



The impact of Augmented Reality on reading comprehension skills among Grade 10 English First Additional Language Learners in the Chris Hani West District, Eastern Cape

Siyabonga Ntini¹  & Lundi Nomlala¹ 

¹ Department of Humanities and Creative Arts Education, Walter Sisulu University, Whittlesea, South Africa

ABSTRACT

The study investigated the impact of augmented reality (AR) on teaching reading comprehension skills in Grade 10 English First Additional Language in the Chris Hani West District, Eastern Cape. The study adopted an interpretivist research approach and employed a case study design. Semi-structured interviews were conducted with carefully selected teachers and learners to gain deeper insight into their experiences and perspectives. Through thematic data analysis, the findings revealed that AR integration improved learner motivation, encouraged collective learning, and made learning more interactive and engaging. Guided by the Cognitive Theory of Multimedia Learning, which posits that meaningful learning occurs when learners actively process information through dual visual and verbal channels with limited cognitive capacity, the study also found that AR supported vocabulary development, helped learners visualize texts more clearly, and improved information retention and overall comprehension compared to traditional teaching methods. Teachers and learners described AR as an innovative and valuable approach to teaching reading. The study concludes that AR has strong potential to enable more dynamic, learner-centered reading comprehension lessons. However, the effective implementation of AR relies on proper training and instruction, reliable technological infrastructure, and continuous support. The study recommends integrating AR into school reading programmes, embedding digital pedagogy in teacher professional development, and allocating adequate funding to ensure access to AR-compatible devices, particularly in under-resourced township and rural schools.

Keywords: Augmented Reality, Reading Comprehension, English First Additional Language, teaching, Technology Integration.

INTRODUCTION

English as an additional language learning continues to be a crucial issue in the South African educational framework due to language and cultural differences.¹ Insufficient English proficiency

¹ Farieda Abrahams, Nomfundo Floweret Moroe, and Katijah Khoza-Shangase, "Transformation of Higher Learning in South Africa: Perceptions and Understanding of Speech-Language Therapy and Audiology Undergraduate Students," *Education as Change* 27 (May 11, 2023), <https://doi.org/10.25159/1947-9417/11648>.

among learners means they struggle to demonstrate their full potential in reading, writing, speaking, and listening, particularly in assessment situations. Learners perform poorly in examinations because they are unable to express what they know fully.² In this regard, reading comprehension is the most challenging element for English First Additional Language learners in South African schools, with challenges including limited vocabulary, decoding, and spelling.³ Moreover, other factors that hinder comprehension include limited English vocabulary development, poor tense usage, poor sentence structure, and difficulty interpreting meaning from context.⁴ These challenges have been noted globally, with studies revealing that many English second-language learners continue to struggle with reading comprehension from secondary school through higher education.⁵ To effectively address these issues, visual aids can improve comprehension and create a more reliable and flexible learning environment for English language learners.⁶ In this regard, the use of AR offers a promising possibility by allowing digital content to be overlaid onto the real environment, creating an immersive learning experience.⁷ AR enables learners to actively engage with complex concepts by superimposing virtual models and simulations in real-world contexts.⁸ This technological innovation supports multiple forms of interaction, including mobile, online, and blended learning, by improving learner engagement and participation.⁹ Furthermore, AR serves as a bridge between traditional teaching tools and modern digital technologies, positively influencing learners' academic performance.¹⁰

Along with these challenges, there is limited research on the impact of AR on reading comprehension. Many studies have focused mainly on learners' home language, with little emphasis on key factors, such as background knowledge, which play a significant role in improving reading comprehension in AR-supported learning contexts. This gap highlights the need for further empirical research on the use of AR to enhance reading comprehension among English language learners. Therefore, the aim of this paper was to examine the impact of augmented reality in teaching reading comprehension skills to Grade 10 English first additional language learners in Chris Hani West District, Eastern Cape. The findings are presented subsequently.

LITERATURE REVIEW

Reading comprehension is a complex process that requires the use of the brain, eyes, and ears to perceive, interpret, and construct meaning.¹¹ Moreover, reading comprehension has been shown to improve with the use of Augmented Reality in instructional procedures, especially for English second-language (ESL) learners. With augmented reality, learners can connect more deeply with textual content in an immersive, dynamic learning environment. Studies reveal that AR supports ESL learners by

² Munassir Alhamami, "English as a Medium of Instruction (EMI) in Computing Undergraduate Programs," *Education and Information Technologies* 26, no. 5 (September 30, 2021): 6549–62, <https://doi.org/10.1007/s10639-021-10637-6>.

³ Jane R. Shore and John Sabatini, "English Language Learners With Reading Disabilities: A Review Of The Literature And The Foundation For A Research Agenda," *ETS Research Report Series* 2009, no. 1 (June 8, 2009), <https://doi.org/10.1002/j.2333-8504.2009.tb02177.x>.

⁴ Mubashir Iqbal et al., "Factors Responsible for Poor English Reading Comprehension at Secondary Level," *SSRN Electronic Journal*, 2015, <https://doi.org/10.2139/ssrn.2602630>.

⁵ Elnaz Khataee, "Reading Failure among Iranian EFL Learners: Study of Underlying Problems," *International Journal of English Language & Translation Studies* 6, no. 3 (2018): 164–76.

⁶ Ghulam Shabiralyani et al., "Impact of Visual Aids in Enhancing the Learning Process Case Research: District Dera Ghazi Khan.," *Journal of Education and Practice* 6, no. 19 (2015): 226–33.

⁷ Bimo Sunarfri Hantono, Lukito Edi Nugroho, and P. Insap Santosa, "Meta-Review of Augmented Reality in Education," in *2018 10th International Conference on Information Technology and Electrical Engineering (ICITEE)* (IEEE, 2018), 312–15, <https://doi.org/10.1109/ICITEE.2018.8534888>.

⁸ Iulian Radu et al., "How Augmented Reality Influences Student Learning and Inquiry Styles: A Study of 1-1 Physics Remote AR Tutoring," *Computers & Education: X Reality* 2 (2023): 100011, <https://doi.org/10.1016/j.cexr.2023.100011>.

⁹ Gareth Young et al., "Exploring Virtual Reality in the Higher Education Classroom: Using VR to Build Knowledge and Understanding," *JUCS - Journal of Universal Computer Science* 26, no. 8 (August 28, 2020): 904–28, <https://doi.org/10.3897/jucs.2020.049>.

¹⁰ Bursali, Hamiyet, and Rabia Meryem Yilmaz, "Effect of augmented reality applications on secondary school students' reading comprehension and learning permanency," *Computers in Human Behavior* 95 (2019): 126-135. <https://doi.org/10.1016/j.chb.2019.01.035>

¹¹ Khemendra Kamal Kumar et al., "Investigating Students' Leisure-Time Reading Preferences in Upper Primary Classrooms in Fiji," *International Electronic Journal of Elementary Education* 17, no. 4 (2025): 519–28.

providing contextual and visual cues that help them connect new words to the text's meaning.¹² These visual components, which include interactive images, 3D models, and animations, help learners understand abstract ideas more easily by making them more relatable and tangible. Decades of research have demonstrated that, compared to teaching without such aids, computer technology in the classroom can improve student achievement and improve teaching and learning.¹³ AR, a relatively new technology, has significantly improved e-learning.¹⁴

Additionally, AR provides learners with a multi-sensory experience that enhances memory and recall of the material by blending the real and virtual worlds. This is especially helpful for English FAL learners, as reading comprehension techniques may not fully meet the diverse learning requirements of learners with low language competence.¹⁵ In addition, compared to traditional reading comprehension activities, AR offers learners dynamic, less static ways to test their comprehension through interactive quizzes and real-time feedback. Research has shown that learners who used AR for reading comprehension performed better than those who used regular texts, demonstrating higher engagement and better understanding.¹⁶

By providing scaffolded support without requiring immediate teacher intervention, AR technologies also promote independent learning by helping learners hone their self-regulation abilities. English FAL learners benefit from the freedom to study material at their own pace, reviewing challenging passages or new terms multiple times, which gradually improves comprehension.¹⁷ Consequently, augmented reality is a valuable technology for teaching English as a second language, as it enhances reading comprehension and facilitates vocabulary acquisition, ultimately improving overall language fluency.

Moreover, Shabaan et al. noted that an augmented reality-based mobile application profoundly improves the reading comprehension of early childhood learners who are experiencing learning challenges.¹⁸ They also discovered that learners demonstrated a positive, promising attitude towards integrating augmented reality and showed great excitement about the interactive, multimodal texts provided by the AR mobile application. On the other hand, augmented reality can boost learners' interest and involvement in reading.¹⁹ It is further suggested that AR features reduce cognitive burden for readers by providing visual scaffolding and contextual signals, thereby reducing abstraction and enabling deeper comprehension, particularly of complex or advanced subjects. Recent research has demonstrated encouraging outcomes when employing augmented reality to enhance reading comprehension.

According to a study by Danaei et al., augmented reality mobile applications can enhance reading comprehension by providing visual and auditory signals.²⁰ They discovered that learners who read a storybook with augmented reality performed better at retelling and recalling than learners who only read the story in print. The AR storybook incorporated relevant multimedia elements, such as animations, pictures, and videos, into the written text on a tablet. Ebadi and Ashrafabadi found that the reading comprehension abilities of upper-intermediate university students were significantly enhanced by using

¹² Shu Zhang, Menno D.T. de Jong, and Jordy F. Gosselt, "Cultural Differences in Microblogging: How Western IT Companies Adapt Twitter (X) Activities to the Chinese Weibo Context," *Journal of International Consumer Marketing* 37, no. 1 (January 6, 2025): 72–87, <https://doi.org/10.1080/08961530.2024.2346891>.

¹³ Hussain bin Eidhah Alsaiani, "Reality of Using Augmented Reality Technology from the Perspective of Arabic Language Teachers in Middle Schools in Aljouf Province," *University of Bisha Journal for Educational Sciences* 8, no. 1 (2025): 1.

¹⁴ María Blanca Ibáñez et al., "Experimenting with Electromagnetism Using Augmented Reality: Impact on Flow Student Experience and Educational Effectiveness," *Computers & Education* 71 (February 2014): 1–13, <https://doi.org/10.1016/j.compedu.2013.09.004>.

¹⁵ Xinyi Huang et al., "A Systematic Review of AR and VR Enhanced Language Learning," *Sustainability* 13, no. 9 (April 21, 2021): 4639, <https://doi.org/10.3390/su13094639>.

¹⁶ Alsa Bakhtawar et al., "Designing for a Healthier Indore, India: Participatory Systems Mapping," *Journal of Urban Health* 99, no. 4 (August 18, 2022): 749–59, <https://doi.org/10.1007/s11524-022-00653-3>.

¹⁷ Bogum Yoon, *Effective Teacher Collaboration for English Language Learners: Cross-Curricular Insights from K-12 Settings* (Routledge, 2021).

¹⁸ Tahany S Shaaban and Amr M Mohamed, "Exploring the Effectiveness of Augmented Reality Technology on Reading Comprehension Skills among Early Childhood Pupils with Learning Disabilities," *Journal of Computers in Education* 11, no. 2 (2024): 423–44.

¹⁹ Bilal Şimşek and Bekir Direkçi, "The Effects of Augmented Reality Storybooks on Student's Reading Comprehension," *British Journal of Educational Technology* 54, no. 3 (May 5, 2023): 754–72, <https://doi.org/10.1111/bjet.13293>.

²⁰ Delneshin Danaei et al., "Comparing Reading Comprehension between Children Reading Augmented Reality and Print Storybooks," *Computers & Education* 153 (August 2020): 103900, <https://doi.org/10.1016/j.compedu.2020.103900>.

an AR-based mobile application.²¹ Moreover, they discovered that learners favored augmented reality over old traditional teaching and reading methods and showed high levels of happiness, relevance, and dependability with its use. Additionally, they found that educators view AR as a valuable and effective method of teaching and learning languages.

International studies have shown positive results when AR is implemented in language-learning contexts.²² South African education researchers caution against taking AR's benefits for granted within the local schooling system. Learning through AR is only effective if teachers design educational tasks with care, learners are provided with appropriate content, and both teachers and learners are comfortable using the technology.²³ In South Africa, where many English First Additional Language classrooms have large class sizes and limited digital literacy among both teachers and learners, learners may focus on the novelty of AR's technological functions rather than on intended reading comprehension goals.²⁴ Local research has also argued that adding too many multimedia elements can tax working memory, which is a particular concern in under-resourced schools where learners already struggle with foundational reading skills.²⁵ Multiple international studies indicate that learner gains from AR were not significantly higher than those from traditional methods or thoughtfully designed digital lessons, reinforcing the principle that pedagogy, not technology, should drive AR integration in South African classrooms.²⁶

Augmented reality also entails technical and logistical considerations that are especially acute in South Africa. Mobile devices, reliable internet access, technical support, and ongoing teacher training are often necessary to implement educational AR.²⁷ However, many South African schools, particularly in rural areas of the Eastern Cape, Limpopo, and KwaZulu-Natal provinces, lack consistent electricity, data connectivity, or device-to-learner ratios that enable AR.²⁸ Teachers in these contexts may struggle to find time to incorporate AR activities into their lessons amid other curricular responsibilities, especially when they receive little or no professional development in AR and receive no institutional support from their school principals and district officials.²⁹ While research has shown that AR can be useful for language learning to improve reading comprehension, its usefulness in South Africa depends heavily on the specific learning context, including school quintile level, geographic location, and availability of technical support.³⁰

These considerations are particularly important for South Africa, given its unique linguistic and educational landscape. The country has twelve official languages, and most learners learn English as a First Additional Language while speaking a different home language (such as isiXhosa, Afrikaans, or Sesotho) at home.³¹ Numerous South African studies have examined the reading challenges local

²¹ Saman Ebadi and Fateme Ashrafabadi, "An Exploration into the Impact of Augmented Reality on EFL Learners' Reading Comprehension," *Education and Information Technologies* 27, no. 7 (August 5, 2022): 9745–65, <https://doi.org/10.1007/s10639-022-11021-8>.

²² Rommel Mahmoud AlAli and Ali Ahmad Al-Barakat, "Impact of Augmented Reality-Based Learning on Preparing Children for Creative Reading Skills in Childhood Education Stage," *Forum for Linguistic Studies* 6, no. 5 (November 7, 2024): 226–38, <https://doi.org/10.30564/fls.v6i5.7161>.

²³ Yiannis Koumpourous, "Revealing the True Potential and Prospects of Augmented Reality in Education," *Smart Learning Environments* 11, no. 1 (January 9, 2024): 2, <https://doi.org/10.1186/s40561-023-00288-0>.

²⁴ Nellylyn Moyo and Tranos Zuva, "An Assessment of the Readiness of Gauteng High Schools to Adopt, Augmented Reality (AR) and Virtual Reality (VR) Technologies in Learning," in *2025 5th International Multidisciplinary Information Technology and Engineering Conference (IMITEC)* (IEEE, 2025), 1–15, <https://doi.org/10.1109/IMITEC67386.2025.11410470>.

²⁵ Hamiyet Bursali and Rabia Meryem Yilmaz, "Effect of Augmented Reality Applications on Secondary School Students' Reading Comprehension and Learning Permanency," *Computers in Human Behavior* 95 (June 2019): 126–35, <https://doi.org/10.1016/j.chb.2019.01.035>.

²⁶ Nikolaos Pellas et al., "Augmenting the Learning Experience in Primary and Secondary School Education: A Systematic Review of Recent Trends in Augmented Reality Game-Based Learning," *Virtual Reality* 23, no. 4 (December 21, 2019): 329–46, <https://doi.org/10.1007/s10055-018-0347-2>.

²⁷ Moyo and Zuva, "An Assessment of the Readiness of Gauteng High Schools to Adopt, Augmented Reality (AR) and Virtual Reality (VR) Technologies in Learning."

²⁸ Santiago Criollo-C et al., "Towards Sustainable Education with the Use of Mobile Augmented Reality in Early Childhood and Primary Education: A Systematic Mapping," *Sustainability* 16, no. 3 (January 31, 2024): 1192, <https://doi.org/10.3390/su16031192>.

²⁹ Carisma Nel, Lisa Dieker, and Elma Marais, "The Integration of Mixed Reality Simulation into Reading Literacy Modules," *Education Sciences* 14, no. 10 (October 17, 2024): 1128, <https://doi.org/10.3390/educsci14101128>.

³⁰ Koumpourous, "Revealing the True Potential and Prospects of Augmented Reality in Education."

³¹ Nel, Dieker, and Marais, "The Integration of Mixed Reality Simulation into Reading Literacy Modules."

learners face, focusing on limited exposure to English outside of school, inadequate vocabulary, poor decoding and reading comprehension ability, large class sizes (often exceeding 40–50 learners per teacher), and a persistent digital and resource divide between well-resourced urban schools (typically in Gauteng or Western Cape) and poorly-resourced rural or township schools.³² Although South Africa has made efforts to bridge the digital divide through initiatives such as the National Education Collaboration Trust and the introduction of tablets in some provinces, there remain deep inconsistencies in the accessibility of technological resources for learners across different provinces and school quintiles.³³ Therefore, while AR has the potential to aid English FAL learners by providing contextualized visual cues, for example, animating vocabulary words or illustrating narrative settings in isiXhosa home language contexts, it is essential to consider South African schools' language diversity, large class sizes, limited technological infrastructure, and unequal resource distribution.

Lastly, while international research has found positive results for AR's ability to aid reading comprehension, very little research has been conducted to determine whether the same holds for English FAL learners in South African secondary schools.³⁴ Existing local studies have primarily focused on Gauteng or Western Cape schools with relatively better resources, leaving a gap in understanding how AR might function in rural or semi-rural areas of the Eastern Cape and similar provinces. Research has also not yet examined how AR can be used effectively in these under-resourced, linguistically diverse, and varied educational settings where teachers may have limited prior experience with digital tools. Therefore, building on the readiness assessment conducted by Moyo and Zuva in Gauteng high schools, and the mixed reality simulation work by Nel, Dieker, and Marais in reading literacy modules, this study explored whether AR can help improve the reading comprehension of Grade 10 English First Additional Language learners in the Chris Hani West District in the Eastern Cape, a context characterized by high learner-teacher ratios, limited home language support for English, and inconsistent access to technology.

THEORETICAL FRAMEWORK

This research study is grounded in Richard Mayer's Cognitive Theory of Multimedia Learning (CTML), which is based on the following key elements: the learner's processing of information through separate visual and verbal channels (the dual-channel assumption).³⁵ The theory further assumes that each channel has limited capacity during the learning process, and that learners actively select and integrate new information with prior knowledge to enable meaningful learning. The theory argues that learning is enhanced when words are effectively combined with visual elements rather than presented separately. According to the theory, multimedia instruction is successful when it minimizes cognitive load and directs learners' attention to essential aspects.

The theory explains different principles that support a successful multimedia approach, which include the multimedia principle that states that learners learn better when words are combined with pictures than from words alone; the modality principle, which insists that people learn better from graphics and narration than from graphics and text; the contiguity principle, which states that related and similar words together with pictures should be presented together; lastly, the coherence principle, which emphasises that extra information should be excluded.³⁶

Mayer's theory supports AR in reading comprehension by integrating text, visuals, audio, and interactive elements, enabling learners to process information across multiple channels simultaneously. Liu asserts that when the AR component is designed in line with the multimedia principle, it can support vocabulary development, improve text visualization, strengthen text retention, and promote deeper comprehension by facilitating active cognitive engagement. According to the principles of the Cognitive

³² Moyo and Zuva, "An Assessment of the Readiness of Gauteng High Schools to Adopt, Augmented Reality (AR) and Virtual Reality (VR) Technologies in Learning."

³³ Criollo-C et al., "Towards Sustainable Education with the Use of Mobile Augmented Reality in Early Childhood and Primary Education: A Systematic Mapping."

³⁴ Shaaban and Mohamed, "Exploring the Effectiveness of Augmented Reality Technology on Reading Comprehension Skills among Early Childhood Pupils with Learning Disabilities."

³⁵ Richard E. Mayer, "The Past, Present, and Future of the Cognitive Theory of Multimedia Learning," *Educational Psychology Review* 36, no. 1 (March 17, 2024): 8, <https://doi.org/10.1007/s10648-023-09842-1>.

³⁶ Richard Mayer, "The Future of Multimedia Learning," *The Journal of Applied Instructional Design*, 2022, <https://doi.org/10.59668/423.10349>.

Theory of Multimedia Learning, AR serves as a mediation tool.³⁷ It makes complex concepts more relatable and helpful for learners by integrating digital elements into real-world contexts.³⁸ Therefore, the Cognitive Theory of Multimedia Learning promotes a clear cognitive framework to understand how AR enhances reading comprehension through structured, multimodal information processing.

METHODOLOGY

A qualitative method was used in this investigation. The study design used is a case study. A case study is a structured, detailed analysis of a particular occurrence in its context.³⁹ Pemberton asserts that a qualitative case study ensures that the research problem is examined from multiple perspectives, enabling detailed, multidimensional evaluations of complex situations in their real-world settings.⁴⁰ According to the interpretivist paradigm used in this study, interpretation is the most efficient means of producing information about reality. Instead of making generalizations about the entire population, interpretivists seek to comprehend a phenomenon and its complexity within its particular context.⁴¹ The interpretivist paradigm was used by the researchers because it is suitable for qualitative research and was considered the most appropriate for addressing the study's problem: investigating the impact of AR on teaching reading comprehension among Grade 10 English FAL learners through semi-structured interviews. Since it allows researchers to identify people who can provide comprehensive, in-depth information on the topic under investigation, purposive sampling was used in this study.⁴²

A purposive sample of five (5) learners and four (4) Grade 10 teachers was employed in this paper. Semi-structured interviews were used to collect data from teachers and learners for this research. By using this approach, the researcher was able to collect unstructured data, analyze participants' thoughts, feelings, and opinions about a particular topic, and probe deeply into sensitive, often private issues.⁴³ With participants' informed consent, audio recordings of interviews were made to ensure the accuracy and integrity of the data. Subsequently, a verbatim transcription of the recordings was made for analysis. Anonymity and transparency were preserved by conducting the interviews in a calm, private setting. The researchers used a thematic data analysis approach to identify, examine, and report patterns or themes in the data. The researchers used a thematic data analysis approach because it offers flexibility and the ability to generate rich, transparent, and in-depth information from complex data.⁴⁴ To acquire a thorough understanding of the gathered data, the semi-structured interviews were recorded, transcribed verbatim, and read several times. The researchers refined and classified the initial codes into emergent themes by continuously comparing transcribed recordings and analyses until no new insights emerged, indicating saturation.⁴⁵

PRESENTATION OF FINDINGS

Data Collected From Teacher Interviews

The researchers have conducted semi-structured interviews with four English First Additional Language teachers in Grade 10. Two teachers were interviewed at School A, and two at School B, for a total of four teachers who participated in this paper. Five Grade 10 learners were also interviewed. The questions aimed to understand the impact of augmented reality on teaching reading comprehension to Grade 10

³⁷ Dongyang Liu, "The Effects of Segmentation on Cognitive Load, Vocabulary Learning and Retention, and Reading Comprehension in a Multimedia Learning Environment," *BMC Psychology* 12, no. 1 (January 2, 2024): 4, <https://doi.org/10.1186/s40359-023-01489-5>.

³⁸ Şimşek and Direkçi, "The Effects of Augmented Reality Storybooks on Student's Reading Comprehension."

³⁹ Rachel H Adler, "Trustworthiness in Qualitative Research," *Journal of Human Lactation* 38, no. 4 (2022): 598–602.

⁴⁰ Ian Pemberton, "Other Communicative Approaches," in *Usage-Based Second Language Instruction: A Context-Driven Multimedia Learning Approach* (Springer, 2024), 69–83.

⁴¹ Mariko Hirose and John W. Creswell, "Applying Core Quality Criteria of Mixed Methods Research to an Empirical Study," *Journal of Mixed Methods Research* 17, no. 1 (January 2, 2023): 12–28, <https://doi.org/10.1177/15586898221086346>.

⁴² Steve Campbell et al., "Purposive Sampling: Complex or Simple? Research Case Examples," *Journal of Research in Nursing* 25, no. 8 (December 18, 2020): 652–61, <https://doi.org/10.1177/1744987120927206>.

⁴³ Adler, "Trustworthiness in Qualitative Research."

⁴⁴ Virginia Braun and Victoria Clarke, "Reflecting on Reflexive Thematic Analysis," *Qualitative Research in Sport, Exercise and Health* 11, no. 4 (August 8, 2019): 589–97, <https://doi.org/10.1080/2159676X.2019.1628806>.

⁴⁵ Patricia Fusch et al., "How to Conduct a Focus Group Interview: Tips, Strategies, and Examples for Novice Researchers," *Education for Information* 38, no. 2 (2022): 171–87.

English First Additional Language learners. The data were analysed based on the teachers' responses to interview questions. The following are the aspects that have emerged:

Learner engagement and motivation

The results demonstrate that teachers who participated in interviews frequently reported a significant increase in learners' enthusiasm and drive after being introduced to AR digital application tools, particularly because the AR treatment included smartphone use and visual material. A participant from School A responded as follows:

Teacher A highlighted:

As a teacher who has been teaching English First Additional Language for over 10 years, I have indeed faced numerous challenges in teaching reading comprehension. Our English First Additional Language learners often struggle with comprehending texts. A small number of learners typically participate in classroom discussions during comprehension lessons. Most learners become bored, and you will notice that they become clueless about what the text contains, even when discussing the comprehension text as a whole class. After the Augmented Reality intervention in the chosen group of learners, I observed a significant transformation. This started with the excitement of using their beloved smartphones in classroom lessons, the videos displayed by the apps, and other visual content. Everyone in the group showed interest in the reading comprehension lessons.

Teacher B of School B added that learners showed a strong interest in the lesson and that vocabulary improved as the AR app explained challenging words.

Teacher B expressed:

My learners showed a considerable interest in the lessons. The app produced videos and visuals that enhanced the reading of the given texts. The app also explained difficult words. This assisted learners in building vocabulary, and relevant examples for every challenging word were also provided, enhancing learners' reading comprehension. I also noted the improvement in participation in the discussion sessions.

The responses above demonstrate that integrating AR into reading comprehension lessons enhances learners' willingness to participate fully. Furthermore, it has been proven that using visual and 3D content generated by the AR app helps learners see and relate to what they are reading, rather than struggling to visualize the text. This suggests that using AR in the reading lesson fosters a positive learning environment in which everyone in the classroom shows great interest and eagerness in the learning process. Moreover, the results reveal that AR can be an invaluable pedagogical tool for teaching reading, especially for English FAL learners who often struggle with the traditional text-based method. The data fully support the claims that when technology is used effectively and meaningfully in the classroom, it can transform passive learning into an active, engaging, participatory, and enriching learning experience.

Reading for meaning

The data collected reveal that several factors, such as a lack of background knowledge of the text and a failure to link the title to its content, contribute to learners' inability to read for meaning or comprehend. However, one participant from School B noted a significant improvement in learners' reading for meaning following AR treatment.

Teacher B pointed out:

I saw a significant improvement in reading for meaning. Several factors I usually notice cause learners to lack understanding of reading comprehension. Factors such as a lack of focus make them less interested in the given text. Secondly, a lack of background knowledge prevents them from making inferences while reading and from creating relevant connections between the title and the text's content. However, after the intervention using AR tools, there was a significant

improvement in their concentration and engagement during the lessons. I feel strongly that this initiative would be a game-changer in our schools, especially in a world of technology.

Another participant felt that the use of AR in public schools should be adopted, especially in technologically equipped schools.

Teacher C shared:

I believe augmented reality should be adopted in public schools, particularly in those with ample technological resources. I saw a massive difference in learners who were chosen for treatment with AR using their cell phones during reading comprehension lessons.

The data above show that it is evident that AR integration in the language classroom can be constructive for learners to be able to read for meaning by addressing the most challenging factors that impact learners' reading comprehension abilities, which are the inability of learners to create connections between themselves and the background knowledge of the text, and learners' lack of interest in the text. However, the results demonstrate that by improving concentration, providing background information, and helping learners create conceptual connections within texts, AR enables learners to become more proficient and self-assured readers. The data revealed that learners often struggle to understand the text due to insufficient context. The learner demonstrated improvement in making inferences and meaningfully engaging with the text. Additionally, the results also reveal that AR has the potential to be a game-changing tool for enhancing reading comprehension in technologically advanced classrooms. Using definitions, photos, and background-text-related videos, augmented reality apps can help learners interact with the text more critically and contextually.

Data collected from Learner Interviews

The results reveal that the augmented reality intervention significantly improved learners' comprehension of text. Most of them highlighted that the augmented reality app had helped them overcome the vast challenges they usually experience in reading comprehension. The following aspects were highlighted:

Improved text visualisation

From the findings, a central theme emerged: learners' ability to visualize abstract content more clearly through an AR mobile app. Participants noted that they could "see" and relate to what they were reading better. For example, when they were given a text about volcanic eruptions, they were able to see and visualize what they were reading.

Learner E responded as follows:

After using the AR mobile app to read, I was able to see what the text was about. For example, there was a text about a volcanic eruption; visuals and 3D portraits helped me understand the text better than just reading about it. When reading alone, I usually do not get a clear picture of what I am reading.

Learner A also highlighted an improvement in text visualization; the learner stated:

Most of the time, when I am reading, I struggle to visualize things from the text, but after using AR apps, I felt like I was part of the story.

Learner B reported that using augmented reality (AR) helped them better understand previously abstract ideas and establish a deeper connection with the text.

Learner B: explained:

I often had trouble understanding some parts of the text, especially the difficult ones. However, by the time I used the AR app, I saw visuals of what the text described, which helped me better understand it.

Learner D also noted that AR made reading comprehension more engaging, allowing them to see what they were reading about in the text.

Learner D commented:

The AR app helped me by clearly showing events in the text, such as how earthquakes or volcanoes erupt.

Learner B: stated:

Sometimes, when I am reading about things that are not close to me, I struggle to follow the text easily. Still, AR made it easier by helping me see these things and ensuring I understood and remembered the information better.

From the responses, learners acknowledged the use of AR in the classroom, noting that after using it, they were able to visualize and relate to each section of the passage. The visual content produced by an AR app may positively impact comprehension of a text, as it enables visualisation of its contents. This is a crucial element in reading comprehension.

Improved learner vocabulary

The findings also revealed that learners were able to understand any difficult words or phrases they encountered in the text through the AR app. The app provided multiple meanings of the highlighted word, along with examples of each. Additionally, AR provided rapid and graphically assisted explanations of complex terminology, serving as a just-in-time scaffold to support learning for learners who might otherwise lose interest due to language barriers.

Learner C explained:

I easily understood all the difficult words I came across, as the app explained their meanings and provided examples in visual content. I forget easily when I am reading alone.

Learner B shared:

Sometimes I have trouble understanding English terms, but the app helps by providing graphics and explanations that make sense to me. When I utilize it, I feel as though a teacher is present.

Learner D added:

I was able to learn new terms more quickly because of the AR app. I appreciated how it included a picture along with the word and its definition. It made the narrative simpler to follow.

Learner C commented:

Previously, I would bypass unfamiliar words, but now I can click on them to obtain assistance. I was able to recall the words more effectively by visualizing their meanings.

The findings reveal that the AR digital app has the potential to improve learners' vocabulary levels in reading comprehension. Many learners struggle to comprehend a text because of the difficult words they encounter. Seemingly, learners often struggle to read well and extract meaning due to these complex concepts. However, AR implementation has shown promising potential to intervene in such cases. The findings show that learners can scan any difficult words they encounter in the text. The app will immediately produce different meanings and examples of the scanned word, helping learners develop their vocabulary.

Enhanced reading comprehension

Another participant revealed that the AR experience had greatly improved her comprehension. The learner explained that since the AR allowed them to interact with text visually, they could easily understand what they were reading.

Learner A elaborated:

AR helped me remember and understand many things that I read in the text. When I do self-reading, I skip parts of the text I do not understand, and sometimes I guess. However, when I read using AR, I did not have to make assumptions because everything was shown through videos and pictures.

Learner E demonstrated how AR fills in vocabulary gaps by associating challenging terms with images. This indicates that AR improves contextual comprehension and vocabulary acquisition, particularly for learners who struggle to grasp new terms.

Learner E shared:

I avoided confusion with challenging words by using AR while reading. Whenever I do not understand a word, I instantly look up its definition in an image or a video. That made it easier for me to read and understand the text.

Learner C considered how AR improved long-term memory and narrative comprehension. Reading became more memorable and cohesive when story events could be visualized, suggesting that AR improves memory recall and facilitates instant comprehension.

Learner C elaborated:

After using AR, I was able to follow and understand the text more easily thanks to the pictures and videos that illustrated key points. Additionally, I can now remember everything I read.

The findings highlight that the AR intervention in reading improves learners' comprehension. The number of reading factors that typically affect learners' inability to extract meaning from the text has been highlighted. These issues include poor memory retention, difficulty understanding abstract concepts, and misinterpretation of text. However, through the visuals of the AR intervention, learners overcome these challenges.

Improved concentration and focus

One learner explained that the AR experience helped him improve his focus and concentration. The learner often becomes easily distracted when attempting to comprehend what they read. However, through engaging videos and pictures, the learner maintained focus and concentration.

Learner D pointed out:

I was able to focus more when I used AR apps. Most of the time, when I read alone, I get easily distracted. The AR apps showed many videos and pictures that matched the text, helping me better understand what it was about.

Learner A marked:

Before using AR in reading, I noticed that I quickly lose interest. However, because of the pictures that usually accompany reading, I was always interested in reading. It also made it easier to follow the text.

Learner C shared:

When I read without AR, my mind wanders, and I do not focus on what I am reading. However, when we read with AR, I stayed interested and remembered what I was reading.

Learner E mentioned:

I usually struggled when reading in class because I easily lost focus on what I was reading. However, AR helped me stay focused and remain interested in reading.

The above findings highlight that learners tend to lose focus and concentration easily when reading. This is especially true if the text is unfamiliar and challenging for them. The findings reveal that learners acknowledge the AR intervention in reading. They highlighted improvements in focus and concentration, and most noted a significant transformation after engaging in reading with an AR intervention.

DISCUSSION

The findings of this study reveal that integrating Augmented Reality into reading comprehension lessons positively influenced Grade 10 English First Additional Language (FAL) learners' participation, motivation, vocabulary development, and overall understanding of texts. These outcomes align with international studies that have documented the ability of AR to enhance learner engagement and create

interactive learning environments.⁴⁶ However, much of the existing research has been conducted in well-resourced, technologically advanced settings.⁴⁷ The current study provides new insights by demonstrating that similar benefits can be observed in a semi-rural, under-resourced district in the Eastern Cape, South Africa. This finding extends the literature by suggesting that AR's positive effects on reading comprehension are not solely dependent on high-end infrastructure but can emerge even with basic mobile devices and limited internet access, provided that pedagogical design is thoughtful.

Teachers in this study reported that learners showed heightened interest and excitement when using AR, particularly because the intervention allowed smartphone use and visual content. This supports Meyiwa's claim that AR helps learners visualize text and meaningfully relate to the content. However, a critical divergence from existing literature emerges here: While international studies often highlight AR's role in reducing cognitive load through dual-channel processing,⁴⁸ Teachers in the Chris Hani West District noted that the primary benefit was not cognitive load reduction per se, but rather overcoming *affective barriers* such as boredom, lack of confidence, and disengagement. This suggests that in South African FAL contexts where many learners struggle with foundational reading skills, AR may first serve as a motivational catalyst before yielding cognitive gains. This is a novel contribution to the CTML framework, indicating that emotional engagement may be a prerequisite for effective multimedia learning in low-resource, high-challenge classrooms.

Vocabulary development emerged as a key area of improvement, with learners reporting that AR applications provided immediate definitions, examples, and visual representations of unfamiliar words. This finding corroborates the work of Asadi and Ebadi, who found that AR tools support vocabulary acquisition by offering contextualized, multimodal explanations. However, the current study adds a distinctly South African insight: learners explicitly stated that AR helped them overcome the *absence of teacher support* during independent reading, because the app functioned as a "teacher in their pocket." In large classes (often exceeding 40 learners per teacher), individualized vocabulary support is rarely feasible.⁴⁹ Therefore, AR's capacity to provide just-in-time, personalized scaffolding represents a significant pedagogical innovation for the South African context, where learner-teacher ratios remain persistently high.

Regarding reading comprehension, teachers noted that AR improved learners' ability to read for meaning by addressing previously intractable challenges: lack of background knowledge, poor concentration, and inability to connect titles to text content. This aligns with Şimşek and Direkçi, who found that AR storybooks enhance comprehension by adding sounds, animations, and pictures. However, the present study reveals a new insight: teachers observed that AR enabled learners to make *cultural and experiential connections* to texts that were previously remote from their lived realities. For example, when reading about volcanic eruptions or earthquakes, phenomena unfamiliar to many Eastern Cape learners, AR visuals bridged the experiential gap. This is particularly relevant for the South African curriculum, which often includes texts rooted in global or urban contexts that may not resonate with rural learners. Thus, AR may serve not only as a comprehension tool but also as a culturally responsive pedagogy that validates diverse learner backgrounds.

Learners themselves reported improved text visualisation, enhanced focus, and better memory retention. One learner noted, "I felt like I was part of the story," which directly reflects Mayer's assertion that meaningful learning occurs when learners actively integrate new information with prior knowledge through dual channels. However, a critical finding that challenges some international literature is that several learners admitted they would "skip unfamiliar words" or "guess" when reading traditional texts, but AR eliminated this avoidance behaviour. While Bursali and Yilmaz demonstrated AR's effectiveness in controlled settings, the current study highlights that in poorly resourced South African schools, AR may reduce *strategic avoidance*, a coping mechanism common among struggling readers

⁴⁶ Agnitus Molwantoa and Florence Olifant, "Exploring Grade 8 English First Additional Language Learners' Reading Comprehension Challenges," *Reading & Writing* 16, no. 1 (May 23, 2025), <https://doi.org/10.4102/rw.v16i1.556>.

⁴⁷ Ebadi and Ashrafabadi, "An Exploration into the Impact of Augmented Reality on EFL Learners' Reading Comprehension."

⁴⁸ Liu, "The Effects of Segmentation on Cognitive Load, Vocabulary Learning and Retention, and Reading Comprehension in a Multimedia Learning Environment."

⁴⁹ Molwantoa and Olifant, "Exploring Grade 8 English First Additional Language Learners' Reading Comprehension Challenges."

who lack vocabulary and confidence. This behavioural shift has not been adequately addressed in existing AR reading research and warrants further investigation.

Importantly, this study also reveals tensions and limitations that are often glossed over in international AR literature. Teachers reported that while AR improved engagement, its success depended heavily on reliable electricity, internet connectivity, and device availability, conditions that are inconsistent in many Eastern Cape schools.⁵⁰ Unlike studies conducted in Europe or East Asia, where infrastructure is taken for granted, the current findings suggest that without concurrent investment in basic technological resources and teacher training, AR interventions risk exacerbating existing digital divides.⁵¹ Furthermore, teachers noted that learners sometimes focused more on the novelty of the AR app (e.g., repeatedly watching animations) than on comprehension tasks, echoing the caution raised by Pellas et al. that pedagogy, not technology, must drive AR integration. This finding is particularly salient for South Africa, where the “novelty effect” may be amplified in schools with limited prior exposure to digital tools.

Another new insight from this study is the role of AR in fostering *collective learning* in large classes. While most AR research emphasizes individualized, self-paced learning, teachers in the Chris Hani West District noted that learners often gathered around a single device to discuss vocabulary, predict content, and co-construct meaning.⁵² This collaborative dimension, born partly out of necessity due to limited devices, turned a potential limitation into a pedagogical strength. This finding has not been prominent in international AR literature and suggests that AR integration in collectivist, resource-constrained South African classrooms may promote peer-assisted learning in ways that differ from individualized tablet use in high-income contexts.

Finally, while the Cognitive Theory of Multimedia Learning provides a robust framework for understanding how AR reduces extraneous cognitive load through visual-verbal integration, the current study suggests that an *affective-motivational extension* may be needed for South African FAL contexts. Learners repeatedly emphasized feeling “interested,” “excited,” and “confident” when using AR, emotions that were largely absent during traditional reading lessons. As Liu notes, cognitive engagement is impossible without affective engagement. Therefore, future iterations of CTML should consider emotional and motivational factors as co-requisites for effective multimedia learning, particularly in challenging educational environments where learner self-efficacy is low.

This study confirms international findings that AR improves reading comprehension, vocabulary, and motivation. However, it offers new insights by demonstrating that AR can be effective in semi-rural, under-resourced South African schools, provided that teachers carefully design tasks and that learners have basic mobile access. The study uniquely highlights AR’s role in reducing strategic avoidance, fostering collaborative learning out of infrastructural necessity, and serving as a culturally responsive bridge between unfamiliar text content and learners’ lived realities. At the same time, it critically underscores that AR is not a panacea: without reliable infrastructure, ongoing teacher training, and attention to the novelty effect, its benefits may be limited or unevenly distributed. These findings offer a contextually grounded understanding that extends beyond existing literature, informing both policy and practice for technology integration in South African education.

RECOMMENDATIONS

- The study recommends that the education department consider the formal integration of AR in the Grade 10 English FAL curriculum as a complementary teaching reading method.
- The study recommends that there should be ongoing training and development programmes that will be designed to equip teachers with teaching methods and technical skills necessary to implement AR in reading classes effectively.
- School management and the governing body should ensure reliable internet access, AR-supported devices, and backup power in case of technical disruptions.

⁵⁰ Criollo-C et al., “Towards Sustainable Education with the Use of Mobile Augmented Reality in Early Childhood and Primary Education: A Systematic Mapping.”

⁵¹ Huang et al., “A Systematic Review of AR and VR Enhanced Language Learning.”

⁵² Yoon, *Effective Teacher Collaboration for English Language Learners: Cross-Curricular Insights from K-12 Settings*.

- The study recommends that curriculum developers create AR materials that are well aligned with the English FAL curriculum, considering cultural and linguistic context.
- The study further recommends that future studies also explore AR integration in other language skills, such as writing, speaking, and listening, across different grades.

CONCLUSION

The current study aimed to explore the impact of augmented reality on teaching reading comprehension among Grade 10 English FAL learners in Chris Hani West District. The study used a qualitative research approach, which allowed for a thorough understanding of the integration of AR and its impact on learners' comprehension skills, participation in reading lessons and activities, motivation, and teachers' experiences in using this innovative teaching tool. The study's findings revealed that implementing AR in English reading lessons and activities promoted a more engaging, interactive, and learner-centred learning environment than traditional teaching methods. It was noted that learners who were exposed to AR experiences showed great willingness and curiosity in the AR-based lessons, which enhanced their understanding when reading different texts. Moreover, teachers in this study reported that AR was beneficial, as it captured learners' attention and fostered collaborative learning, despite challenges such as power outages, technical issues, and insufficient training. Therefore, the study concludes that AR is a promising and potentially effective teaching tool to improve reading comprehension in English as a First Additional Language. The tool demonstrated that when used correctly, it can bridge the gap between complex language concepts and practical understanding, making learning enjoyable and engaging. However, the success of AR integration requires continuous, practical training, a robust technological infrastructure, and ongoing support to address implementation challenges in schools.

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ABOUT AUTHORS

Mr. Ntini Siyabonga holds a Master's Degree in Education. He is a teacher at a secondary school, where he teaches English First Additional Language to grades 10 to 12. His research interest is in language Education.

Dr. Lundi Nomlala is a Lecturer at iYunivesithi Walter Sisulu under the Faculty of Education, Humanities and Creative Arts Education Department. He offers English modules. He is the Deputy Head of Department. He serves in various committees, such as the Faculty Research Ethics Committee, the Research and Innovation Committee and the Scholarship of Teaching and Learning (SoTL).