

Impact of Augmented Reality (AR) in English as Second Language (ESL) Learners' Language Learning

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Abstract

In the current era of globalization, the advancement of IR 4.0 is leading to the development of Education 4.0. Education 4.0 has smoothened SDG4 which aimed to ensure lifelong learning and inclusive and quality education for all. With the effort in embracing teaching and learning 4.0 in the education system, various digitalised teaching and learning approaches, including 3D printing, augmented reality (AR), virtual reality (VR), artificial intelligence (AI) and the Internet of Things (IoT), have introduced by the Ministry of Education (MOE). AR plays a vital role in assisting teachers to teach English as A Second Language (TESL). Recent years, there are studies found that many Malaysian students were found facing problems in learning and communicating in English due to the lack of creative use of technology. Thus, meaningful interactions provided by Augmented Reality (AR) is much needed by the students in the classroom environment. Hence, this systematic literature review paper aims to explore the use of AR as a tool in language education, and at the same time elucidate the limitations of using AR in ESL students' language learning. From the analysis, AR is found to be a useful tool in motivating the ESL learners in the language learning process, creating an authentic language learning environment as well as improving their learning outcomes. However, some limitations such as poor internet connection, the availability of resources and teachers' willingness in using AR technology in the language classroom should be addressed. On account of that, various stakeholders like education policy makers, school administrators, parents and learners should take initiatives in embracing the use of AR in the ESL language learning process.

Keywords: Augmented Reality (AR), Teaching English as Second Language (ESL), AR as a Tool, Limitations, Language Learning

Introduction

In the current era of globalization, Sustainable Development Goals (SDGs) plays a crucial role in ensuring that the societies keep pace with the rapidly changing global landscape. SDGs are proposed by the United Nations (UN) in 2015, with the aim to improve the lives of the people by the year 2030. One of the agendas in SDGs is to ensure the inclusive and quality education

for all and promote lifelong learning, which is SDG 4. SDG 4 specifically aims to attain "inclusive and equitable quality education for all" by enhancing accessibility, improving standards, reducing disparities, and fostering the acquisition of knowledge and skills essential for sustainable development. On account of that, "lifelong learning for all" has been implemented in the educational system across the world (Kioupi & Voulvoulis, 2019).

In fact, SDG 4 is driving the education sector to align with the advancements of the Fourth Industrial Revolution (IR 4.0). According to Hamzah (2024), IR 4.0 is a digital revolution represents a transformative period of technological advancement across various industries. It particularly focuses on enhancing the various sectors through increased automation and integration of smart technology, leading to more efficient and systematic process. IR 4.0 is marked by significant technological advancements such as the emergence of supercomputers, smart robots, genetic modifications and neurotechnology that enhances human brain function. These developments signify the transformation in various industries (Ismail et al., 2020). IR 4.0 emphasises the development of virtual and augmented reality technology, which leads to the development of Education 4.0. Education 4.0 transforms the teaching and learning process into a dynamic process, preparing the learners to effectively tackle the challenges posed by IR 4.0. One of the significant changes in the field of education is the shift from traditional to technology-based learning methods.

In Malaysia, the introduction of Education 4.0 within the Malaysian education system was initiated in 2018 by former Higher Education Minister Datuk Seri Idris Jusoh, with the emphasis on the theme "Higher Education 4.0: Knowledge, Industry, and Humanity" (Halili, 2019). Various policies and practices have been integrated in the curriculum to embrace Education 4.0 in the education system. One of the most important strategic plans is the Malaysian Education Blueprint (MEB) 2013-2025. According to Bakar (2023), MEB significantly focus on quality in education as well as educating future-proof students who are equipped with skills and adaptability necessary to thrive in future industries. Recently, the Ministry of Education (MOE) has introduced various digitalised teaching and learning approaches, including 3D printing, augmented reality, virtual reality, cloud computing, artificial intelligence, Internet of Things (IoT), and so forth. These efforts aim to promote lifelong learning in education and equip students to meet the challenges of the digital age.

In the pursuit of realizing the vision of IR 4.0 and Education 4.0, English undoubtedly plays a significant role. On account of that, Common European Framework of Reference for Languages (CEFR), that was implemented in Malaysia's English language education, underscores a communicative approach to teaching and learning. It encourages students to use the language in real-life communication contexts, fostering not only reading comprehension but also grammar, vocabulary acquisition, and language usage. However, according to Aziz and Kashinathan (2021), many Malaysian students were found facing problems in English learning and communication due to the lack of creative use of technology (Abbasova & Mammadova, 2019). Meaningful interactions provided by Augmented Reality (AR) is much needed by the students in classroom environment (Karagozlu, 2021). Hence, this study aims to explore the use of AR as a tool in language education, and at the same time elucidate the limitations of using AR in ESL students' language learning.

Research Objectives and Research Questions

The research objectives of this study are:

1. To explore the use of AR as a tool in language education
2. To elucidate the limitations of using AR in ESL pupils' language learning

The research questions of this study are:

1. How is Augmented Reality (AR) utilized as a tool in ESL education?
2. What are the limitations of integrating AR technology in language learning for ESL students?

Literature Review

Digital Technology in Education

In this era of globalisation, digital technology has become significant game-changing elements in the transformation of the education world. The traditional teaching method has been transformed with the advent of a new era of education and technology. According to Yunus (2018), the transformation started with the implementation of technologies in the classroom, such as LCD projectors, laptops and wireless internet. The implementation of these technologies in the classroom has facilitated and motivated the teachers to adopt digital teaching methods in the classroom (Haleem et al., 2022). Meanwhile, the generations that lives in the era of digitalisation is called digital natives because of their advanced level of computer literacy (Hashim, 2018).

Along with the aim of SDG4 and Education 4.0, some technology-based teaching and learning methods were being implemented, such as flipped classroom, distanced learning and online assessment tools (Saini et al., 2023). Another trending technologies that are being implemented nowadays are social medias such as Facebook, Instagram, WhatsApp and so forth (Sengupta & Vaish, 2022). These social medias promote authentic learning environment, by allowing the learners to share their learning experiences and get access to the teaching and learning resources (Herri & Gunawan, 2020). This helps to foster learners' comprehension, which then enhance their learning outcomes. The incorporation of these technologies in education is reshaping and enriching students' perspectives, fostering broader and more profound learning skills. On account of that, lifelong learning skills that are necessary in the global society are internalised among the pupils (Pazilah et al., 2019).

In fact, technology is also bringing a major impact towards the field of English as a Second Language (TESL). In order to keep pace with the fast-changing era of globalisation as well as to equip the language learners with the future-proof skills, some of the technology-enhanced language teaching and learning approaches are being introduced, including Mobile-Assisted Language Learning (MALL), Computer-Assisted Language Learning (CALL), Massive Open Online Course (MOOCs) and others (Amin, 2019). These approaches complement traditional classroom instructions and offer diverse opportunities for language learners to engage with language content, practice language skills, and interact with authentic language materials and contexts.

Augmented Reality (AR) Technology

Augmented Reality (AR) is a technology that merges the virtual objects with the real world, allowing the users to view the virtual elements in a physical reality (Chen et al., 2019). It superimposes digital content, such as images, videos, and 3D models into the real world, by

viewing through smartphones, Tablet, and digital devices. The key technologies in AR automation includes intelligent display technology (head-mounted devices, smart phones, PC desktop display and other display devices), 3D registration technology (superimposing 3D virtual images in the real environment) and intelligent interaction technology (interaction between people and virtual objects in real scene).

The key element in AR technology is real-world environments. The main purpose of AR is to create the co-existence of the virtual objects and information with the real-life objects using cameras in the digital devices (Sarigoz, 2019). It overlays the digital content onto the physical environment, which enhance the user's perception of reality by blending virtual elements with real-world surroundings (Barhorst et al., 2021). Hence, it helps to improve the user experience in interacting with the digital content in an authentic physical environment.

AR has been utilised in various sectors such as tourism, medical, manufacturing, robotic, entertainment and education. The popularity of AR stems from its capability to blend computer-generated content with the real world, providing the users an enhanced interpretation of reality. This unique feature of AR can bridge the theoretical knowledge and practical application, making learning more dynamic and immersive. By immersing AR in the daily life, people can experience seamless blend of virtual and real environments that enhance and improve everyday livings.

Augmented Reality (AR) in Education

Nowadays, the advent of digital technology, such as mobile devices and tablets, enhanced the integration of AR in the world of education. AR is popularly utilised in the process of teaching and learning because it is proved to be able to effectively engage the learners in the learning process (Wedyan et al., 2022). That is because it allows visualisation of the learning concept, thus boosting the learners' engagement and understanding of the concept in the real-world environment, offering opportunities for engaging experiences. This shows that AR is closely aligns with constructivist and situated learning theories by involving learners in real-world social and physical contexts through immersion.

In fact, AR provides scaffolding, guidance, and facilitation that supports metacognitive and interactive learning processes, such as active observation, peer coaching, reciprocal teaching, and authentic inquiry. Some studies proved that AR is playing vital role in enhancing learning effectiveness and outcomes. For example, Alkhabra et al. (2023) stated that AR is effective in enhancing retention learning and critical thinking, which is similar to a study done by Alzahrani (2020) that further proved that AR promotes learners' concentration, spatial abilities, engagement and interactivity in the learning process.

However, there are also some challenges reported by Alzahrani (2020) associate with AR technology, such as information and cognitive overload, lack of experience, technical issues, and teachers' readiness. Other than that, Nguyen et al. (2019) stated that the AR equipment and programs are expensive and thus this leads to the accessibility challenges reported by Biswas et al. (2021), mentioning that access to the hardware and software of AR is not available to all learners, especially those from low economic backgrounds.

Augmented Reality (AR) in English as Second Language (ESL) Education

The use of AR in English as Second Language (ESL) education is gaining popularity by the teachers. According to Taskiran (2019), AR facilitates contextualised learning, in which the learners get to experience authentic learning in a real-world context. According to Azuma (2017), AR helps to engage the ESL learners in the authentic language experiences by providing meaningful language learning environment that stimulates real-world contexts. Authentic learning is no longer a new skill to be introduced, but it is an essential element in language learning.

With AR integrated in ESL learning process, the language learning environment is contextualised. According to Pazilah et al. (2019), integrating technologies such as images, audios and video clips in ESL classroom helps to promote immersive and contextualised learning environment. This helps to provide learners with immersive experience to practise the language skills. With the opportunities to engage with virtual objects and environments that mimic real-world scenarios, a connection between the topic learnt and the real world is created (Yaacob et al., 2019). Thus, this enables learners to use language skills contextually within a language-rich setting.

Other than that, the implementation of AR technology in learning language is proved to be a source of motivation towards language learning (Abbasova & Mammadova, 2019) and Ng and Ng (2015) mentioned that motivation is a key stimulant for successful second language acquisition. According to a study done by Vedadi et al. (2019), the implementation of AR in ESL improved pupils' motivation and vocabulary acquisition. Apart from that, Chang et al. (2020) revealed the helpfulness of AR in educational domain in comparison to traditional teaching method. Hence, digital technology plays an essential role as a motivation and encouragement for the learners in the language learning process. With motivation in learning, classroom engagements among the pupils are increased, and thus facilitates their language learning process and outcomes.

Methodology

This study is a systematic literature review (SLR) paper. According to Sarker et al. (2019), systematic literature review is important for the development of a field. SLR allows synthesis, reflection and evaluation of previous research, and thus provide deeper insight for advancement of knowledge. In this study, a synthesis of studies related to the use of Augmented Reality (AR) in English Language Education was conducted to identify the use of AR in ESL education and its limitations. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), guided by Page et al. (2021) was adhered in conducting this SLR paper. The PRISMA framework helps to facilitate validation of the review process.

Scientific articles were extensively search from some databases, such as ERIC, MDPI, Springer Link and Google Scholar. The keywords searched includes 'Augmented Reality', 'English as Second Language' and 'AR in education'. Some inclusion criteria are determined to set boundaries and scope of publications:

- i) Research must include empirical study
- ii) Addressed AR in academic settings
- iii) The target language is English language
- iv) Types of documents include Journal articles, written in English

By adhering to the inclusion criteria, 20 articles, focusing on the year 2018 to 2024, were selected, downloaded and analysed carefully. All the articles were analysed and synthesised based on the outlined research questions of this study:

- i) How is Augmented Reality (AR) utilized as a tool in ESL education?
- ii) What are the limitations of integrating AR technology in language learning for ESL students?

The findings were then grouped and discussed based on the themes and keywords.

Findings

The analysed data were tabulated in table 1 according to the year of publication. The table includes the authors and year of study, aim of the study and the results of the study. The data is presented in a table to ensure a clear and organised comparison of the studies.

Table 1

Studies on AR integration in ESL education

Author(s) of the Study	Aim of the Study	Results of the Study
Ibrahim et al. (2018)	To assess potential benefits of AR technology for immersive vocabulary learning	AR technology provides immersive learning experience and enjoyable learning environment.
Taksiran (2019)	To investigate AR-supported game-based language learning experience	According to the results of the questionnaire, AR-supported learning was considered motivating and enjoyable
Xu et al. (2019)	To investigate the effect of a mobile-base handwriting recognition AR application	A dynamic and authentic learning environment is created through the implementation of handwriting recognition-based AR application in ESL classroom. Learners' attention and enthusiasm in learning language are enhanced.
Ji & Shin (2019)	To investigate the engagement and motivation of AR-based vocabulary learning.	AR-based instruction fostered higher interest and curiosity and thus enhance young learners' motivation to learn English
Yaacob et al. (2019)	To identify the effect of using Augmented Reality (AR) flashcards on the vocabulary learning of low-ability learners in rural area	Augmented Reality (AR) flashcards were effective in enhancing vocabulary learning. A high level of motivation and engagement among the students are maintained.
Chang et al. (2020)	To investigate the effectiveness of augmented reality in enhancing EFL students' learning performance within a situational context.	The results indicated that AR helped to enhance pupils' concentration, confidence. A near real-life scenarios in learning is provided too.

Tsai (2020)	To study comparison between the effectiveness of traditional English flashcards with the vocabulary learning method using Augmented Reality	The traditional vocabulary learning method were surpassed by the Augmented Reality teaching effects
Afnan et al. (2021)	To examine the effect of AR-based learning materials	Students' motivation and performance in learning were enhanced with AR-based learning techniques.
Jalaluddin et al. (2021)	To assess the impact of Mobile Augmented Visual Reality (MAVR) programme in learning vocabulary	MAVR is an interactive tool in learning vocabulary
Kristianto et al. (2021)	To identify the effect of the application of augmented reality 3D digital learning material	The findings of this research shows that augmented reality promotes learning improvement in education
Ebadi & Ashrafabadi (2022)	To investigate the impact of AR in learners' reading comprehension	AR significantly increased reading comprehension level and interest in reading comprehension tasks of the students. This study also reported some limitations such as limited internet connection and technical problems of AR apps
Hashim et al. (2022)	To investigate the effectiveness of 'AReal-Vocab' for mildly autistic in acquiring English language.	The AR tool was reported to be engaging and sparking learners' interest, and thus enhanced pronunciation and articulation.
Shaumiwaty et al. (2022)	To study the effect of the implementing of augmented reality as a learning tool for English in elementary schools.	The result reported student learning outcomes in English showed increment after the utilization of Augmented Reality-based learning media
Azimova & Solidjonov (2023)	To investigate the impact of AR in learning ESL.	AR was effective in enhancing vocabulary learning and pronunciation, and also provided the learners with engaging and interactive learning experience The need for a stable internet connection is reported as a limitation.
Belda-Medina & Marrahi-Gomez (2023)	To investigate the effectiveness of AR technology in vocabulary development and learning motivation in learners	Positive attitudes and great enthusiasm were reported in AR integration. Some limitations mentioned in this study were teachers' preparation and willingness, as well as lack of resources and poor connectivity.

Yangin Ersanli (2023)	To identify the effect of vocabulary learning and retention by using AR	AR can be used as an innovative teaching tool to enhance vocabulary retention.
Hussein et al. (2023)	To identify the achievement of 4th-year primary school pupils in English using Web AR	Web AR offered enjoyable learning environment, aroused pupils' interest and encouraged pupils' brainstorming.
Mamani-Calapuja et al. (2023)	To investigate the use of AR application on learners' English learning.	AR application was useful for complementing traditional vocabulary learning and improves vocabulary acquisition.
Korosidou (2024)	To identify the impact of AR application on young learners' alphabet and vocabulary learning and retention	The results showed that AR is captivating and motivating, which can bring great impact in long-term alphabet retention and vocabulary learning.
Voreopoulou et al. (2024)	To investigate the effectiveness of Augmented Reality Escape Classroom Game (ARECG) in ESL and teachers' perceptions on the ARECG	ARECG cultivates a learning environment which is friendly and student-centered, The environment is suitable for deep meaningful language learning.

From the results of SLR, most of the studies prove that AR promotes students' motivation and interest in learning. There are also studies that mentioned the ability of AR in creating an interactive and immersive learning environment, which allows learning to take place in real-life scenarios, as well as complementing the traditional teaching method. According to the analysis of papers, the results indicated that the use of AR technology significantly improved the learning process and outcomes, especially pronunciation, vocabulary learning and retention.

However, several studies have highlighted limitations associated with integrating AR in the language learning classroom. The primary limitation mentioned is poor internet connectivity, which can lead to the interruptions in the AR experience and reduce its effectiveness. Additionally, teachers' preparation and willingness to use AR technology are significant constraints in incorporating AR in the classroom. Other drawbacks such as lack of resources and technical problems associated with AR apps can hinder the successful integration of AR in the language learning classroom.

Discussion

In this chapter, the content analysis is being grouped according to keywords and themes. The results of the content analysis are used to answer the research questions of this paper.

How is Augmented Reality (AR) utilized as a tool in ESL education?

Acts as Motivator

Learners' motivation and interest are one of the most mentioned outcomes of AR in the literature. This proves that AR is utilised in the ESL classroom as a motivator in learning English. According to Maslow's motivation theories, motivation was stemmed from fulfilling basic physical needs, followed by ensuring community security, establishing identity, building

self-esteem, and ultimately culminating in self-actualization. Meanwhile, Gardner (1982) also believes that learners who have more positive attitudes in learning are more engaged in the learning process, which can consequently enhance their learning outcomes.

With the help of AR in creating the 3D contents, the learners can easily visualise the information through the explicit illustration (Huang et al., 2021). The vocabulary is presented through vivid pictures. Hence, the unfamiliar and difficult words can be easily explained (Huang et al., 2021). On account of that, the learners will feel less stressful learning English. With AR being integrated in the learning process, the ESL learners' interest in language learning can be enhanced. The positive attitudes and mindsets towards the English learning process allows them to participate and interact actively with the peers in the learning environment (Ramzan et al., 2023).

Platform for Authentic Learning Environment

AR also acts as a platform that helps to promote authentic learning environment in the language learning classroom. This is because AR is able to create a real-world like learning situation, which allows the learners to immerse themselves in the authentic language-rich environment. The immersive learning experience prompted by AR allows learners to experience the physical situation that is similar to the real world, through the interaction with the virtual environment (Cheng & Tsai, 2019). The learners can interact with the real objects without having the real objects in the classroom. For instance, 2D pictures or images in the textbook can be enriched with the audio, 3D graphics and animations, allowing the learners to vividly illustrate the connection between these virtual elements and the present surroundings.

When the learners are actively engaged with AR as the learning tools, they are actually practicing autonomy in learning, which allows them to take control on their own learning by participating actively in the learning environment. This can indeed transform the traditional learning style to a more interactive one, by allowing the learners to interact with the learning content enthusiastically. Hence, the student-centred learning environment is promoted eventually.

Catalyst to Improve Learning Performance

By enhancing the learners' motivation and allowing them to engage actively in the learning process, AR can eventually improve students' learning performance. According to the papers analysed, students' learning performance and outcomes were improved with the help of AR. The contextualised learning environment promoted by AR overlays the information in ESL such as vocabulary onto the real-world context (Tyson, 2021). Hence, the abstract concept of the vocabulary can be easily visualised vividly.

Other than that, AR also improves pupils' learning performance through the combination of visual, auditory, and tactile stimuli, which can cater multiple learning needs of the pupils (Childs et al., 2023). Pupils with different learning styles are fulfilled, hence deepen their understanding and enhance information retention. Besides that, AR is also able to help learners in improving their pronunciation (Hadid et al., 2019). With the audio included in the AR learning tools, pupils' pronunciation, especially on vocabulary is improved. The authentic native-like voice-over is attached in the tools, allowing the pupils to listen and expose to the native-like language rich environment. Thus, learners' pronunciation is improved.

What are the limitations of integrating AR technology in language learning for ESL pupils?*Teachers' Readiness and Willingness in Using AR*

According to the analysis of papers, it is mentioned that teachers' readiness and willingness in using AR in ESL classroom possessed a vital concern in the effort of integrating AR as learning tools in ESL learning process. This is because many teachers have limited knowledge and experience in using technology, particularly new digital tools like AR (Belda-Medina & Marrahi-Gomez, 2023). Hence, they are not confident in their technological abilities, hence prefer to stick to the traditional teaching methods that they are familiar with.

Other than that, the lack of training and professional development in using technology becomes one of the reasons that the teachers are not ready to integrate AR in their ESL classroom. AR applications often need technical skills and pedagogical knowledge that some of the teachers may not possess. Hence, without proper training and professional development, the teachers may feel ill-equipped to utilise AR effectively in their classroom.

Lack of Technology and Internet Connectivity

Besides the teachers' readiness and willingness in utilising AR, the issue of resource availability is also one of the significant barriers in utilising AR as learning tools. This is because the integration of AR requires devices that are capable to run the AR applications. However, many schools, especially the ones in the rural areas, are lack of necessary devices and software (Belda-Medina & Marrahi-Gomez, 2023), such as smartphones, tablets or AR-supported devices. Moreover, many schools do not allow the pupils to bring their digital devices to the school. Hence, the lack of access to compatible devices can prevents learners to fully engage in the AR-enhanced learning environment.

In addition, AR very much relies on the internet connections to make sure it functions at its best. However, some of the schools, especially the remote-area schools often faced slow internet speed or no internet connection at school (Azimova & Solidjonov, 2023; Belda-Medina & Marrahi-Gomez, 2023). On account of that, the content of AR cannot be accessed. This eventually limits pupils' opportunities in engaging with the AR, thus impedes their effective AR-enhanced learning experiences.

Implication

Augmented reality has appeared as a promising tool in the domain of ESL language learning. It offers numerous advantages and opportunities for various stakeholders in the field of education, including the school administrators, education policy maker, parents and learners themselves. All parties are playing pivotal roles in enhancing the integration of AR in the ESL language education.

Firstly, the school administrator should ensure that the schools are equipped with the necessary resources to support the AR integration. They hold the key to facilitate the successful integration of AR in ESL language learning environment. Hence, the necessary resources such as AR-enabled devices, stable internet connectivity and technical support and necessary software should be invested in the effort of AR-supported infrastructure development.

The education policy makers in Malaysia also play a crucial role in shaping the direction of AR integration in ESL learning. Professional development and training should be provided for the school administrators and teachers to enhance their AR literacy and instructional skills. Trainings for teachers are essential to ensure the quality of the teacher and improve students' learning (DeMonte, 2013). Workshops and seminars are useful in helping the teachers to leverage their AR technology skills and integrated AR effectively in the language learning classroom. Other than that, some policies that promote the inclusion of AR in the language learning environment should be advocate. This is to ensure the effectiveness of AR integration in the ESL learning environment.

Besides that, the parents should embrace AR in supporting their children's language learning journey. They should foster a supportive home environment that encourages the integration of AR tools on language learning. Besides that, proper monitoring and guides should be given to the children when using AR to make sure the advantages of AR in language learning are maximised. Meanwhile, the learners should be empowered actively participate in their learning journey by encouraging them to explore and leverage the AR-enhanced learning tools. In this era of digitalisation, digital literacy and life-long learning skills are important. Digital literacy is the form the basis of lifelong learning (Demir et al., 2022). Hence, this lifelong learning skills are essential for the learners to embrace AR technology in their ESL language learning process. By developing learners' digital literacy that are able to leverage the AR-integrated learning materials, which eventually allows them to unlock new opportunities for immersive language learning environment.

Conclusion

In conclusion, this systematic literature review has shed light of the impact of Augmented Reality in ESL language learning. Through the exploration and analysis of the existing research paper, AR is indeed holding a significant impact in enhancing the ESL language learning experience. As such, AR is integrated in the ESL language learning process as a motivator to increase learners' interest, promoting the authentic and immersive language learning environment, as well as improving the learners' learning performance. However, there are also some limitations associated with the integration of AR in ESL education that should be acknowledge. For instances, teachers' readiness and willingness in adopting AR is an important factor that determine the successful implementation of AR in the ESL language learning classroom. Other than that, the issues of technology infrastructure and poor internet connectivity should be addressed to prevent the hindrance of AR integration in the ESL learning environment.

On account of that, various stakeholders should take the responsibilities in addressing the challenges of AR integration. Each party should collaborate intimately with each other to maximise the benefits of AR technology in ESL language learning. School administrators and policymakers can play a crucial role in advocating AR-supportive policies and allocating sufficient suitable resources for the implementation of AR technology. Teachers, on the other hand, should embrace a receptive attitude towards adopting AR in their teaching methods. The learners should also embrace AR as a valuable learning tool that enhances their language acquisition experience and journey. With the close collaboration between all stakeholders, the capabilities of AR technology in leveraging the dynamic language learning experience can be harnessed, thus empowering the ESL learners to strive in today's globalized world.

This systematic literature review has contributed both theoretically and contextually to the knowledge of AR in ESL education. Theoretically, it extends the understanding that AR is indeed able to foster motivation among pupils, as well as enhancing their active engagement in the ESL learning process. The contextualised learning facilitated by AR has also helped to improve pupils' learning performance and outcomes. Moreover, with the identified limitations and key barriers in the integration of AR in ESL learning process, this study offers valuable insights into the challenges faced by the teachers and stakeholders. It also highlights a research gap about the needs for effective strategies to implement AR in the ESL classrooms. This can lay the groundwork for future studies with the aim to optimise the use of AR in ESL learning.

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