The Realities of Roblox and Metaverse Technologies and Emerging Potential Enhancing English Language Learning

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Abstract

Integrating gamified learning through Roblox into English Language Education (ELE) offers significant advancements, supporting Sustainable Development Goals (SDG) 4 and 5 for equitable, inclusive quality education and lifelong learning opportunities. This Systematic Literature Review (SLR) utilized the PRISMA 2020 checklist, including its 27-item framework and four-phase methodology (identification, screening, eligibility, and inclusion), to rigorously analyze 50 articles published from 2015 to 2023. Articles were sourced from Google Scholar, Web of Science, and Scopus, focusing on three core research objectives, (1) How do Roblox and Metaverse platforms impact ESL learners? (2) What mechanisms facilitate this learning? (3) What challenges arise when integrating these technologies into primary ESL settings? The findings emphasize that Roblox and Metaverse platforms provide interactive and immersive learning experiences, enhancing engagement, vocabulary retention, and real-time application of language skills. Key mechanisms include contextual learning and immediate feedback, which align with natural language acquisition processes, offering practical and engaging environments for ESL learners. These technologies also foster cultural exchange and inclusivity, broadening learners' horizons globally. However, challenges remain. Equitable access to technology, effective curricular integration, sustainability of engagement, and data security were identified as critical barriers. Addressing these issues requires robust infrastructure development, targeted teacher training, and iterative pilot testing to refine strategies. This study underscores the transformative potential of Roblox and Metaverse technologies in revolutionizing ELE, offering strategic solutions to harness their benefits effectively. By overcoming existing challenges, these platforms can create inclusive, engaging, and effective language learning environments, driving global educational progress.

Keywords: English Language Education (ELE), Metaverse Technology, PRISMA, Roblox, Systematic Literature Review (SLR)

1. Introduction

In the 21st century, education is evolving rapidly, with English Language Learning (ELL) emerging as a cornerstone for global communication, economic advancement, and cultural exchange. English has cemented its status as the lingua franca of international business, academia, and diplomacy, making its mastery critical for success in a globalized world. The World Economic Forum (2016) highlights that learners today require advanced skills such as digital literacy, collaboration, problem-solving, and critical thinking to thrive in an interconnected society. Despite its importance, ELL remains a challenge for many learners due to diverse linguistic, social, and environmental factors. Conventional teaching methods often fail to meet these challenges, necessitating innovative approaches in language education.

National educational policies worldwide, including Malaysia's National Education Policy (NEP) and the Malaysian Education Blueprint, underscore English proficiency as a driver of international competitiveness and societal development (Ministry of Education, 2020). However, achieving proficiency involves navigating barriers such as a lack of engaging resources, socio-economic disparities, and limited exposure to practical language usage. These gaps call for transformative strategies to make language learning more engaging, inclusive, and impactful.

The Metaverse represents a digital ecosystem where physical and virtual realities converge, creating immersive environments for communication, exploration, and learning. Enabled by technologies such as Virtual Reality (VR), Augmented Reality (AR), and Blockchain, the Metaverse is increasingly recognized as a game-changer in education (Johnson & Thompson, 2021). Platforms such as Roblox, Minecraft, The Sandbox, and Horizon Workrooms exemplify this shift by offering shared virtual spaces where learners can interact, collaborate, and learn in real time.

Roblox, in particular, has gained traction for its ability to foster interactive, immersive learning. The platform provides opportunities for learners to engage in virtual role-playing, simulations, and collaborative projects, allowing them to practice conversational English and acquire new vocabulary in contextually rich settings (Yunus & Rafiq, 2022). Unlike traditional rote learning, these environments mimic real-life situations, promoting active participation and fostering practical language skills. By placing learners in real-world scenarios, the Metaverse addresses significant gaps in traditional educational models, offering personalized and experiential learning opportunities (Smith & Daniels, 2022).

ELL transcends language acquisition, serving as a gateway to global opportunities and cultural awareness. English proficiency enhances employability, academic access, and social mobility, making it a priority for nations aiming to position themselves competitively in the global economy. For Malaysia, English is a vital component of its national education agenda, with policies emphasizing its role in fostering innovation and global integration (Ministry of Education Malaysia, 2013). However, traditional ELL strategies often fall short of addressing diverse learning needs, leading to disengagement and limited skill retention.

The Metaverse offers a compelling solution by creating immersive environments where learners can experience language in action. These platforms enable students to communicate in real time, participate in interactive simulations, and engage in collaborative tasks that mimic natural language usage (Hu-Au & Lee, 2017). This approach not only enhances vocabulary

retention and grammar application but also promotes cultural understanding and global citizenship.

The integration of Metaverse technologies into education aligns seamlessly with the United Nations' Sustainable Development Goals (SDGs), particularly SDG 4 and SDG 5. SDG 4 emphasizes inclusive, equitable quality education and lifelong learning opportunities, while SDG 5 focuses on gender equality and inclusivity in education (United Nations, 2015). Metaverse platforms, such as Roblox, address these goals by creating accessible, scalable, and engaging learning environments. For example, students from rural or underfunded schools can access high-quality resources and virtual classrooms through these platforms, reducing geographic and economic barriers (Warschauer & Matuchniak, 2010).

In Malaysia, the adoption of Metaverse technologies supports the Malaysian Education Blueprint's vision of leveraging digital tools to enhance education. By fostering collaboration across diverse cultural and linguistic contexts, these platforms contribute to developing global citizens who are empathetic, culturally aware, and proficient in digital literacy (Byram, 2008).

While the Metaverse holds immense promise, its integration into ELL comes with challenges. A significant concern is the digital divide, as many students from low-income families lack access to essential technology, such as VR headsets or reliable internet connections. Addressing this inequity requires collaborative efforts among governments, educators, and technology providers to ensure inclusive access to Metaverse platforms (Warschauer & Matuchniak, 2010).

Teacher readiness also poses a challenge. Educators need specialized training to navigate and utilize these platforms effectively. Professional development programs must focus on digital literacy, instructional design, and classroom management within virtual environments (Rivera & Garden, 2021). Additionally, ethical considerations such as data privacy, cybersecurity, and student safety must be prioritized to foster trust and ensure responsible use of these technologies (Kaddoura & Al Husseiny, 2023).

Despite these challenges, the opportunities are vast. Gamification elements, such as leaderboards, badges, and rewards, significantly enhance learner motivation and engagement. Personalized learning pathways within platforms, especially Roblox, allow educators to tailor activities to individual student needs, improving retention and participation (Bedwell et al., 2012). These platforms also promote cultural exchange, enabling students to interact with peers globally and fostering a sense of global citizenship.

While the educational potential of Metaverse platforms is evident, several gaps in research remain. Longitudinal studies on the impact of these technologies on language skill retention and overall learning outcomes are limited (Han et al., 2023). Additionally, there is a lack of comprehensive frameworks linking specific Metaverse features to educational objectives, which could guide educators and developers in optimizing these platforms for ELL (Alhasan et al., 2023).

Another underexplored area is the socio-cultural implications of Metaverse platforms in diverse educational contexts. Understanding how these technologies influence educational equity and access is critical for ensuring their benefits are distributed fairly. Research should also focus on scaling these platforms in underfunded schools, providing insights for policymakers and educators to address systemic inequities.

2. Research Objectives

2.1 To explore the impacts of Roblox and Metaverse platforms on English as a Second Language (ESL) learners

2.2 To identify and analyze the underlying mechanisms that facilitate learning through Roblox and Metaverse platforms

2.3 To examine the challenges associated with integrating Metaverse technologies into primary ESL educational settings

Integrating Metaverse technologies into ELL offers transformative opportunities to enhance engagement, inclusivity, and practical language application. Platforms, especially Roblox demonstrate the potential to revolutionize traditional education by creating immersive, interactive, and personalized learning environments. However, realizing their full potential requires addressing critical challenges such as technological access, teacher training, and ethical considerations. By aligning with broader educational goals like SDGs 4 and 5, Metaverse platforms can contribute significantly to advancing educational equity, fostering global citizenship, and preparing learners for the demands of a digitally interconnected world.

This study underscores the importance of strategic implementation and ongoing research to harness the benefits of Metaverse technologies effectively. With thoughtful planning and collaboration among educators, policymakers, and technologists, these platforms can redefine the future of ELL, ensuring that learners worldwide are equipped to navigate the complexities of the 21st century.

3. Methodology

This systematic literature review was guided by the PRISMA Checklist 2020, which includes a 27-item checklist and a structured four-phase flow diagram (identification, screening, eligibility, and inclusion). The four phases were used to systematically identify relevant studies, assess their eligibility based on predefined criteria, and include those that align with the research objectives. By following this structured approach, the review ensured transparency, rigor, and comprehensiveness in analyzing the selected articles, providing a solid foundation for addressing the research questions.

3.1 Search Strategy Phase

To effectively explore the educational potential of Roblox and similar Metaverse platforms in the context of primary ELE, a systematic search strategy was employed across multiple scholarly databases, which comprise Google Scholar, Web of Science (WoS), and Scopus. This search was guided by the objective of understanding how Roblox and similar Metaverse platforms can overcome traditional educational barriers and align with global educational objectives, specifically SDG 4. Table 1 details a list of these inclusion and exclusion criteria, illustrating the parameters used to refine the selection of relevant research articles.

Table 1. The inclusion and exclusion criteria in choosing the articles

Criteria	**Inclusion**		
Databases	Google Scholar, WoS, and Scopus		
Search Strategy	**Keywords** . Metaverse a. Roblox b. GBL c. ESL education d. Virtual Learning environments	Combined using Boolean operators AND, OR, and NOT	**Keywords** . "Roblox AND ESL" a. "Metaverse AND primary education," (c) "virtual learning AND SDG 4" (d) "gamification AND primary education"
Inclusion Criteria . Publication: between 2015-2023 a. Language: written in English b. Focus on ESL Learners		**Exclusion Criteria** . Published before 2015 a. Non-English Papers b. Non-ESL Learners c. Screened based on titles and abstracts	
Evaluation	Assessed for eligibility (suitable articles based on the keywords) Must have open access to the full-text		
Data Extraction	Data extracted based on . Key findings a. Study design b. Sample size c. Intervention d. Outcomes		
Data Synthesis	Narrative Analysis Thematic analysis		

The study systematically searched for articles based on inclusion criteria where the combinations and variations of keywords such as "Roblox," "Metaverse," "virtual learning environments," "digital game-based learning," "ESL education," "primary education," and "SDG 4 education" were used. This is projected in Table 1. These terms were combined using Boolean operators (such as AND, and OR) to refine the search. For instance, search terms using

"Roblox AND ESL," "Metaverse AND primary education," or "virtual learning AND SDG 4" were entered in the following databases which are Google Scholar, WoS, and Scopus for their extensive repository of scholarly articles, providing a broad scope of academic research across various disciplines, including education and technology. As a result, a total of 77 articles were identified.

3.2 Inclusion and Exclusion Criteria Phase

The pool of 77 articles was filtered using the inclusion and exclusion criteria that further narrowed the size of the selection. The Inclusion Criteria were designed to ensure that the articles focused on the use of Roblox and other Metaverse platforms in educational settings, particularly in primary education and for ESL learners. The criteria emphasized the effectiveness, challenges, and outcomes of these platforms in addressing educational barriers. Specifically, the inclusion criteria were (1) Publication Date, (2) Language, and (3) Focus. Conversely, the Exclusion Criteria were set to filter out articles that did not meet the focus or relevance required for this review. These criteria included Non-ESL Learners, Screening Basis, Publication Date, and Language.

3.3 Screening and Evaluation Phase

For Screening and Evaluation, initial searches yielded a list of titles and abstracts, which were screened based on relevance to the research objectives. The full texts of these filtered articles were then assessed for their depth of analysis, empirical evidence, and direct relevance to exploring the capabilities of Roblox and similar platforms in transforming ELE.

The articles are thoroughly read to identify how deeply they delve into relevant educational theories, the technical aspects of these platforms, and their practical implications in language learning environments. For instance, studies that offer a robust theoretical framework explaining how gamified elements on platforms such as Roblox influence language acquisition are considered more valuable. Additionally, the richness of the discussion, including how well the articles compare Roblox with other digital learning tools or platforms, contributes to assessing the depth of analysis. Articles with broad, superficial overviews are filtered out in favour of those that provide detailed, focused exploration, allowing for a deeper understanding of how such platforms transform language learning.

Next, the empirical evidence is critical in supporting the claims made within the studies. Therefore, the selected articles are carefully evaluated for their methodological rigour, such as whether they employ qualitative, quantitative, or mixed methods to explore the impact of Roblox and similar platforms. Studies that include clear, replicable, and data-driven methodologies are prioritized. The relevance of each article to the core research questions is assessed to ensure it directly addresses the role of Roblox and Metaverse platforms in ESL education. The aim is to ensure that each selected article aligns with the primary focus of this review, which is how these platforms influence ELE. Studies that provide practical applications, such as case studies demonstrating how educators have successfully integrated Roblox into their ESL curriculum, are prioritized. Articles that focus too broadly on gamified learning without specifically discussing its application in ELE are filtered out. The research is also concerned with whether these platforms help address specific ESL challenges, such as improving learners' engagement, vocabulary acquisition, and cross-cultural communication

skills. Through these rigorous screening processes, only the most relevant, well-researched, and impactful studies are included in the systematic review.

3.4 Data Extraction and Synthesis Phase

Data Extraction and Synthesis were administered where aspects such as the research objectives, methodologies, participant demographics, key findings, and conclusions were extracted from each selected article. This data was then synthesized to form a comprehensive understanding of the current landscape of digital game-based learning in ESL through the use of Roblox and the Metaverse, and its alignment with educational equity and inclusivity goals. This strategic and systematic approach ensured a comprehensive data collection, facilitating an in-depth review that aligns with the overarching goals of assessing the transformative potential of these innovative educational technologies in line with global educational standards and objectives.

3.5 Analysis Phase

Figure 1 shows the PRISMA Flow Diagram which outlines the structured process used to assess the educational potential of platforms, particularly Roblox and the Metaverse in primary ELE. Initially, Google Scholar, WoS, and Scopus were used as databases to conduct a comprehensive search, yielding 77 articles. After removing duplicates, these 57 articles were screened further to issue relevance and data sufficiency. In the eligibility phase, 52 articles were assessed in detail, resulting in the exclusion of 5 articles. 47 studies were selected for qualitative synthesis upon using the inclusion criteria.

The qualitative synthesis in this context involves a deep analysis and integration of the 40 studies that were included in the systematic review. This process goes beyond merely summarising the findings of each study. It involves identifying patterns, themes, and insights that emerge across the different studies. By synthesizing these key aspects, the review provides a comprehensive understanding of how Roblox and the Metaverse are being used to enhance primary ELE.

In this synthesis, the studies are likely examined for various dimensions such as the effectiveness of these platforms in improving language skills, their impact on student engagement, and how they are being implemented in different educational settings. The synthesis also considers the methodologies used in the studies, the contexts in which the platforms are applied, and any challenges or limitations identified by the researchers.

A systematic approach to identifying, analyzing, and reporting patterns within qualitative data by bringing together the findings from multiple studies as outlined by Braun and Clarke (2006). The qualitative synthesis offers a nuanced view of the educational potential of Roblox and the Metaverse.

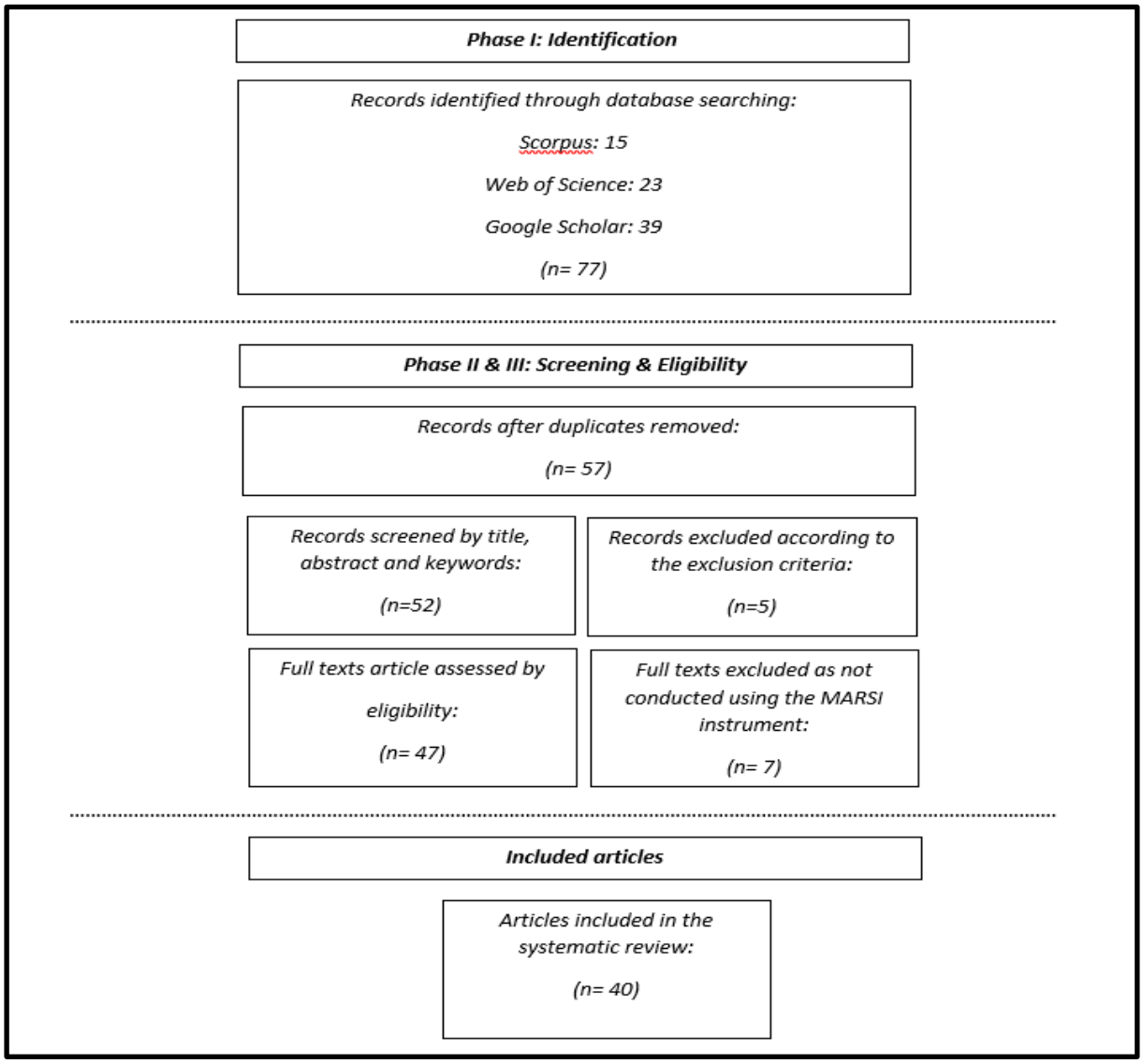

Figure 1: PRISMA Flow Diagram

The first step is data familiarisation, which involves an immersive reading and re-reading of the selected articles. This allows a comprehensive understanding of the content, as it relates to how Roblox and Metaverse technologies are utilized in enhancing ESL education. Through this deep engagement with the data, significant ideas and recurring concepts were noted. In the second step, the researchers generated initial codes, which involved systematically identifying key elements within the data. These codes, such as "immersive learning," "student engagement," and "gamification effects," are created to capture significant aspects of the articles that address the research focus. This step breaks down the data into more manageable segments, making it easier to group similar concepts.

Next, the researchers searched for themes based on the previously identified codes that are grouped into broader categories. For instance, codes related to student motivation and active participation in the learning process might be clustered into a theme called "engagement mechanisms." Similarly, codes discussing access to technology and digital equity might coalesce under the theme of "accessibility barriers." This is where meaningful patterns were identified in the data, which later led to the reviewing of themes. Identified themes are refined

and adjusted to ensure they accurately represent the data. This involves checking whether the data within each theme is cohesive and whether themes are sufficiently distinct from one another. In some cases, themes may be split into sub-themes, or several themes might be merged if they overlap significantly.

This review process ensures clarity and consistency across the data. Once the themes are clear and well-defined, the next step is finalizing the themes, which involves assigning precise and meaningful labels to each theme that accurately reflect the content they encompass. For example, a theme such as "interactive learning environments" may encapsulate discussions about how this Roblox platform provides immersive and gamified learning contexts for ESL students. Finally, a report is produced where the themes are presented in a coherent narrative, addressing the research questions and providing insights into how Roblox and Metaverse platforms impact ESL learners. The report will discuss each theme in detail, supported by data from the reviewed articles, and linked to the overarching objectives of the study. By following this six-step approach, the thematic analysis offers a thorough and systematic interpretation of the data, providing valuable insights into the educational applications of Roblox and the Metaverse in primary ELE.

4. Findings and discussions

4.1 The impacts of using Roblox and other Metaverse platforms on ESL learners

A. Enhancement in engagement and motivation

Gamified environments like Roblox significantly enhance student engagement and motivation in ESL learning by leveraging interactive and immersive elements. Alsawaier (2018) demonstrated that incorporating gamification mechanics, such as points, badges, leaderboards, and immediate feedback, fosters heightened participation and consistent practice among learners. His quantitative study revealed that immediate rewards and reinforcement play a crucial role in maintaining interest in gamified educational settings. Similarly, Buckley and Doyle (2016), through experimental research, compared traditional learning materials with gamified versions and found significantly increased motivation and active participation in the gamified group. Their findings highlight how intrinsic motivators, such as enjoyment and challenge, combined with extrinsic incentives like rewards and competition, drive student engagement.

Deterding et al. (2011) extended this understanding by proposing a theoretical framework categorizing gamification elements, such as feedback loops and reward systems, into structured design patterns. While their work was not empirical, it provided a foundational lens for examining how gamification mechanics systematically enhance user engagement. This framework has informed subsequent studies, emphasizing the potential of gamified systems to create engaging and behaviorally impactful learning environments aligned with educational goals.

Hanus and Fox (2015) explored the long-term effects of gamification, revealing its nuanced dynamics. Their semester-long study showed that while gamified elements initially boosted motivation and performance, engagement waned over time. This decline underscores the importance of adaptable strategies to sustain gamification's effectiveness. Together, these studies illustrate the transformative potential of gamified environments in ESL education, emphasizing thoughtful design and ongoing adaptation to maximize long-term benefits.

B. Contextual and Immersive Learning

The effectiveness of using platforms such as Roblox and other Metaverse technologies in enhancing ESL learning is based on several mechanisms that fundamentally capture students' attention and sustain their engagement through contextual and immersive learning, and interactive experiences.

One key reason these platforms capture students' attention is that they create highly engaging environments that mimic real scenarios. As opposed to traditional classroom methods that may rely on passive memorization, Metaverse platforms foster active participation through contextualized, immersive learning environments. For example, Chen and Hsu (2020) argue that these virtual settings enable learners to use the language in real-time, authentic contexts, which helps them better retain vocabulary and understand grammatical structures. This immersion allows students to actively use the language to navigate through social interactions and problem-solving tasks, making learning more relevant and engaging. This kind of participation aligns with the natural ways languages are learned, such as through practical application and real-time feedback.

Moreover, past studies, such as Sundqvist and Wikström (2015) and Reinders and Wattana (2015), demonstrate that students in gamified, interactive settings perform better in language proficiency tests than those in traditional learning environments. This evidence shows that platforms e.g. Roblox foster greater attention and involvement from students by making the learning process more enjoyable and relevant. These platforms provide opportunities for students to engage in role-playing, collaborative projects, and virtual simulations, where language is used in practical, context-based scenarios. This active involvement directly contrasts with traditional methods, where students often remain passive recipients of information. The continuous engagement in Metaverse platforms is further reinforced by the real-time feedback these environments offer. Gee (2003) points out that immediate feedback is critical for reinforcing learning, as it allows learners to adjust their language use quickly. This immediate response system, available in platforms such as Roblox, ensures students' self-correction and refinement of skills on the spot, reinforcing learning more effectively unlike those offered in traditional classrooms which often employ delayed feedback environments.

In conclusion, the interactive and immersive nature of Roblox and other Metaverse platforms successfully captures students' attention by offering meaningful, context-rich experiences that promote active participation. The alignment of these platforms with the natural processes of language acquisition, supported by real-time feedback mechanisms, makes them powerful tools for enhancing engagement and retention in ESL learners.

C. Achieving Broader Educational Goals

With strategic implementation, Roblox and Metaverse technologies have the potential to revolutionize ELE and contribute to achieving broader educational goals. First, educators must ensure strategic integration into existing teaching frameworks, which involves aligning the interactive and gamified elements of these platforms with the curriculum's specific language skills. For example, language exercises focusing on vocabulary, grammar, and conversational skills can be adapted into Roblox's virtual challenges. These virtual tasks offer students opportunities to practice the language in context, providing real-time feedback and enhancing comprehension. This is critical because learners benefit from seeing how language

functions in practical, immersive settings. As indicated by Alsawaier (2018), aligning educational content with these platforms helps meet national and international educational goals by creating experiences that directly address language acquisition objectives.

Another important aspect of the successful implementation of Roblox and Metaverse is equipping teachers with the necessary skills to utilize these digital tools. As Chen and Hsu (2020) highlighted, professional development programs are key in familiarising teachers with the features of Roblox and the Metaverse. Teachers' training should not only be on navigating these platforms but also on how to create virtual spaces that support language learning objectives. Digital literacy training must also extend to understanding how to blend traditional teaching methods with these technologies, ensuring a hybrid approach that enhances student engagement. This would not only ensure educators' comfort in using these tools but are also adept at designing lessons that take full advantage of the interactive, immersive potential of Metaverse technologies.

Collaboration between educators, instructional designers, and educational technologists is essential for a comprehensive implementation of these platforms in language learning. As emphasized by Baig (2021), collaboration is necessary to create virtual simulations, role-playing activities, or virtual field trips that can deeply immerse students in the language learning experience. These ensure that the Metaverse platforms are utilized to their full potential, dlivering highly engaging, context-rich learning experiences. Before full-scale implementation, administer pilot programs that allow schools and districts to test the effectiveness of Roblox-based modules in smaller groups, as suggested by Wang et al. (2022). These programs are critical for identifying technical and pedagogical challenges while monitoring student performance, engagement, and technical issues and refining their approach based on feedback.

Finally, equitable access to technology must be considered, as noted by Warschauer and Matuchniak (2010). A major challenge in implementing digital learning platforms e.g. Roblox is the digital divide, which calls on schools' attention. Smith and Jones (2021) also emphasize continuous monitoring and data collection. Gathering data on student progress and engagement allows for iterative improvements, ensuring that these platforms remain relevant, effective, and adaptable to the needs of students over time. In conclusion, the successful implementation of Roblox and Metaverse platforms in ELE requires thoughtful curriculum integration, comprehensive teacher training, and collaboration between educators and technologists. By piloting these technologies and ensuring equitable access, educators can maximize the transformative potential of these platforms, offering immersive, engaging, and effective language learning experiences that align with broader educational goals particularly those outlined in SDGs 4 and 5.

4.2 The underlying mechanisms that facilitate the learning process

The integration of Roblox and Metaverse platforms into ELE leverages four underlying mechanisms that facilitate effective learning. First, these platforms significantly enhance student engagement by offering interactive, game-like experiences that motivate students to participate actively in their language learning journey. Second, they provide immersive and contextual learning environments, allowing students to practice English in realistic scenarios that mimic real-life situations, thereby deepening their understanding and application of

language skills. Third, the platforms promote cultural understanding by exposing students to virtual worlds that represent diverse cultures, broadening their appreciation of cultural diversity, which is integral to language learning. Lastly, Roblox and Metaverse technologies support personalized learning by enabling educators to tailor educational experiences to the unique needs and paces of individual learners, ensuring that each student can achieve their specific language learning goals. These combined mechanisms make the integration of these platforms a powerful tool in revolutionizing language education. These digital and interactive natures help learners visualize and experience the language contextually, which enhances understanding and retention (Bailenson, 2018). Such immersive experiences allow learners to practice the language in relevant ways, making the learning experience more meaningful and effective.

Roblox and similar platforms support contextual learning, where language skills are developed through practical application rather than rote memorization. This approach is particularly effective for vocabulary retention and usage, as learners experience language in situational contexts, making the learning process more relevant and memorable (Chen & Hsu, 2020). Contextual learning mirrors natural language acquisition processes, where language is learned through meaningful interactions and experiences. This mechanism supports faster and more effective language learning. In sum, the use of Roblox and other Metaverse platforms in ELE taps into advanced pedagogical strategies that make language learning more engaging, contextual, and adaptive. These platforms not only address various learning styles and needs but also foster a richer, more interactive educational environment conducive to language acquisition.

4.3 The challenges in integrating Metaverse technologies in primary ESL settings

Integrating Metaverse technologies in primary ESL settings presents several significant challenges that need to be addressed to maximize their educational benefits. The digital divide remains a significant barrier, with students from lower socio-economic backgrounds often lacking access to these resources. This inequity can lead to disparities in learning opportunities and outcomes (Warschauer & Matuchniak, 2010). As such, equal access to the required technology is crucial for the successful integration of Metaverse platforms in primary ELE. Another challenge is ensuring that the content within the Metaverse is appropriate for young learners. There are real concerns about exposure to harmful or inappropriate content, which necessitates robust moderation and control mechanisms. Educators and developers must work together to create safe virtual environments that protect children from potential online risks (Roblox Blog, 2023). Ensuring safe and appropriate content is critical for maintaining a conducive learning environment. A successful integration of Metaverse technologies in ELE also depends on teachers' efficacy where some may not be familiar with these advanced technologies or how to incorporate them effectively into their teaching practices (Avelino & Ismail 2022). Professional development and ongoing support are essential to help teachers develop the skills and confidence needed to use these tools effectively (Lin et al., 2022). Without proper training, the potential of Metaverse technologies to enhance ESL learning cannot be fully realized.

The implementation of Metaverse technologies often requires substantial investment in infrastructure and software. Schools, especially those in underfunded areas, may face financial

constraints that hinder the acquisition and maintenance of necessary technology. This includes not only the initial purchase of devices but also ongoing costs for updates, maintenance, and technical support (Roblox Corporate, 2023). Finding ways to finance and sustain these technologies is a major challenge for educational institutions.

While Metaverse platforms can increase engagement through interactive and gamified learning environments, maintaining consistent student motivation over time can be challenging. The novelty of these platforms might wear off, and educators need to develop strategies to keep students consistently engaged. Ensuring that the educational content remains relevant and challenging is essential to maintaining long-term interest and motivation among learners (Cogent Education, 2023).

Privacy and data security are critical concerns when integrating digital technologies into education. Protecting students' personal information and ensuring secure data-handling practices are paramount. Schools must adopt stringent data protection policies to safeguard students' privacy and comply with legal regulations regarding data security (Dehghanzadeh et al., 2019). Addressing these concerns is essential to build trust and ensure the responsible use of technology. By addressing these challenges through comprehensive planning, continuous training, and strategic funding, the integration of Metaverse technologies can be optimized, thereby enhancing the learning experience and educational outcomes for all students.

4. Conclusions

The integration of Roblox and other Metaverse platforms into ELE marks a significant moment in language learning, merging technology with pedagogy in ways that were previously unimaginable. This systematic review has underscored the transformative potential of these digital environments, revealing their ability to create immersive, interactive, and contextually rich settings that deepen engagement, motivation, and practical language skills among ESL learners. Such platforms foster language acquisition in dynamic, gamified formats that allow students to practice vocabulary, grammar, and conversational skills within real-world scenarios. This experiential learning not only strengthens language retention but also enables students to apply language skills in authentic contexts, preparing them for real-life communication.

Beyond the direct benefits to learners, Metaverse technologies particularly Roblox align with broader educational objectives outlined in SDGs 4 and 5, advocating for inclusive, equitable education and lifelong learning. The global nature of these platforms fosters cross-cultural exchange, encouraging students from diverse backgrounds to interact, learn together, and develop cultural awareness and empathy. Such platforms, therefore, support a global vision of education that transcends geographical boundaries, aligning ELE with a future-ready curriculum that meets both local and international educational standards.

However, realizing this vision requires addressing significant challenges identified in the review, such as technological accessibility, content appropriateness, pedagogical alignment, and infrastructure demands. To navigate these barriers, a multi-faceted approach is essential. This includes not only investing in reliable technology and internet access to bridge the digital divide but also implementing comprehensive policies that uphold student safety, data security, and equitable access. In addition, ongoing teacher training is crucial to equip educators with the skills to navigate and integrate these platforms effectively within the

curriculum, creating a blended learning model that balances digital and traditional educational methods.

In conclusion, the review highlights that while Roblox and Metaverse platforms have the potential to revolutionize ELE, this potential can only be realized through strategic, thoughtful implementation. Educators, policymakers, and technologists must work collaboratively to build an inclusive, secure, and adaptable framework for using these tools in education. With careful planning and continuous assessment, these digital platforms can create enriched, culturally aware, and engaging language learning environments that prepare students for an interconnected world. Ultimately, the successful integration of Metaverse technologies in ELE is not just about enhancing language learning, but it's about shaping a generation of global citizens who are linguistically proficient, digitally literate, and culturally sensitive. By addressing these goals, the field of language education can move closer to fulfilling its role in building a more inclusive, educated, and empathetic global society.

5. Limitations

The limitations identified in the study provide critical perspectives on the challenges associated with integrating Metaverse platforms like Roblox into ELE. A key limitation lies in the scope and generalizability of the findings. By focusing on 50 articles published between 2015 and 2023 and sourced from databases like Google Scholar, WoS, and Scopus, the analysis may inadvertently exclude significant studies from other sources or unpublished research. This restriction narrows the study's applicability, particularly in educational contexts beyond English-speaking regions or those employing different pedagogical approaches. Such limitations underscore the need for broader, more inclusive reviews encompassing diverse educational settings and learner demographics to ensure universal applicability.

The study also heavily focuses on emerging technologies like Roblox and other gamified platforms, which are relatively new in educational contexts. While these technologies promise to enhance engagement and contextual learning, the lack of longitudinal studies limits the ability to assess long-term effectiveness. Hanus and Fox (2015) highlight that gamification's initial motivational boost may wane over time, emphasizing the importance of sustained engagement strategies. Without extensive research into skill retention and scalability, it is challenging to predict whether the benefits of these technologies will endure across different learner groups or educational levels.

Another critical limitation relates to technological barriers and equity. The digital divide remains a significant obstacle, particularly for underprivileged and rural communities where access to reliable internet, VR headsets, or compatible devices may be limited. Although the study identifies this issue, it falls short of deeply exploring how socioeconomic disparities affect different demographic groups. Addressing these inequities requires comprehensive policies, infrastructure investments, and collaborations among governments, educational institutions, and technology providers. Without such efforts, the integration of Metaverse platforms risks exacerbating existing inequalities in education rather than alleviating them.

Lastly, the study's discussion of ethical and privacy concerns lacks specificity in addressing regulatory compliance and safeguarding sensitive student data. As virtual learning environments increasingly involve data collection and digital interactions, clear frameworks for ensuring data security and ethical usage are essential. Similarly, while the importance of

teacher preparedness is acknowledged, the study does not evaluate existing training programs or offer detailed strategies for equipping educators to integrate these technologies effectively. This omission limits the study's practical utility for policymakers and educators tasked with implementing these innovations in classrooms.

Overall, these limitations highlight areas for further exploration, including expanding the scope of research to diverse contexts, conducting longitudinal studies, addressing equity challenges, and developing actionable frameworks for teacher training and data security. Addressing these gaps will enhance the robustness of future research and the practical implementation of Metaverse technologies in transforming language education.

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