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The Use of Augmented Reality in English Language Teaching: A Meta-Thematic Analysis

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Abstract
This study explores the role of augmented reality (AR) in English language teaching through a meta-thematic analysis of qualitative research. By synthesizing data from seven studies, the analysis identifies key themes regarding AR's impact on the teaching-learning process, student engagement, and challenges. The findings indicate that AR enhances vocabulary acquisition, increases student motivation, and facilitates a more immersive learning environment by making abstract concepts more concrete. Furthermore, AR supports creativity and active learning by integrating interactive and multimedia elements into instructional settings. However, challenges such as technological constraints, limited resources, and increased cognitive load are also observed. This study highlights the dual nature of AR in education, functioning both as a facilitator and a potential obstacle, emphasizing the need for well-structured implementation strategies to maximize its benefits.

Keywords: augmented reality (AR), meta-thematic analysis, English language teaching, augmented reality technology

INTRODUCTION

The educational sector has undergone and continues to experience significant transformations due to recent technological advancements. Technologies such as artificial intelligence, augmented reality and virtual reality, mobile learning, cloud computing, big data analytics, and educational robotics have emerged as innovative tools that enhance the effectiveness, interactivity, and accessibility of the teaching and learning processes. One prominent technology is augmented reality (AR), which enriches the real environment with computer-generated audio, graphics, video or GPS data (Azuma, 1997; Milgram & Kishino, 1994; Van Krevelen & Poelman, 2010). AR offers a readily accessible environment that can be utilized at any time and in any location (Dunleavy et al, 2009). Furthermore, it integrates two-dimensional and three-dimensional virtual data generated by a computer into the user's environment through various methods, including 3D graphics technology, sensing technologies, human-computer interaction techniques, and multimedia approaches (Cai et al., 2013).

The foundations of augmented reality technology were established in the 1960s through the pioneering work of Ivan Sutherland and his students on computer graphics at Harvard and the University of Utah. This technology, which saw its inaugural application with the US Air Force and NASA, has become increasingly widespread since the 1990s, thereby reaching a broader audience (Feiner, 2002). As a result of these advancements, one of the technologies that have gained significant popularity in recent years is augmented reality (AR) applications (Alkhamisi et al., 2013). The scope of augmented reality applications is believed to be quite broad. Examples of its applications include medicine and health (Azuma, 1997; Berryman, 2012), building (Delgado et al., 2020; Oke & Arowojya, 2021), education and training (Sharma et al., 2021; Saju

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et al., 2022), marketing (Berryman, 2012; Saju et al., 2022), and military and defense (Azuma, 1997).

Over time, educators have begun to recognize the innovative potential of augmented reality technology in the context of teaching and learning. Augmented reality (AR) technology enhances the learning process by making educational environments more interactive and enjoyable (Wu et al., 2013). This technology can be utilized to create enriched educational settings that offer real-world learning experiences that actively engage several senses (Luckin & Fraser, 2011). Today, with the increasing use of the internet and mobile applications, it is considered a crucial necessity to incorporate technology innovations into education and conduct research in this field (Liu et al., 2010; Tan & Liu, 2004).

Literature Review

Augmented reality in education

Augmented reality (AR) has been utilized in education to develop tools that enhance both learning and teaching experiences (Garzón, 2017). AR technology serves as a significant tool in creating enriched educational environments and fostering genuine learning experiences that engage multiple senses (Luckin & Fraser, 2011). This technology aids students in comprehending complex spatial relationships and abstract concepts by integrating virtual objects with real-world environments (Arvantis et al., 2007).

As indicated by Criollo-C et al. (2021), the integration of augmented reality in educational settings offers various benefits, including heightened student engagement and interaction. A substantial body of research demonstrates that AR technologies possess significant potential to improve teaching effectiveness and learning outcomes, as well as positively influence student motivation (Bacca et al., 2014; Billinghurst & Duenser, 2012; Cevahir et al., 2022; Chang & Hwang, 2018; Georgiou & Kyza, 2018; Ibanez et al., 2014; Sotiriou & Bogner, 2008; Yoon et al., 2018). Evidence suggests that AR not only enhances learning outcomes but also promotes digital literacy and enriches the educational environment (Akçayır & Akçayır, 2017; Chang et al., 2015; Chiang et al., 2014; Jerry & Aaron, 2010; Lai et al., 2019; Vázquez-Cano et al., 2020). In addition to significantly enhancing student engagement, motivation, and enjoyment in learning activities (Basumatary & Maity, 2023; Lampropoulos et al., 2022; Pellas et al., 2019), research suggests that AR applications can improve learning outcomes by facilitating a deeper understanding and retention of complex topics (Ibânez & Delgado-Kloos, 2018; Mystakidis et al., 2021; Sırakaya & Sırakaya, 2020).

Furthermore, AR technology enables students to visualize course materials in three dimensions and interact with them, thereby amplifying their learning experiences and facilitating the comprehension of complex subjects (Cheng & Tsai, 2013). According to Dunleavy and Dede (2014), AR serves as a valuable tool in inclusive education, effectively catering to the needs of students with various learning styles. AR is recognized as a versatile tool that accommodates various learning approaches by adapting to individual educational needs, promoting collaborative learning environments, and enhancing personalized educational experiences (Lampropoulos et al., 2022; Zulfigar et al., 2023). The combination of artificial intelligence and AR applications allows for the creation of personalized and engaging learning experiences (Zawacki-Richter et al., 2019). Furthermore, the integration of augmented reality (AR) with game-based learning (GBL) has the potential to transform educational experiences by boosting student motivation and enhancing learning outcomes (Pellas et al., 2019).

Despite its potential, augmented reality (AR) technology in education faces several challenges. The primary drawbacks of AR in educational settings involve technical difficulties and the complexities associated with developing AR materials (Khan et al., 2019). Furthermore, educators must possess sufficient knowledge and skills related to the implementation of AR (Akçayır & Akçayır, 2017). To effectively integrate augmented reality in education, training for educators and modifications to the curriculum are essential to fully realize its advantages (Tzima et al., 2019; Zulfigar et al., 2023). Other significant obstacles include the necessity for a

high level of technological expertise, as well as the rising costs and time constraints linked to AR integration (Bacca et al., 2014; Chen, 2019; Heintz et al., 2021; Wu et al., 2018). Additionally, concerns regarding technology (Albishri & Blackmore, 2024; Lin et al., 2011; Wu et al., 2013) and resistance from instructors (Lee et al., 2012) further complicate the adoption of AR in educational contexts and contribute to the challenges faced in adopting AR in educational contexts. Despite its benefits, AR also encounters challenges such as technological issues, usability concerns, and the need for appropriate hardware and internet access (Basumatary & Maity, 2023; Zulfigar et al., 2023).

Related Research On English Language Teaching

The volume of research investigating the application of augmented reality (AR) technology in education is experiencing significant growth. Numerous studies have highlighted the positive effects of AR technology on vocabulary instruction (Chen et al., 2017; Dalim et al., 2020; Hsu, 2017; Le et al., 2017; Parmaxi & Demetriou, 2020; Redondo, 2020; Wu et al., 2013), the overall learning process (Criollo-C et al., 2021; Heintz, 2021), as well as students' performance and motivation (Chen & Wang, 2015; Martinez et al., 2017). Additionally, research indicates that AR technology supports the enhancement of the four primary language skills in English language teaching (Liu, 2009; Liu et al., 2010; Liu & Tsai, 2013; Parmaxi & Demetriou, 2020).

Hagihara et al. (2022) proposed the development of an English vocabulary learning application for early childhood education that utilizes markerless augmented reality (AR). A systematic review conducted by Parmaxi and Demetriou (2020) indicates that mobile-based AR applications enhance reading, writing, speaking, and vocabulary skills among students. Nguyen et al. (2020) discovered that the integration of AR with gamification significantly improved student performance and engagement. Additionally, two AR-based educational game systems were developed and implemented to promote English vocabulary acquisition (Sun & Hsu, 2019), alongside an English tutoring system (Kim & Kim, 2018). Hsu (2017) examined the influences of learning styles, anxiety, and cognitive load within augmented reality game systems. Solak and Çakır (2015) explored the impact of augmented reality materials on vocabulary learning among language learners. Dunleavy and Dede (2014) conducted a comprehensive evaluation of the pedagogical affordances and constraints of augmented reality (AR) within the contexts of learning, teaching and instructional design. Their findings indicate that while AR holds significant potential to foster student engagement, motivation and individualized learning experiences, it also poses notable challenges related to technological limitations, increased cognitive load and complexities in pedagogical integration. In a similar vein, Hsieh et al. (2014) examined the impact of AR on student performance and reported that the use of AR applications led to improvements in academic achievement, particularly by enhancing conceptual understanding and promoting sustained learner motivation. Furthermore, Bacca et al. (2014) focused on the application of AR within educational contexts.

Purpose of the Research

The purpose of this study is to investigate the utilization of augmented reality (AR) in the context of English language instruction. To achieve the objectives of this research, the following questions are sought to be addressed:

1. How does the incorporation of AR influence English language teaching and learning process?

2. What contributions does AR make to the affective dimensions of student learning?

3. What are the potential drawbacks associated with the use of AR in English language instruction?

METHOD

Research Design

This study aims to investigate the application of augmented reality (AR) technology in English language instruction through a meta-thematic analysis of qualitative research in this field. Meta-

thematic analysis serves as a methodological framework for qualitatively synthesizing the shared and comparable characteristics of studies that explore various dimensions of a specific subject. Meta-thematic analysis is a process through which participant views (raw data) presented in qualitative research on a particular subject are re-analyzed via document analysis to derive themes and codes (Batdı, 2020). The analysis involves examining data collected through document analysis, which is subsequently redefined into coherent themes and codes, thus providing meaningful interpretations of the findings (Batdı & Atik, 2020).

Data Collection Tools

This study aims to provide a comprehensive analysis. To achieve this objective, the meta-thematic analysis was employed, and qualitative findings were derived through document analysis and the coding of qualitative data. The following databases were utilized to retrieve studies for the meta-thematic analysis conducted during this phase of the investigation: Web of Science, Scopus, Taylor & Francis, Science Direct, Springer, and ProQuest. A systematic search was conducted across these databases to identify relevant studies, utilizing the search terms "augmented reality" and "English language teaching." The search encompassed the entire period since the introduction of augmented reality technology up to the present. In total, 353 papers were identified across the six databases: 12 from Web of Science, 11 from Scopus, 14 from Science Direct, 267 from ProQuest, 30 from Springer, and 19 from Taylor & Francis.

Process

The inclusion and exclusion criteria for the meta-thematic analysis were developed based on the studies identified during the screening process. Specifically, the inclusion criteria required that eligible studies focus on augmented reality in English language instruction, provide qualitative themes or qualitative raw data, and are accessible in full text. Additionally, it was stipulated that only articles and theses meeting these criteria would be considered for the analysis. The studies included in the meta-thematic analysis were conducted across various educational levels, encompassing early childhood education, primary school, secondary (high school) education, and English as a Foreign Language (EFL) contexts. This diversity in school levels provided a broad perspective on the implementation and impact of the studied phenomenon across different age groups and learning environments. The studies identified after the screening process were subsequently evaluated according to the established inclusion and exclusion criteria. Figure 1 presents a PRISMA flow diagram that illustrates these criteria, along with rationales for excluding certain studies from the analysis.

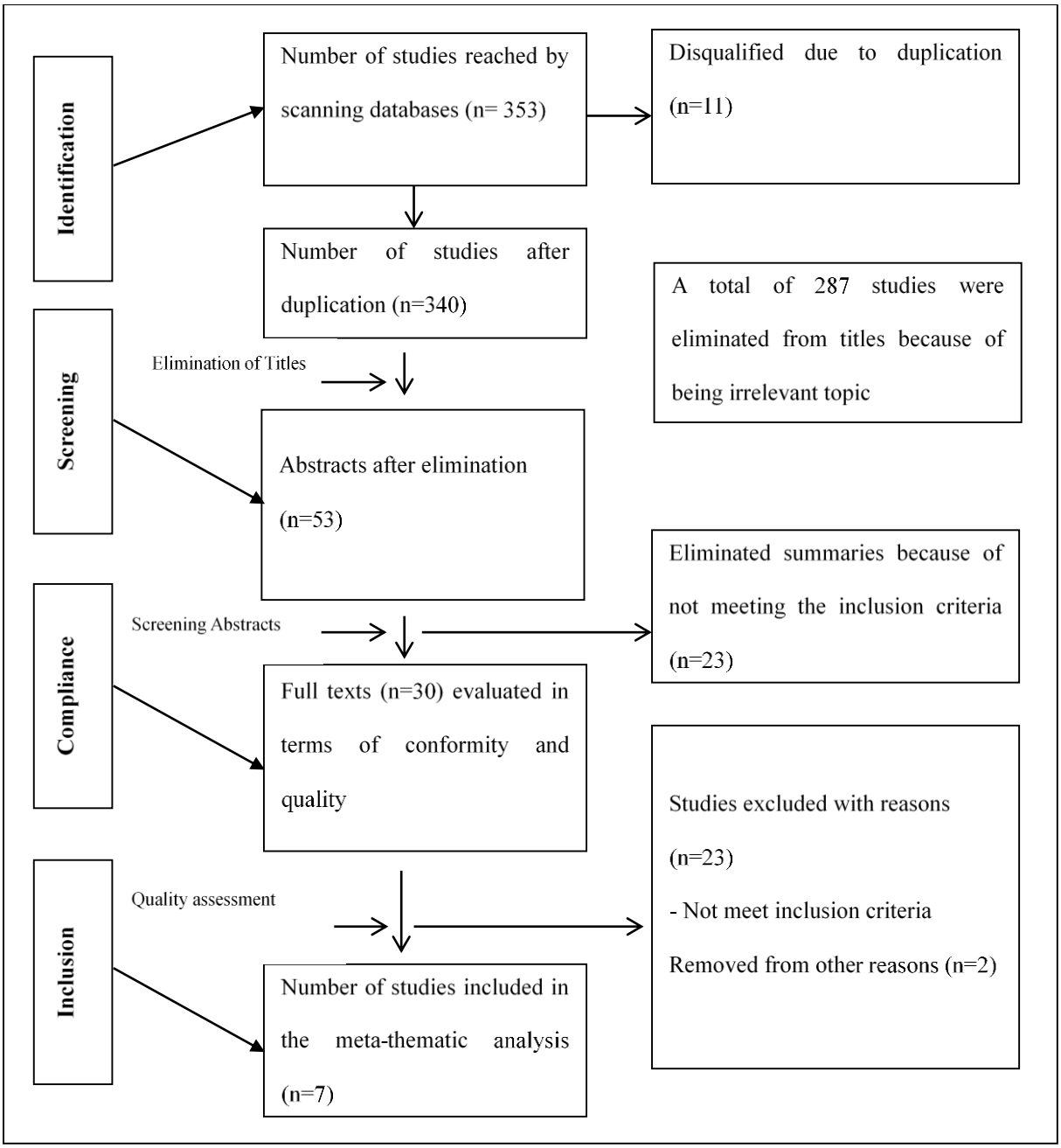

Figure 1. Flow diagram of the studies included in the meta-thematic analysis

Upon reviewing the PRISMA diagram, it was found that a total of 353 papers related to augmented reality in English language instruction were sourced from the specified databases. Of these, 11 studies were excluded due to duplication. Following the removal of duplicates, 340 studies remained. An additional 287 studies were excluded based on an evaluation of their titles and abstracts, as these were deemed adequate but not aligned with the primary objectives of the research. A further assessment of the abstracts of the remaining 53 studies using the "relevance" criterion led to the exclusion of 23 additional papers that did not meet the intended purpose. Consequently, 30 studies were retained. Among these, 23 papers were discarded for failing to satisfy the meta-thematic inclusion criteria. Furthermore, two studies were eliminated from analysis due to duplication across three distinct databases. As a result, a total of seven studies met the established inclusion criteria for meta-thematic analysis.

Analysis of Data

The research utilized content analysis to investigate the themes and codes identified in qualitative studies regarding augmented reality technology in English language instruction. Content analysis is a versatile research methodology that can examine documents within library and information science studies, effectively addressing both quantitative and qualitative research needs (Finfgeld-Connett, 2014).

Through meta-thematic analysis, the data derived from qualitative studies were articulated as themes and codes. These concepts were visually represented and interpreted in figures and presented using the Edrawmind tool, an online concept networking platform. This tool allowed for a clear and engaging interpretation of the information, making complex relationships and ideas easier to understand and analyze. The codes were categorized under three primary themes: “the reflections of augmented reality on the learning-teaching process,” “the contributions of augmented reality to students in the affective dimension,” and “the negative aspects of augmented reality.” The agreement between the two data coders regarding these themes was assessed using Cohen’s Kappa agreement values, which indicated a high level of concordance. Each study was assigned a code: M1, M2, ... for articles (M) and T1, T2, ... for theses (T), and these codes were consistently used throughout the research. Direct quotations providing support for the identified themes and codes were also incorporated in the relevant sections. An expert in the field reviewed the developed themes and codes to evaluate their appropriateness.

To ensure the validity and reliability of the research, each stage of the research procedure was meticulously documented and described. To mitigate potential researcher bias in the literature review, a comprehensive range of databases was explored, accompanied by a thorough evaluative process. The research findings were presented authentically, without lengthy explanations or elaborations. Two researchers independently generated unique themes and codes, and the findings were communicated through direct quotations.

RESULTS

The codes extracted from the studies analyzed through meta-thematic analysis were categorized into three themes: "The Reflections of Augmented Reality (AR) on the Teaching-Learning Process," "The Contributions of AR to Students in the Affective Dimension,” and “The Negative Aspects of AR." This section of the study presents the evolving themes along with the respective codes that comprise them in a distinct manner.

The Reflections of AR on the Teaching-Learning Process

The meta-thematic analysis revealed that the theme was represented by 29 codes, specifically focusing on “The Reflections of Augmented Reality on the Teaching-Learning Process.” These codes are illustrated in Figure 2.

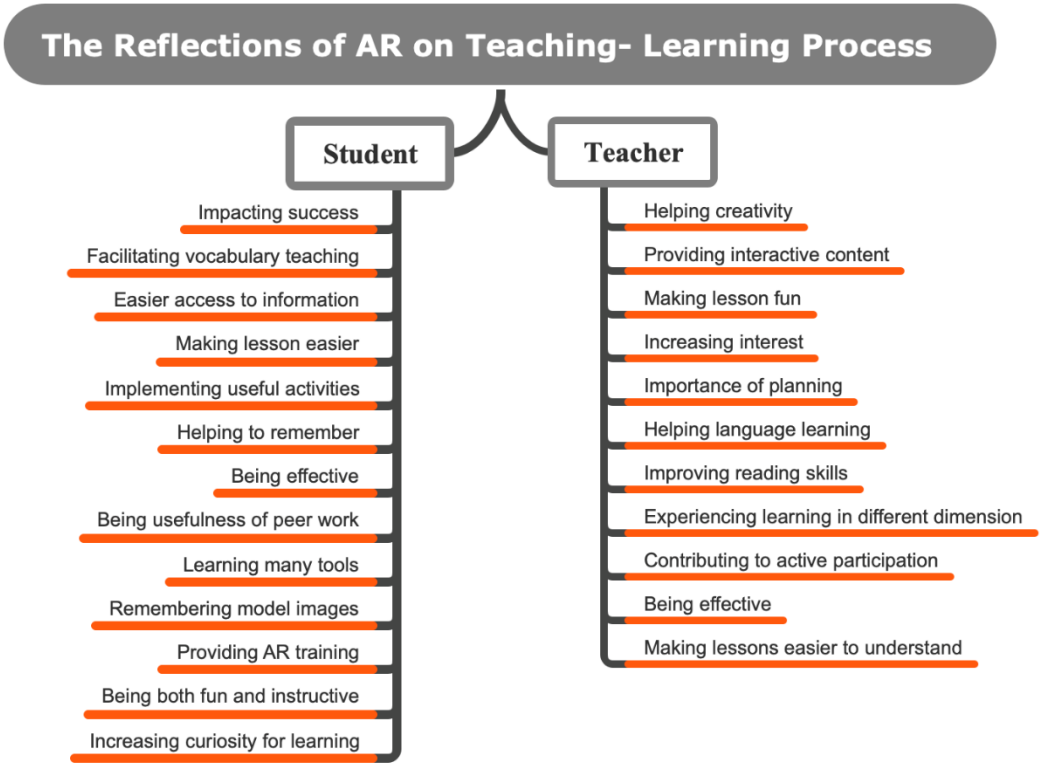

Figure 2. The reflections of AR on the teaching-learning process

In Figure 2, the codes addressing the reflections of augmented reality (AR) on the teaching-learning process are categorized into two distinct dimensions: teacher and student. In the teacher dimension, the most prevalent codes can be summarized as "facilitating language learning," "experiencing language in multiple dimensions," and "enhancing creativity."

For example, in the M2-p.9 study, it was stated, "The students use this for the first time, which is a positive experience. It immerses them in the language and allows them to engage with language learning from a different perspective." This statement supports the codes of "facilitating language learning" and "experiencing language learning from multiple dimensions." Furthermore, the remark, "It is appropriate to teach language skills using AR because lessons can be conducted almost anytime and anywhere," from M5-p..3129 aligns with the codes "facilitating language learning" and "effectiveness." Thus, one notable effect of augmented reality on the teaching-learning process is its capacity to enhance students' creativity. A reference supporting the code "enhancing creativity" includes the following statement: "The students will have more opportunities to express themselves especially in terms of creativity" (M5-p.3129).

Several codes related to the student dimension can be articulated as "facilitating vocabulary acquisition," "providing beneficial activities," "enhancing learning through applications," and "stimulating learning curiosity." Relevant references include the statement from the M1-p.10 study: "I believe that I will learn new English words through activities like this because it made it easier for me to learn English words…," which supports the code of "facilitating vocabulary acquisition." In the M6-p.9 study, a participant noted, "The demonstration of videos and animations within the book in AR applications increases my curiosity and confidence in learning, and I attribute my success largely to the use of AR technology." This statement underlines the code of "stimulating curiosity for learning." Finally, in the T1-p.129 study, it was remarked, "AR enables us to access information more easily and aids in visualizing information," which supports the code of "easier access to information."

The Contributions of AR to Students in the Affective Dimension

The meta-thematic analysis revealed a total of nine codes categorized under the theme "The Contributions of AR to Students in the Affective Dimension." These codes are illustrated in Figure 3.

Figure 3. The contributions of AR to students in the affective dimension

In M1-p.10, one participant stated, "I was very eager to do the activities. I was very excited when the teacher brought the tablets." This statement supports the codes "being enthusiastic" and "being excited." "How cool, what a magic thing. Using modern technology like that is my first time and I am full of enthusiasm about it." supports the code "being enthusiastic" (M6-p.8). A reference for the second most prevalent code, "being excited," can be found in another participant's remark: "The students were excited, but I was doubtful if they learned through the AR" (M2-p.7).

Additionally, augmented reality has been associated with students' experiences of being pleasant and feeling a sense of accomplishment in the affective domain. For instance, one expression contributing to the code "being pleasant" is as follows: "Learning the words was not difficult for me; it was easy. When we used the tablet, we both had fun and learned" (M1-p.11). "I feel very curious…. I will always want to use it." (M3-p.1522). A statement that exemplifies the code "feeling a sense of accomplishment" is: "When I completed the activities, I said I succeeded. I wanted my teacher to acknowledge my success. I was happy when I succeeded" (M1-p.11).

The statements "Demonstration of videos and animations in the book in AR applications increases my curiosity and confidence in learning" and "Thanks to AR applications, I prepare harder for the language test. I gained so much confidence about individual learning" together support the "increasing self-confidence" code. (M6-p.9). And also, "I like combining pieces in the puzzle. I liked looking through the tablet after combining the pieces" (M4-p.7005). Lastly, "Students have more opportunities to express themselves" supports the code "providing personal fulfillment" (M5-p.3128).

The Negative Aspects of AR

The meta-thematic analysis identified that the theme was articulated through a total of 27 codes centered on "The Negative Aspects of Augmented Reality." Of these codes, eleven pertain to teachers while sixteen relate to students. These codes are illustrated in Figure 4.

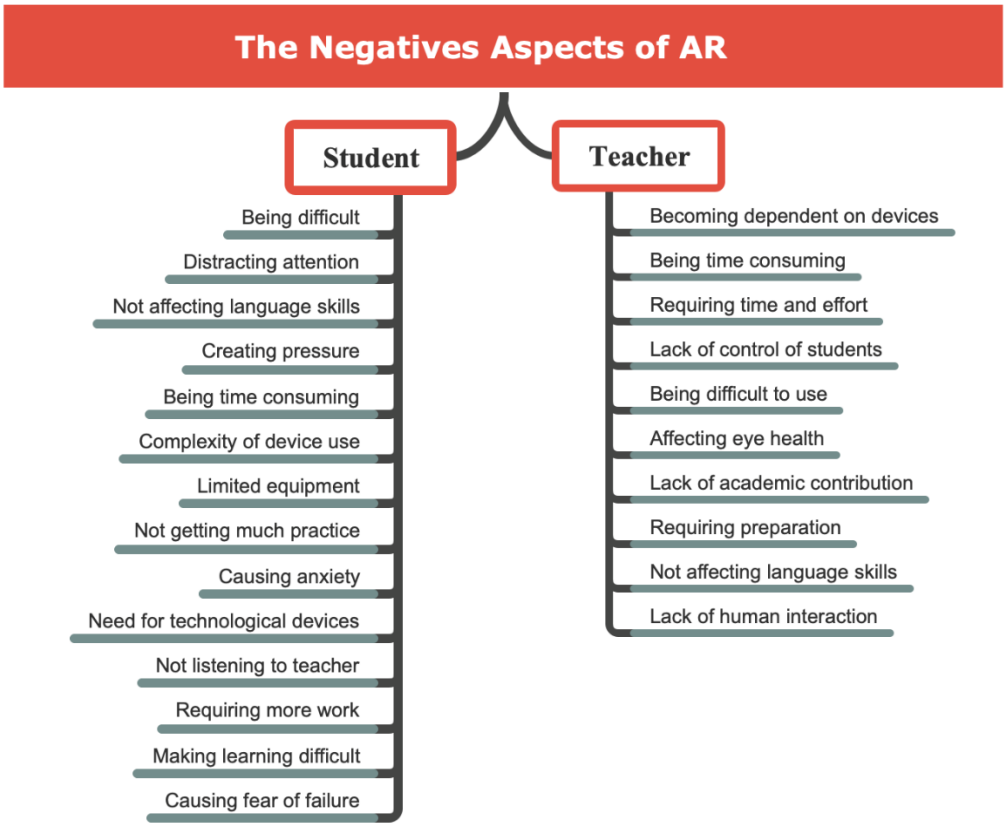

Figure 4. The negative aspects of AR

The code "being time-consuming" emerged as the predominant code for both teachers and students. Relevant statements that exemplify this code are as follows: In the T1-p.189 study, it is noted, "…Sometimes, I got a bit upset because I had to wait for a long time for the [AR] content to pop up. The technology itself should be fast and easily accessible, but I still had to wait for the loading time…" Similarly, in the M2-p.8 study, a student expressed, "The time was limited [. . .] I could not practice so much, I am skeptical if my language skills will improve." Regarding the teacher perspective, the following citation serves as a reference for this code: "in order to create a working AR will require a lot of time and efforts," as stated in the M5-p. 3130 study. "Without proper preparation, AR-based applications cannot be utilized, so it may raise the time required." supports "requiring preparation" and "requiring time and effort" code (M6-p.9).

The assertion, "The limited number of AR goggles made it difficult for everyone to practice their speaking skills" (M2-p. 8), illustrates the code concerning "limited equipment." Conversely, the statement, "You can use AR-based wearables and mobile phones in class, and you will always want to use them and discuss them, so you won't be listening to the teacher in class" (M3-p. 1523), further reinforces the code relating to "not listening to the teacher." Additionally, another pertinent reference concerning the teacher dimension is articulated in the following statement: "My classroom is rowdy and uncontrollable, which could be better for me and my lesson", and "Managing my classroom is important to me as some students may start arguing for the duration one uses the googles. This must be properly handled to avoid chaos in the class… (M2-p. 9). This statement supports the code identified as "lack of control of students.". "I had difficulty while holding the tablet. Holding it and looking at the screen is difficult. I was afraid to drop it. The tablet was a bit heavy" supports the code "causing anxiety" and "Combining pieces of the puzzle was difficult. I didn't like it much" (M4-p.7007) supports the code "being difficult" (M4-p.7007).

DISCUSSION

This study examines the impact of augmented reality (AR) technology on English language instruction. Research findings indicate that AR technology enhances the comprehension of abstract concepts by rendering them more tangible (Cheng & Tsai, 2013). It promotes student engagement and interaction (Criollo-C et al., 2021; Dalim et al., 2020), serves as an effective tool for language teaching (Kim & Kim, 2018; Liu, 2009; Sun & Hsu, 2019; Nguyen et al., 2020), and significantly contributes to the development of reading skills (Liu et al., 2010; Parmaxi & Demetriou, 2020). The design of AR systems should consider accessibility and the unique needs of diverse learners to optimize their educational effectiveness (Garzón et al., 2019).

In particular, the study's findings point to the notable effectiveness of AR in facilitating vocabulary acquisition, a result that is widely supported by prior research. Numerous studies support the efficacy of augmented reality (AR) technology in vocabulary acquisition (Chen & Wang, 2015; Chen et al., 2017; Dalim et al., 2020; Hsu, 2017; Lee et al., 2017; Parmaxi & Demetriou, 2020; Pan et al., 2021; Redondo, 2020; Sun & Hsu, 2019; Wu et al., 2013). These investigations demonstrate that AR applications facilitate vocabulary learning and enhance the retention of acquired vocabulary. Furthermore, AR has shown a moderate to significant positive impact on learning outcomes across various educational settings, contributing to an overall increase in learning effectiveness when compared to traditional instructional tools (Garzón & Acevedo, 2019). AR can alleviate unnecessary cognitive load by integrating real and virtual learning components, thus allowing for a more efficient allocation of cognitive resources (Thees et al., 2020; Kucuk et al., 2016; Lin & Yu, 2023). Additionally, AR significantly enhances student motivation, engagement, and self-efficacy by providing interactive and immersive learning experiences (Cai et al., 2022; Czok et al., 2023; Lin & Yu, 2023).

Furthermore, augmented reality (AR) technology has been identified as a significant contributor to the language teaching process in various capacities. The literature indicates that AR technology fosters interactive and meaningful learning experiences, thereby enhancing student motivation during instructional activities (Li & Wong, 2021). Additionally, AR has been recognized for introducing an innovative dimension to the teaching and learning processes (Akçayır & Akçayır, 2017; Besser et al., 2020; Chen & Tsai, 2013; Vazquez-Cano et al., 2020). It has demonstrated positive effects on academic achievement (Chen & Wang, 2015; Martinez et al., 2017) and has been found to enrich the overall learning experience (Redondo, 2020; Wu et al., 2013). Moreover, AR technology has been shown to facilitate improved retention of learned information among children (Liu, 2009; Wu et al., 2013). In this context, it becomes evident that AR represents a significant tool in creating student-centered learning experiences, offering opportunities for peer teaching and collaborative interactions (Kamarainen et al., 2013; Yılmaz, 2016). Collectively, these findings suggest that AR technology possesses considerable pedagogical value as an application in English language teaching.

The integration of augmented reality (AR) technology into the educational process has a significant impact on the affective dimension, which encompasses students' emotions, attitudes, motivation and values. In this context, AR contributes to enhancing learners' interest, engagement and positive attitudes toward learning, thereby fostering a more emotionally supportive and motivating educational environment. Numerous studies have demonstrated that augmented reality enhances students' awareness of learning objectives and fosters greater interest and motivation towards lessons and educational materials (Chiang et al., 2014; Dalim et al., 2020; He et al., 2014; Li & Keller, 2018; Önal et al., 2019; Redondo, 2020; Taşkıran, 2019). A study conducted by Pan et al. (2021) indicates that AR applications stimulate curiosity among students, thereby positively impacting their motivation. The majority of participants in this study reported enjoying the use of AR applications, a finding that corresponds with the conclusions drawn by Redondo (2020) and Wojciechowski and Cellary (2013). Furthermore, augmented reality has been shown to positively influence students' creativity (Kara et al., 2013; Yılmaz & Göktaş, 2017). Augmented Reality (AR) significantly enhances emotional responses in educational environments, demonstrating more pronounced effects on affective dimensions

than on cognitive dimensions. This includes improved engagement, motivation, and positive attitudes toward the learning material (Shen & Tsai, 2022; Lin & Yu, 2023). Although AR can reduce cognitive load in educational contexts and indirectly influence emotional responses by making the learning experience more enjoyable and less stressful, it does not consistently lead to improvements in learning outcomes (Thees et al., 2020).

Research indicates that augmented reality (AR) technology has both positive and negative effects on learning outcomes. For instance, some studies suggest that AR applications can distract students' attention (Kesim & Özarslan, 2012). Additional adverse factors identified include a reduction in human interaction (Huang et al., 2021) and the potential to cause health issues, such as eye disorders (Yılmaz & Batdı, 2016). Furthermore, the implementation of AR technology requires additional time for setup and usage (Gavish et al., 2015), while the financial costs associated with AR devices can be prohibitive (Alkhattabi, 2017; Bacca et al., 2014; Heintz et al., 2021; Lindergen & Johnson-Glenberg, 2013; Scrivner et al., 2016). Although AR has proven effective in certain contexts, it may not be uniformly benefit all dimensions of learning. Additionally, its application may pose challenges in crowded classrooms, potentially necessitating more instructional time than traditional methods (Akçayır & Akçayır, 2017). Moreover, augmented reality (AR) technology can be complex and costly, presenting a significant obstacle to its widespread implementation in educational settings (Alzahrani, 2020). Frequent technical issues, such as connectivity problems and software malfunctions, can disrupt the learning process and diminish the effectiveness of AR tools (Akçay, 2017; Titchiev et al., 2023). Additionally, some educators may resist adopting new technologies due to a lack of experience or training, which can impede the effective integration of AR (Alzahrani, 2020; Klivak, 2024).

CONCLUSION

This study makes a significant contribution to the existing body of knowledge by systematically synthesizing qualitative findings on the use of augmented reality (AR) in English language teaching through a meta-thematic analysis. While previous studies have largely focused on isolated implementations or specific outcomes, this study offers a holistic perspective by identifying recurring themes across diverse educational levels, including early childhood, primary, secondary, and EFL contexts. The findings extend the literature by demonstrating how AR fosters not only vocabulary acquisition and language development but also supports emotional engagement, learner autonomy and interactive participation – dimensions that are often overlooked in technology- integrated language instruction.

Moreover, the study brings critical attention to the affective outcomes of AR, such as increased enthusiasm, enjoyment, motivation and a sense of accomplishment, which play a vital role in sustaining long-term learning engagement. These insights enrich the discourse surrounding affective learning theories within digital environments. Additionally, by identifying the practical challenges associated with AR - such as time constraints, technological limitations and classroom management issues- this study highlights the need for strategic planning and teacher training in the effective integration of AR into language curricula.

From an interdisciplinary perspective, the study bridges educational technology, instructional design and language pedagogy, offering empirically grounded recommendations for researchers, educators and policymakers. It provides a valuable evidence base for future research aiming to explore the sustainable and pedagogically sound integration of immersive technologies into formal education. Ultimately, this study not only consolidates existing findings but also opens new avenues for inquiry into the role of AR in shaping both cognitive and affective dimensions of language learning.

THE IMPLICATIONS FOR FURTHER RESEARCH

The findings of this study present several avenues for further scholarly exploration into the use of augmented reality in English language teaching. Firstly, while the current meta-thematic analysis offers a comprehensive understanding of AR's affective and instructional contributions,

future research should employ experimental or quasi-experimental design to establish causal links between AR integration and learning outcomes, such as vocabulary retention, language proficiency, and long-term academic achievement.

There is a growing need to investigate the differential impact of AR on learners with diverse characteristics, including age, gender, learning styles, socio-economic background, and prior digital literacy. Such studies would provide a nuanced understanding of how AR can be personalized to meet individual learners' needs and optimize learning experiences across various contexts.

Future research should examine the pedagogical strategies and classroom management techniques that best support the effective use of AR technologies. This includes exploring how AR can be integrated with other instructional models- such as flipped classrooms, project-based learning, or gamification- to enhance student engagement and learning performance.

Longitudinal studies are needed to assess the sustainability of AR's educational benefits over time. These studies could explore how continuous exposure to AR applications affects learner motivation, autonomy, and knowledge transfer in real-world language use.

Finally, interdisciplinary collaborations involving instructional designers, educational technologists, linguists, and cognitive scientists are essential to advance theory- driven models for the integration of AR in language education. Such collaborations can contribute to the development of robust, evidence-based frameworks that guide future implementations and policy development in technology-enhanced language learning.

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