experiences with a web-based interface (Hsu and Liu 2021). Like ARIS, these tools had the advantage of being free and inherently user-friendly, thus allowing game designers with limited programming skills to use them to create interactive location-based game experiences.

Three studies (16%) used custom-built applications for their games. Creating such applications requires considerable technical expertise and programming skills but allows for a high degree of customisation and control (Godwin-Jones 2016). Open Data Kit (ODK) was employed by Chang, Shih, and Chang (2017) to create an app with structured, location-based activities undertaken at the Tainan Confucius Temple

in Taiwan. ARCore and Unity were used to develop the *Parsishoo* game in Mozaffari and Hamidi's (2023) study, while *MiniHongo* was written specifically for Tran et al.'s (2023) location-based game. Only one study (5%) did not use any tools to facilitate gameplay (Pitura and Terlecka-Pacut 2018). Instead, teams of upper-school students used maps of Krakow to locate eight significant historical locations where they completed various tasks such as solving puzzles and conducting interviews with locals. Participants interacted with game agents, played by university students, who provided historical context and guidance. They used their mobile devices for communication and for material collection but not to access an app as in the other games.

Proficiency Levels

As Xu et al. (2020) point out, teaching design and practice are strongly associated with the proficiency level of learners. Different techniques, activities and assessments are required for teaching different levels. In the studies chosen for this review, however, language proficiency levels were often broadly defined, vague or not stated (Table 3). Only two studies (10.5%) explicitly stated that proficiency levels had been assessed using a standardised measure. Participants in Hsu et al.'s (2021) study were required to have achieved at least elementary level in the General English Proficiency Test (GEPT), an official English proficiency exam commissioned by Taiwan's Ministry of Education and aligned with the national English education framework. Similarly, the proficiency levels of the participants in Lee's (2022) study were taken from their scores in the Test of English for International Communication (TOEIC), an internationally recognised test of English language proficiency.

Further studies specified proficiency levels using commonly used terms but did not explain how they were determined. Cervi-Wilson and Brick (2018) described the participants in their study of ImparApp as elementary-level learners of Italian, while Mozaffari and Hamidi (2023) used the term 'intermediate' to categorise participant levels in their study of *Parsishoo*. Perry (2021) grouped 58 participants by proficiency level (elementary, intermediate or advanced) prior to gameplay.

Other studies that referenced proficiency levels used broad classifications without further clarification. Nine (47%) described participants as having mixed proficiency levels, with learners at different stages of language acquisition playing the same game at the same time (e.g., Okoye 2019; Pitura and Terlecka-Pacut 2018). Six studies (32%) did not mention proficiency levels at all (e.g., Chang, Shih, and Chang 2017; Hellermann and Thorne 2022; Mei and Yang 2019).

Game Mechanics

The vast majority of games (95%) required collaborative gameplay, with players often working together to complete tasks and challenges (Table 4). Many games incorporated location-based mechanics where participants navigated real-world environments to engage with the game's narrative. For example, the *ChronoOps* game, which featured in eight studies (42%) (e.g., Hellermann and Thorne 2022; Sydorenko et al. 2019), required players to walk to specific locations where they planned and produced short videos highlighting examples of sustainable practice on their campus. Similarly, the

scavenger hunt created by Mei and Yang (2019) had students collaborate in exploring their campus and answering quiz questions at various location.

Other games, like *The Guardians of the Mo'o* (Zheng et al. 2018), used augmented reality to create interactive storytelling experiences. Players collaborated to complete quests and interact with non-player characters via QR codes at strategically placed locations. Collaboration was also central to the only game that did not rely heavily on technology (Pitura and Terlecka-Pacut 2018). Here, upper-secondary students worked in teams to navigate Krakow's historic sites, completing tasks like interviews and puzzles with guidance from real-life game agents.

In contrast, the *MiniHongo* game created by Tran, Kajimura, and Shibuya (2023) did not require collaboration or teamwork. Unlike the other games, it focused on individual, self-paced learning through location and activity-based lessons, with participants engaging with contextual vocabulary and providing feedback through daily check-in surveys and interviews.

RQ3 – How is the effectiveness of location-based games in language learning examined in research?

The final research question explores how the effectiveness of location-based games in language learning is examined in the included studies. This includes not only reported findings such as language gains, motivation and interaction but also the theoretical frameworks, methodological designs and evaluation tools used. These elements are essential for understanding how effectiveness is conceptualised, measured and interpreted.

Theoretical Frameworks

Four studies (21%) referred to frameworks rooted in Vygotsky's Social Constructivism (Vygotsky 1978) and other sociocultural theories, which emphasise the significance of collaborative learning, social interaction and the cultural context in language acquisition (see Table 5). Other frameworks included Problem-Based Learning (PBL) (e.g., Lee 2022) and Situated Learning Theory (SLT) (e.g., Tran, Kajimura, and Shibuya 2023), both of which emphasise contextualised learning experiences that foster active engagement and critical thinking.

Three studies (16%) adopted frameworks associated with cognitive and learning theories, including Usage-Based Linguistics (UBL), the Technology Acceptance Model

Table 5. Theoretical frameworks.

Broader category	Specific theoretical frameworks	Number of publications
Sociocultural and Constructivist Approaches	Social Constructivism, Sociocultural Theory, Problem-Based Learning (PBL), Situated Learning Theory	4
Cognitive and Learning Frameworks	Usage-Based Linguistics (UBL), Technology Acceptance Model (TAM), Ecological Perspective on Language Learning	3
Multiple Theoretical Frameworks	Situated Learning Theory (SLT), Enactivism, Distributed Cognition, Critical Pedagogy	1
	Situated Cognition, Sociocultural Theory, Collaborative learning	1
	4E Cognition and Sociomaterialism	1
	Distributed, Situated, Embodied, Enacted and Extended Cognition Frameworks	1
No Framework Mentioned	N/A	8

(TAM) and the Ecological Perspective on Language Learning. Four studies (21%) employed multiple frameworks, combining elements from different perspectives like Situated Learning, Enactivism and Distributed Cognition. In eight studies (42%), no theoretical framework was specified.

Methodological Approaches

The methodologies used across the 19 studies investigating location-based games for language learning included qualitative and mixed-methods approaches (Figure 8). No study relied solely on quantitative methods. A total of eleven studies (58%) employed qualitative methodologies. Among these, eight studies (42%) used Ethnomethodological Conversation Analysis (EMCA) to examine the interactions of language learners during gameplay (e.g., Hellermann, Thorne, and Haley 2019; Sydorenko et al. 2021; Zheng et al. 2018). The remaining three studies (16%) used other qualitative tools such as open-ended oral questions, structured observation sheets and focus groups to gather detailed feedback on participant experiences. Eight studies (42%) adopted mixed-methods designs, which used qualitative and quantitative approaches, including pre- and post-tests, cognitive load questionnaires and semi-structured interviews to assess student engagement and learning outcomes.

Evaluation Tools

Table 6 lists the evaluation tools used in the studies and categorises them by evaluation method (observational, perceptual, performance-based and system-generated metrics). Most studies investigated learners' experiences and interactions using a variety of tools, with the number used in each study ranging from one to five. Observational tools such as video recordings (58%), field notes (53%) and conversation transcripts

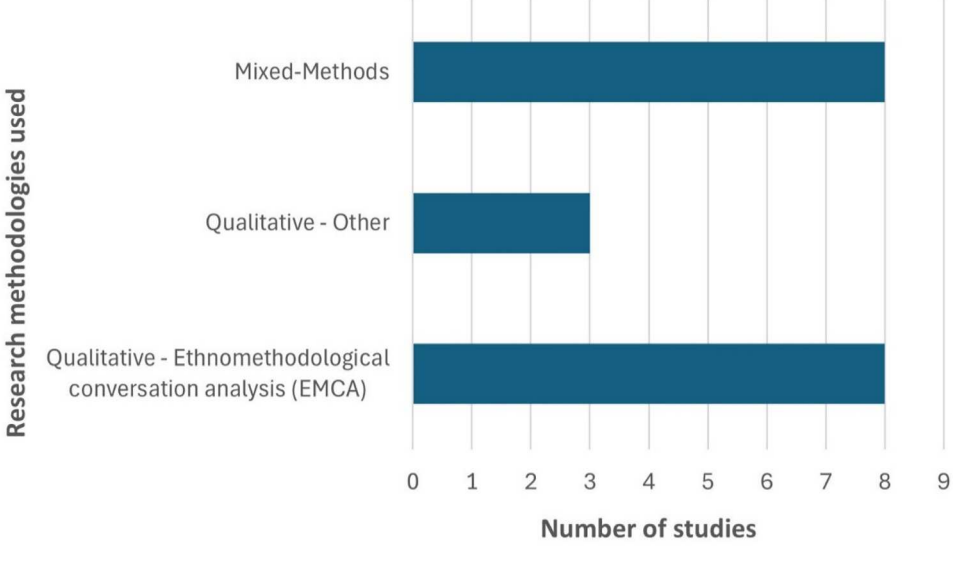

Figure 8. Methodologies used.

Table 6. Evaluation tools.

Evaluation tool	Nature of evaluation	Number of studies
Video recordings	Observational	11
Questionnaires	Perceptual (self-report)	10
Field notes	Observational	10
Transcripts of conversations	Observational	9
Semi-structured interviews	Perceptual (qualitative)	6
Focus group interviews	Perceptual (qualitative)	3
Pre- and post-tests	Performance-based assessment	2
Login checks	System-generated metrics	1
Reflection papers	Perceptual (written reflection)	1
Structured observation Sheets	Observational (structured)	1
App scenes	Observational (screen-based)	1
Only post-tests	Performance-based assessment	1

(32%) were the most common. Perceptual tools were also frequently used, with questionnaires appearing in ten studies (53%) and interviews or focus groups in eight (47%). Performance-based tools such as pre- and post-tests were less common; only three studies (16%) incorporated tests *(*Chang, Shih, and Chang 2017; Hsu and Liu 2021; Tran, Kajimura, and Shibuya 2023*)*, typically conducted before and after participation in the location-based game. One study (5%) used system-generated data (login checks) as an additional evaluative measure (Tran, Kajimura, and Shibuya 2023).

Study Findings

The 19 studies in this review provide insights into how the effectiveness of location-based games in language learning has been evaluated (Figure 9). One of the most prominent findings is the impact on motivation and engagement. Nine studies (47%) noted that using a location-based game fostered increased motivation and engagement. For example, participant feedback revealed that the mobile instructional pervasive game

Figure 9. Study findings.

used by Chang, Shih, and Chang (2017) increased the time learners were willing to dedicate to language tasks, thus emphasising the motivational benefits of this approach.

Seven studies (37%) reported improvements in language skills, including vocabulary retention (Tran, Kajimura, and Shibuya 2023) and speaking (Hsu and Liu 2021) as a result of participating in a location-based game. Another key finding was the role of collaboration. Eight studies (42%), including Sydorenko et al. (2019) and Thorne, Hellermann, and Jakonen (2021) highlighted the extent to which participants were encouraged to engage in co-constructing language skills and knowledge. Six studies (32%) noted usability and design features in their findings and participants generally provided positive feedback on the interactive features and user-friendly interfaces of the games. However, some challenges were noted, particularly regarding app design (Hsu and Liu 2021).

While the findings suggest that location-based games enhance motivation, engagement, collaboration and language skills, studies involving *ChronoOps* (e.g., Hellermann, Thorne, and Fodor 2017) often emphasised theoretical exploration over practical evaluation, focusing on linguistic and interactional features rather than directly assessing the game's impact on language learning outcomes. For example, aspects such as reading-aloud strategies (Hellermann, Thorne, and Fodor 2017; Thorne and Hellermann 2017), interaction dynamics (Hellermann and Thorne 2022) and the role of situational elements (Hellermann, Thorne, and Haley 2019) in language use were explored to a much greater extent than motivation or engagement.

Discussion

This scoping review provides an overview of studies conducted between 2016 and 2024 on location-based games for language learning. As already mentioned, it was motivated by the need to map the existing research landscape and identify gaps in the current understanding of how location-based games can support SLA in a range of contexts. Previous reviews have either overlooked location-based games entirely or have been limited in scope and methodological rigour. In this discussion, our aim is not to offer conclusive findings but, by synthesising the literature in this emerging field, we seek to provide a broad overview of key research trends, including the dominant role of collaboration and the limited use of theoretical frameworks. We also identify areas for further investigation and offer actionable insights to guide future research. The discussion, structured around our three research questions, draws together the key patterns and insights identified in the results.

Publication Trends, Sources, Geographical Locations and Target Languages

Research on location-based games for language learning has been published across a wide range of sources but can still be described as a somewhat niche area within the field of DGBL. Despite studies being frequently published in high-impact language education journals, an average of three per year between 2016 and 2024 suggests it remains an emerging and underexplored area. Several of the studies included were written by teacher-practitioners (e.g., Cervi-Wilson and Brick 2018; Pitura and Terlecka-Pacut 2018), indicating some level of pedagogical experimentation and practical interest. However, beyond these published accounts, there is limited systematic documentation of how widely location-based games are being implemented across different educational contexts.

Our scoping review does not aim to measure actual uptake and it is currently unclear how many language teachers use location-based games in practice. This gap between research and practice highlights the need for future empirical studies focused on exploring the extent of practical implementation of location-based games in language teaching. As educational institutions continue to adopt blended and experiential learning models, such as augmented reality, there is significant potential for greater integration of location-based games into mainstream SLA discourse. This requires, as Reinhardt (2019) suggests, sustained effort, a strategic approach and ongoing reflection.

Geographically, research has been unevenly distributed, with a significant concentration of studies from the United States (e.g., Hellermann and Thorne 2022; Thorne, Hellermann, and Jakonen 2021) as well as Taiwan and South Korea (e.g., Chang, Shih, and Chang 2017; Lee 2022). Interest in location-based games in East Asia may reflect a growing focus on innovative, technology-driven approaches to language education, particularly in university settings (Miller and Wu 2021). In contrast, there is a notable absence of studies from South America, Africa and many parts of Europe. It is unclear whether this reflects lower adoption of location-based games in these regions or a lack of published research output. Factors such as access to mobile technologies, educational policy priorities and local research infrastructures may influence this uneven distribution. This situation raises concerns about the generalisability of findings as location-based games rely on geographical and cultural contexts that may shape learning experiences differently. More research in these underrepresented regions would further our understanding of location-based games for language learning and contribute to a more inclusive and globally relevant knowledge base.

Regarding target languages, English dominates as the primary focus, with 58% of studies in this review investigating location-based games for learners of English. This is perhaps inevitable given the dominance of English as a global language. Nevertheless, 42% of the studies involved other languages. The *ChronoOps* augmented reality game was, in fact, designed to be multilingual, suggesting that there is some potential for developing similar games with multiple language settings. Researchers would then be able to explore the ways in which gameplay works with learners of different languages, thus enhancing the inclusivity and effectiveness of location-based games for language learning. Furthermore, greater linguistic diversity would provide more opportunities for teachers to implement location-based games in various educational contexts, making them a more practical and accessible tool for language teaching beyond research environments.

Types and Features of Location-Based Games used for Language Learning

The vast majority of studies (89.5%) focus on university students, with only one (5%) addressing school-aged learners (Pitura and Terlecka-Pacut 2018). This imbalance suggests that location-based games for language learning are predominantly being explored in university contexts where access to technology and participant recruitment are perhaps more straightforward. Gaining access to schools may involve additional challenges such as parental consent and risk assessments. However, younger learners could benefit from the games in unique ways, particularly if designed with age-appropriate scaffolding and pedagogical support. More research on how location-based games for language learning function in primary and secondary education would be valuable in broadening their applicability.

Similarly, research has largely overlooked how location-based games could be used in adult education outwith university settings. Language learning extends well beyond formal education, with many adults participating in workplace training, community-based language programmes and private language classes. However, only one study (5%) examined the use of location-based games for language learning among adults in employment (Tran, Kajimura, and Shibuya 2023). Given that mobile and game-based learning approaches have been shown to be effective for adult learners (Kukulska-Hulme and Viberg 2018), exploring how location-based games can support adult learners in these settings, where motivation, autonomy and real-world application are particularly relevant, could provide important insights into the broader potential of location-based games for language learning.

In terms of participant numbers, the disparity in sample sizes across the 19 studies in our review has significant implications for the generalisability and reliability of the findings. Smaller sample sizes may limit the external validity of results, while larger groups may provide more robust data. Furthermore, the predominance of small-group dynamics (53% of studies) warrants further discussion. While such groupings may foster more interaction and individual engagement, they may also restrict the diversity of linguistic input and peer interactions. A notable trend in the reviewed studies is the concentration of research at Portland State University, with 42% of studies involving *ChronoOps* conducted there. Seven of the 19 studies (37%) were written by either Steven L. Thorne, John Hellermann, or both. This raises questions about potential institutional and contextual biases that may shape the findings as well as whether the consistency of game design across studies limits the broader applicability of results. Future research would benefit from more consistent reporting of participant numbers and clearer documentation of study contexts, ideally expanding to a broader range of institutional, geographical and sociolinguistic settings to enhance the generalisability of findings.

The dominance of the ARIS platform across the studies reflects a strong preference for accessible, no-code solutions in the design of location-based language learning games. Advanced programming skills were not necessary to create interactive, AR-enhanced learning environments and thismay explain its appeal. ARIS, along with other free tools like HP Reveal and 7Scenes, has now been discontinued. Developers will need to look elsewhere for similar platforms and the increased complexity and potential costs of seeking alternative solutions could deter some from undertaking location-based game projects. To maintain momentum and encourage further innovation, there is a clear need for the development of more free, easily accessible tools for location-based game creation. Such tools would help ensure that the technical and financial barriers to entry remain low, enabling more practitioners to explore the potential of AR and location-based games for language learning.

Interestingly, one study (Pitura and Terlecka-Pacut 2018) departs entirely from app-based interaction, relying instead on analogue materials (maps) and live human agents to facilitate gameplay. This study demonstrates that meaningful, location-based language learning experiences can still be achieved without using digital platforms, especially when supported by creative design and local engagement. It also suggests that while technology can enhance language learning, it is not always essential for fostering interaction, immersion or engagement. This is a promising direction for future research as it explores the possibility of fostering language learning through location-based games without relying heavily on technology.

The inconsistent reporting and vague definitions of language proficiency levels across the reviewed studies highlight a broader issue in game-based language learning research: the lack of clarity regarding learner characteristics. Since teaching design is often closely tied to learner proficiency, this gap limits our ability to assess the appropriateness and effectiveness of particular games for specific learner groups.

The fact that only two studies (10.5%) assessed proficiency using standardised tools such as the GEPT or TOEIC suggests that validated, comparable measures are not yet widely integrated into study designs within this domain. While some studies used general descriptors like 'elementary' or 'intermediate', these classifications were often not clearly defined or measured, raising questions about how such groupings were determined and whether learners' needs were truly aligned with the game's linguistic demands.

The large proportion of studies (47%) that involved learners with mixed proficiency levels adds an additional layer of complexity. While this may reflect real-world classroom contexts, where mixed-level instruction is common, it also complicates the evaluation of the suitability of certain games for specific learner profiles and hinders our ability to offer evidence-based guidance for practitioners.

It is worth noting that some of the most flexible game designs, such as those using *ChronoOps,* were able to accommodate a wide range of proficiency levels (e.g., Okoye 2019; Thorne, Hellermann, and Jakonen 2021). Here, the focus was on collaborative, multimodal tasks such as video production, which may be less linguistically prescriptive and more adaptable to learners' individual strengths. This suggests that certain types of game-based tasks might be inherently more inclusive across proficiency levels, a hypothesis worth exploring in future studies.

The reviewed studies featured a variety of location-based games, ranging from AR applications (Mei and Yang 2019) to GPS-driven treasure hunts and narrative-based experiences (Cervi-Wilson and Brick 2018). These games incorporated different mechanics, including task-based collaborative missions, gamified vocabulary exercises and interactive storytelling. While requiring collaboration and communication among language learners in a location-based game may seem like a 'no-brainer' (Godwin-Jones 2016, 15), there is limited research comparing the effectiveness of different game mechanics for language learning. For instance, some studies suggest that competitive elements can enhance motivation (e.g., Cervi-Wilson and Brick 2018) whereas others argue that excessive competition may hinder meaningful interaction (e.g., Hellermann, Thorne, and Fodor 2017). Future research should systematically analyse which game features are most conducive to language acquisition and long-term retention.

Examining the Effectiveness of Location-Based Games in Language Learning

Regarding the effectiveness of location-based games, a key finding is the lack of consistency in the theoretical frameworks in the reviewed studies. The fact that nearly half did not specify a theoretical framework may complicate the synthesis of research findings and make it difficult to draw more general conclusions regarding the effectiveness of location-based games in language learning. Amongst the eleven studies (58%) in which theoretical frameworks were mentioned, there was considerable variation. Sociocultural and constructivist theories featured in several (e.g., Hsu and Liu 2021; Thorne and Hellermann 2017), whilst others drew from cognitive models such as Usage-Based

Linguistics (UBL) and the Technology Acceptance Model (TAM) (e.g., Hellermann and Thorne 2022; Mei and Yang 2019).

This diversity in theoretical frameworks, while valuable in capturing different perspectives, also presents challenges in synthesising results. As Pegrum (2014) points out, it may be that we don't need one underlying theory but a cluster of interrelated theories. Nevertheless, the lack of alignment across studies makes it difficult to draw overarching conclusions. To improve the comparison and integration of findings, future research would benefit from adopting clearer, more consistent frameworks. This would not only provide a more coherent understanding of how location-based games support SLA but also help define the specific conditions under which they are most effective.

Most studies employed a range of methodologies to investigate learners' experiences and interactions. This facilitates a more comprehensive exploration of the learning process and contributes positively to the robustness and generalisability of research in the field. Qualitative methods were particularly prominent, with Ethnomethodological Conversation Analysis (EMCA) being the primary approach used, especially in studies conducted at Portland State University (e.g., Hellermann and Thorne 2022; Sydorenko et al. 2019). This focus on understanding learner interactions in naturalistic, real-world contexts provides valuable insights into how learners engage with location-based games and how they promote and encourage language acquisition.

The prevalence of qualitative and mixed-methods approaches has provided a rich understanding of learner engagement, interaction patterns and the social aspects of language learning with location-based games. However, while these methods offer deep contextual insights, there is a lack of purely quantitative research. Only three studies (16%) (Chang, Shih, and Chang 2017; Hsu and Liu 2021; Tran, Kajimura, and Shibuya 2023) included performance-based evaluation tools such as pre- and post-tests, which are useful for measuring the long-term impact of location-based games on language proficiency. This may be due to the challenges of designing and administering them in the context of a location-based game involving movement and collaborative elements that may be difficult to quantify or measure using traditional testing methods. Instead, many studies used mixed-methods approaches that combined qualitative insights with quantitative tools such as surveys and questionnaires. They tended to focus more on learner attitudes and engagement rather than systematic comparisons or clearly defined language skill assessments.

Greater integration of quantitative methodologies could enhance the field in several ways. Firstly, they would allow for more systematic comparisons across different learning contexts such as universities and schools. This would help establish whether the effectiveness of location-based games for language learning is consistent across different learner groups. Secondly, quantitative approaches could provide more measurable evidence of long-term language learning outcomes, which might clarify whether improvements in motivation and engagement translate into sustained language proficiency gains. Quantitative data could also support the refinement of location-based games design by linking specific game mechanics to measurable improvements in linguistic skills, thereby providing clearer guidelines for game developers and practitioners.

Future research should aim for a balanced integration of qualitative depth with quantitative rigour, ensuring that the strengths of both methodologies are fully exploited. Incorporating experimental designs, follow-up assessments and short-term retention

studies within mixed-methods research would provide a more comprehensive understanding of how location-based games influence language learning. Given that most games are often played infrequently in a class setting, longitudinal studies in the traditional sense may be less relevant. Instead, future research could explore whether skills gained through location-based games transfer to other language learning activities or whether repeated exposure to different location-based games results in cumulative learning benefits. By combining detailed interactional analyses with performance-based assessments, a stronger evidence base for the educational value of location-based games for language learning could be built.

Overall, the studies employed a mix of evaluation tools, offering both qualitative insights into participants' experiences and more direct measures of language learning. The prevalence of observational tools such as video recordings, field notes and conversation transcripts may be due to the naturalistic setting of the studies where participants interacted with mobile technology in real-world environments. These tools are effective in capturing authentic, spontaneous interactions during gameplay, providing valuable insights into collaborative learning processes. Future research could benefit from a more integrated use of performance-based tools (e.g., pre- and post-tests) alongside observational and perceptual measures to offer a more holistic view of how location-based games contribute to language learning outcomes. This approach would help triangulate findings and strengthen the evidence base by linking learners' experiences with actual learning progress.

Limitations

This scoping review has some limitations that should be considered when interpreting the findings. Firstly, it only focuses on studies published between 2016 and 2024. Future research could explore a broader time frame to provide a more comprehensive picture. Although we conducted a thorough search across multiple databases, some relevant grey literature and unpublished studies may have been missed. Expanding the inclusion criteria and database coverage could address this limitation. Furthermore, the use of subjective coding to extract themes and synthesise data introduces an element of interpretation that may affect the consistency and generalisability of the findings. We attempted to minimise bias by involving a research team in the coding process. Despite the inherent subjectivity of qualitative analysis, particularly in emerging areas like location-based games for language learning, this review establishes a solid basis for further research into this promising area.

Conclusion

This scoping review provides a comprehensive overview of research trends, limitations and future directions in the field of location-based games for language learning. Our findings indicate that while such games have the potential to support language learning across various contexts, further research is essential to better understand their effectiveness. Furthermore, there is a pressing need for the development of more accessible and user-friendly tools for creating games. Future studies should focus on evaluating the effectiveness of different game mechanics, exploring their use in various educational contexts and addressing the challenges surrounding tool accessibility. By building on

the insights provided here, we hope to contribute to a deeper understanding of the role of location-based games in language learning and inform the creation of more effective learning interventions.

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Author Contributions

Donald Richardson: Conceptualisation, Methodology, Data Curation, Formal Analysis, Writing (Original Draft, Review & Editing), Visualisation.

Blair Matthews: Writing (Review & Editing), Validation, Supervision.

Both authors contributed to the design and development of the study, critically revised the manuscript for intellectual content, approved both the protocol and the final version to be published, and agree to be accountable for all aspects of the work.

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Data Availability Statement

The full coding scheme, database search summary and extracted dataset for all 19 studies are available as supplementary material via the University of St Andrews Research Portal: https://doi.org/10.17630/f721abd5-c67d-4f79-b697-297be33ee969.

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