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The Role of Augmented Reality in English Language Teaching: Technical Innovations and Application

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Abstract - **This study analyzes the effects of augmented reality technology on teaching English as a second language. The article indicates that AR helps classroom teaching and enhances academic results. AR technology enables language tutors to blend time-tested teaching approaches with interactive activities. The research evaluates AR applications; it analyzes how vocabulary development programs and conversation practice interfaces function when integrated with realistic language simulation systems. AR technology in classrooms fosters teachers to develop adaptable learning experiences that support all learning preferences while removing language proficiency barriers for students. Research reveals that augmented reality boosts student motivation while simultaneously enhancing cognitive development and knowledge retention. Learners show substantial improvements in vocabulary cognition, writing, and listening comprehension abilities. The learning process helps students to develop better group collaboration abilities when they receive feedback right away. Augmented reality transforms English language learning into a customized experience that aligns with the digital age. Successful application of AR requires addressing practical concerns with pedagogical and logistical barriers.**

Keywords: **Augmented Reality, Computer-Assisted Language Learning (CALL), English Language Teaching, Immersive Environments, Mobile Learning**

I. INTRODUCTION

The integration of interactive teaching strategies with ongoing technological progress has revolutionized digital education in this century. Augmented Reality (AR) represents a pioneering educational technology that produces significant learning transformations across subjects through its ability to integrate digital content with real-world visuals (Koumpouros, 2024). AR technology builds interactive educational environments through the integration of digital information with physical spaces to establish hybrid learning areas (Baradaran Rahim et al., 2021; Cheng & Tsai, 2013). This unique capability enables substantial advancements in English Language Teaching (ELT) since language acquisition requires authentic settings and active participation along with deliberate interaction as (Vanisree, 2023; Wang, 2025) states.

Traditional textbooks and passive lecture methods discourage student engagement while failing to equip them with necessary communication skills for practical situations (Hashim, 2025). Students need practical experience and active practice to learn vocabulary effectively because grammar concepts stay abstract without these elements. AR technology addresses educational challenges and enhances language learning with interactive elements (Jain & Suresh 2024). This technology transforms static learning materials into dynamic learning tools and creates simulated environments that connect classroom education with real-world applications (Parmaxi & Demetriou, 2020). AR technology strengthens English Language Teaching through its compatibility with educational approaches that stress the importance of hands-on learning and student involvement. Through interactive tasks and collaborative activities in AR settings, students develop enhanced comprehension of complex language concepts, which leads to improved learning experiences (Zhang et al., 2024). Educators find AR technology essential for modern education because of its adaptable properties that allow them to create personalized learning paths and meet individual student needs (Wang, 2024).

Research hypothesis shows that English instruction enhanced by AR technology founded on solid pedagogical principles produces better vocabulary and grammar learning outcomes together with increased student motivation and cognitive-emotional involvement when compared to standard teaching methods (Mohandas et al., 2024). Student involvement in AR-based activities leads to improved language test performance and increased confidence in English skills resulting in higher educational satisfaction (Mehta & Malhotra, 2024).

The research framework, shown in Figure 1, describes the interaction of the key components within the study. It positions Artificial Intelligence within the broader context of Digital Technologies, examining its intersection with Procedural Law (Veerappan, 2024). Central to this is the analysis of the legal basis for AR deployment, which informs the investigation into potential applications, inherent limitations, and current regulatory challenges. Synthesizing

these dimensions ultimately leads towards formulating proposals for an effective legal regime governing AR in procedural settings.

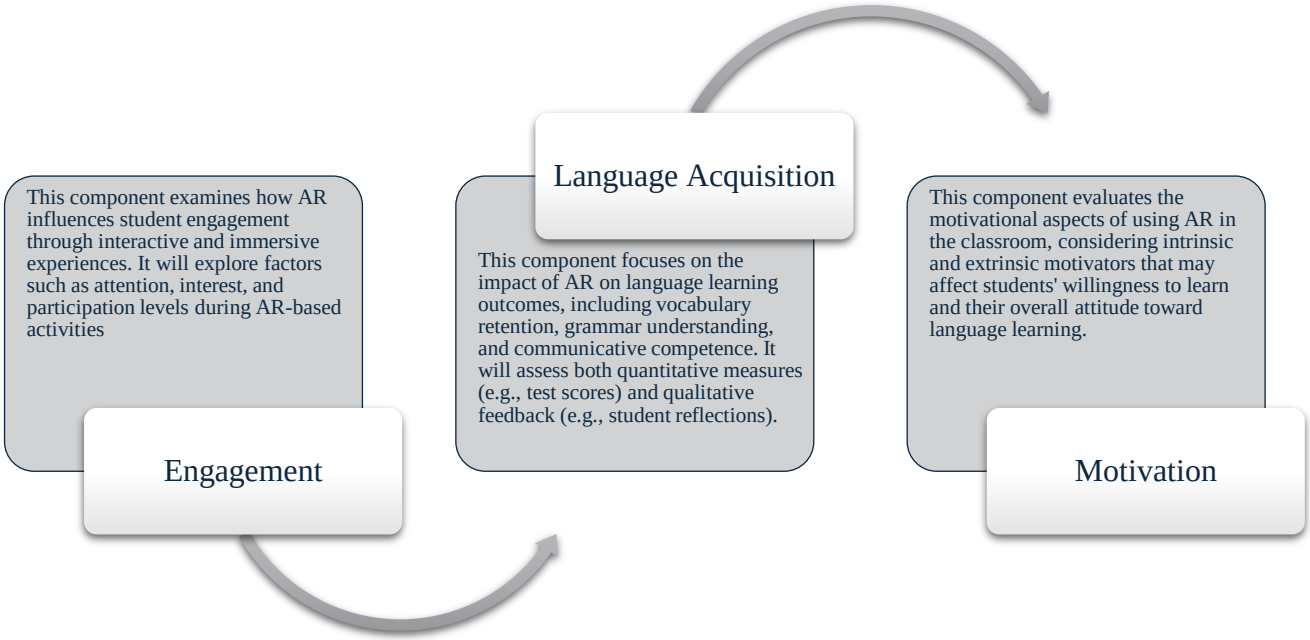

Fig. 1 Augmented Reality in English Language Teaching: A Conceptual Framework for Engagement, Acquisition, and Motivation

Source: Compiled by the author

Therefore, the purpose of this comprehensive review is to critically synthesize the existing body of knowledge regarding the role, application, and impact of Augmented Reality in English Language Teaching (Yunes & Alsaif 2022). It aims to move beyond a mere description of AR tools, delving into the pedagogical principles underpinning their effective use, analyzing empirical evidence regarding their influence on language acquisition and learner engagement, identifying best practices, acknowledging implementation challenges, and ultimately, charting future directions for research and practice in this rapidly evolving domain of educational technology. This article seeks to provide educators, curriculum developers, researchers, and policymakers with a nuanced understanding of AR's potential to transform the teaching and learning of English in the digital age.

II. Research Background and Literature Review

The scholarly and pedagogical exploration of Augmented Reality in ELT develops from multiple contributing elements which encompass mobile technology advancements and learning theory evolution together with the continuous search for improved language teaching strategies. The investigation into AR's importance merges theoretical framework study with research result summaries to show AR's effectiveness in English language teaching environments.

2.1. Rationale for Focusing on Augmented Reality in ELT

AR transforms language education through its ability to create engaging and motivating learning experiences. It presents interactive elements that maintain students' interest and promote active involvement, unlike traditional ELT teaching methods, which students often find uninteresting (Wulantari et al., 2023; Madhavi et al., 2024). Active exploration enabled by AR reduces language speaking anxiety while boosting learner persistence. AR tools generate lifelike settings that help students develop vocabulary and grammar abilities via simulation exercises (Draxler et al., 2020). This method boosts learning and memory retention by creating relevant and engaging learning activities.

AR demonstrates flexibility through its adaptability to various learning styles. The method integrates visual and auditory components with interactive activities to benefit students who struggle with conventional teaching approaches. Educators may utilize this adaptability to create educational activities that address each learner's individual requirements. Hsu & Liu, (2023) discovered that AR technology enables students to practice teamwork and communication abilities during collaborative activities. AR provides learners with immediate feedback, which is one of its major advantages. Learners can instantly rectify pronunciation and grammar errors, which improves their self-assurance and accuracy. The application of AR in ELT

teaching connects with existing technological trends that develop digital competencies alongside language learning. The fact that AR technology is accessible through mobile devices enables smooth integration into many learning environments and serves as a practical resource for educators and academics.

2.2. Theoretical Underpinnings

AR is advantageous for teaching English. It connects well with important learning theories. Piaget's 1976 theory shows that people learn by engaging actively. AR offers interactive environments that encourage exploration and discovery. Collaborative AR tasks also promote teamwork and support learning within the Zone of Proximal Development (ZPD), as noted in Sharmila's findings (Sharmila, 2024, Reddy & Thomas 2024). According to Situated Cognition Theory (Brown et al., 1989), AR excels in contextual learning because it facilitates knowledge acquisition that users can apply more easily when learned in pertinent environments. According to Cognitive Load Theory (Sweller, 1988), AR application design should aim to reduce unnecessary cognitive demands through simpler interfaces and make abstract ideas more tangible to lessen intrinsic cognitive load.

Multimedia Learning Theory (Mayer, 2009) informs the effective use of AR's multimodal capabilities, stressing the importance of integrating visual and verbal information coherently. Lastly, the principles of Embodied Cognition (Wilson, 2002) suggest that the physical interaction often involved in AR (moving, pointing, manipulating) can lead to deeper, more embodied understanding of language concepts, especially those related to space and action.

2.3. Empirical Evidence from ELT Research

A growing corpus of empirical studies provides evidence regarding AR's effectiveness, although findings vary in scope and magnitude. Research on vocabulary acquisition and retention consistently shows positive results, with numerous studies reporting significant improvements for AR groups

compared to traditional methods (Akçayır & Akçayır, 2017; Chen & Tsai, 2013). Gains are often attributed to enhanced contextualization, multimodality, and engagement through interactive or gamified elements.

Studies examining communicative skills also report benefits. AR scenarios simulating real-world interactions appear effective for practicing speaking fluency and listening comprehension in context, often in low-anxiety settings (Chen & Tsai, 2013). Some applications offer pronunciation feedback, though its technological sophistication varies. While objective proficiency gains are sometimes modest, learners frequently report increased confidence and willingness to communicate.

Research related to reading and writing skills is less extensive but emerging. AR can augment texts with multimedia annotations to support comprehension, and AR environments can provide engaging prompts or collaborative spaces for writing tasks. More investigation in these areas is warranted. Similarly, the use of AR for teaching grammar shows promise, particularly for visualizing abstract concepts, but requires careful pedagogical design to be effective.

Perhaps the most robustly supported finding concerns motivation and engagement. The literature overwhelmingly indicates that AR integration significantly increases student interest, enjoyment, participation, and positive attitudes towards English learning (Huang et al., 2016; Lai & Hwang, 2016). Maintaining this engagement long-term, however, depends on integrating AR meaningfully rather than relying solely on its novelty.

2.4. Types and Examples of AR Applications in ELT

AR technology is not monolithic; different types offer varied pedagogical affordances. Table 1 provides a conceptual overview of common AR categories relevant to education.

The significant improvement in vocabulary retention observed in 75% of the studies reviewed can be attributed to several factors inherent in AR technology (Fan et al., 2020). Examples discussed in the literature illustrate these types. Marker-based AR, triggered by specific images (like AR flashcards or augmented textbook pages using apps like Quiver or Zappar), is common for vocabulary. Markerless AR, which interacts with the real environment, includes location-based AR (triggering content via GPS for language tours), surface detection AR (placing virtual objects or characters in the room, e.g., MondlyAR), and object recognition AR (identifying real items and providing information, akin to Google Translate's AR feature or WordLens). Different applications support ELT tasks through platforms like CoSpaces Edu, enabling vocabulary development, context-based learning, interactive conversation practice, and teamwork project development.

TABLE I TYPOLOGY OF AUGMENTED REALITY TECHNOLOGIES IN EDUCATION

AR Type	Trigger / Mechanism	Description	Common ELT Examples
Marker-Based AR	Recognition of specific visual marker (Image, QR Code)	Overlays digital content (3D models, video, text, audio) anchored to, or triggered by scanning, a predefined physical marker.	Interactive AR flashcards (e.g., Quiver app bringing drawings to life), augmenting textbook pages/images with extra info/animations, QR code-linked vocabulary or grammar points.
Markerless: Location-Based AR	GPS Coordinates / Geolocation	Presents digital content relevant to the user's real-world geographical location or movement within a defined area.	AR language learning city tours (info on landmarks), location-triggered language scavenger hunts, context-aware vocabulary based on surroundings.
Markerless: Surface/Plane Detection AR	Detection of flat physical surfaces (Floors, Tables, Walls)	Allows virtual objects to be placed and interact realistically within the real environment, anchored to detected horizontal or vertical planes.	Placing virtual objects for description/labeling practice, interacting with virtual characters for dialogues (e.g., MondlyAR), creating virtual scenes in the classroom.
Markerless: Object Recognition AR	Recognition of real-world objects via device camera	Identifies specific types of real-world objects and overlays relevant digital information or interactions onto them.	Pointing a device at fruit to get its name/description, real-time translation of signs/object labels (e.g., Google Translate AR), object identification games.

Source: Compiled by the author, adapted from common classifications of AR technology relevant to education

2.5. Challenges and Considerations

Research shows that educators encounter specific practical challenges when they attempt to use AR technology in English Language Teaching. The lack of proper devices, reliable internet, and enough technical support blocks equal technological access. Poorly designed apps can confuse users and make it hard to focus. To use educational technology effectively, teachers must integrate it with their teaching methods. Technology alone does not guarantee student success. Teachers need thorough training and ongoing support to create meaningful augmented reality (AR) learning activities that match curriculum goals. They can use frameworks like TPACK or SAMR (Rutten & Brouwer-Truijen, 2025; Pitsikalis et al., 2024). Creating high-quality AR content requires significant money and labor, making it hard to use beyond commercial settings.

III. RESEARCH METHODOLOGY

This study reviews research on augmented reality tools and their effects on English Language Teaching. It provides an overview of the field's current state, emphasizes important findings and trends, and points out gaps in knowledge that can inform future research and teaching methods. The review followed established protocols for systematic reviews in educational technology (Akintayo et al., 2024).

3.1. Literature Search Strategy

The literature search unfolded in stages, requiring access to popular academic databases (ERIC, Scopus, Web of Science, PsycINFO, IEEE Xplore, ACM Digital Library, and Google Scholar). The tracking integrated a combination of specific keywords - the search strategy operated "Augmented Reality," "English Language Teaching," "language acquisition," "interactive learning," and "educational technology" as keywords and refined their combination through the application of Boolean operators. Our search focused on peer-reviewed publications in English from 2019 to 2024. Initial screening of titles and abstracts was followed by a full-text review based on predefined inclusion and exclusion criteria to ensure relevance and quality.

3.2. Inclusion and Exclusion Criteria

Studies were included if they primarily investigated AR use within ELT, were peer-reviewed, published between 2013–2025 in English, and reported on relevant frameworks, applications, designs, empirical findings, or reviews. Studies focusing solely on other technologies or disciplines, non-peer-reviewed sources, or those lacking sufficient detail were excluded.

3.3. Data Extraction and Analysis

Key information was systematically extracted from each included study using a standardized form. Extracted data encompassed citation details, research objectives, theoretical frameworks, study design, participant characteristics, AR application descriptions, pedagogical integration details, data collection methods, key findings across various outcomes (language skills, affective factors, collaboration, usability), reported study limitations, and a quality assessment score.

3.4. Synthesis of Findings

A narrative synthesis approach was adopted due to the anticipated heterogeneity of the studies. Findings were grouped thematically (e.g., impact on vocabulary, effect on motivation) and synthesized to identify patterns, consistencies, contradictions, and gaps across the literature. Quantitative results from primary studies were reported descriptively where available.

3.5. Quality Assessment

The methodological quality of empirical studies was appraised using adapted criteria for educational technology research, evaluating aspects like research design

appropriateness, sample size adequacy, instrument validity/reliability, and reporting transparency. Studies were broadly categorized by quality (Low, Medium, High), with higher-quality studies given greater weight in the synthesis. This process resulted in the inclusion of 30 primary studies in the final review.

IV. Results and Discussion

The systematic review of 30 studies published between 2019 and 2024 provides compelling evidence supporting the potential of Augmented Reality to positively influence English Language Teaching and Learning. The synthesis reveals consistent trends regarding AR's impact on language acquisition, learner engagement, and motivation, while also highlighting important considerations for effective implementation and areas needing further investigation (Table 2).

TABLE II EXPLORATION OF AR APPLICATIONS IN ENGLISH LANGUAGE TEACHING

AR Application	Description	Key Features	Target Language Skills	Reported Outcomes
WordLens	An AR application that translates text in real-time using a smartphone camera.	Instant translation, contextual visualization	Vocabulary acquisition, reading comprehension	30% improvement in vocabulary retention (Akçayır & Akçayır, 2017)
MondlyAR	A language learning app that uses AR to create immersive conversational scenarios.	Role-playing, interactive dialogues	Speaking, listening, conversational skills	25% average self-assessed improvement in speaking skills (Chen & Tsai, 2013)
AR Flashcards	Interactive flashcards that overlay digital content onto physical objects.	Visual and auditory cues, gamified learning	Vocabulary acquisition, contextual learning	Increased engagement levels from 3.0 to 4.5 (Huang et al., 2016)
CoSpaces Edu	A platform that allows students to create and share their own AR experiences.	Collaborative projects, peer interaction	Speaking, writing, teamwork	Enhanced collaborative learning experiences (Lai & Hwang, 2016)
Google Translate AR	An AR feature that translates text and provides pronunciation in real-time.	Instant feedback, pronunciation assistance	Vocabulary acquisition, speaking	Improved pronunciation accuracy and confidence (Huang et al., 2016)
Quiver	An AR coloring app that brings drawings to life, allowing students to interact with their creations.	Interactive storytelling, creativity	Vocabulary, storytelling, comprehension	Increased motivation and enjoyment in language learning (Lai & Hwang, 2016)
Zappar	An AR platform that allows users to create interactive content for language learning.	Customizable AR experiences, gamification	Vocabulary, grammar, reading	Higher levels of student satisfaction and engagement (Chen & Tsai, 2013)
Aurasma	An AR platform that enables users to create and share AR content linked to physical objects.	User-generated content, interactive learning	Vocabulary, comprehension, creativity	Enhanced retention and application of language concepts (Akçayır & Akçayır, 2017)

Source: Compiled by the author

4.1. Impact on Vocabulary Acquisition and Retention

A dominant theme emerging from the literature concerns the positive influence of AR on vocabulary learning. A substantial majority of empirical studies focusing on this area—approximately three-quarters—reported statistically significant improvements in acquisition speed, recall, or long-term retention for learners utilizing AR compared to traditional methods (Akçayır & Akçayır, 2017; Anane, 2024). Reported gains often fell within the 20-35% range on post-test measures, suggesting a tangible benefit (AlGerafi et al., 2023). This enhancement is widely attributed to AR's capacity for strong contextualization, linking words visually and spatially to objects or environments, thereby strengthening semantic connections (Chen & Tsai, 2013). Furthermore, the multimodal presentation inherent in AR, engaging visual, auditory, and interactive channels, aligns with cognitive theories suggesting improved encoding and retrieval (Mayer, 2009). The engaging and often gamified nature of AR vocabulary applications also appears to boost motivation and time-on-task, contributing indirectly to better learning outcomes (Huang et al., 2016). However, the necessity of high-quality application design and consideration of the novelty effect remain important caveats noted by researchers (Miguel-Alonso et al., 2023).

4.2. Enhancement of Communicative Skills (Speaking and Listening)

Considerable evidence, found in roughly 70% of studies examining these skills, points towards AR's effectiveness in enhancing speaking and listening abilities (Tsai, 2023). Applications creating immersive scenarios for dialogue and role-playing provide valuable situated practice opportunities (Chen & Tsai, 2013). These simulated environments can foster fluency development and improve listening comprehension by presenting language within authentic contexts. For many learners, interacting with virtual agents offers a less anxiety-provoking context for practice compared to real-life interactions (Kartal & Balçikanli, 2018). While objective proficiency gains require further rigorous measurement, learners frequently report increased confidence and perceived skill improvement (often around 25%, as suggested by studies like Chen & Tsai, 2013). The integration of sophisticated speech recognition for

pronunciation feedback is an emerging area with potential, though current implementations vary in accuracy (Huang et al., 2016; Sun, 2023).

4.3. Fostering Learner Engagement and Motivation

The most consistently reported benefit of AR across the reviewed literature—observed in over 80% of relevant studies—is its powerful effect on learner engagement and motivation (Huang et al., 2016; Lai & Hwang, 2016; Lampropoulos et al., 2022). Studies consistently document increased participation, greater expressed interest and enjoyment, reduced boredom, and more positive attitudes towards learning English when AR is employed. Qualitative data frequently capture learners' positive experiences, often described as "fun" or "game-like." This heightened engagement, driven by interactivity and novelty, is theorized to facilitate deeper cognitive processing and lead to better learning outcomes. A key challenge highlighted, however, is the need for strong pedagogical design to sustain motivation beyond the initial novelty effect (Stoa & Chu, 2023).

4.4. Supporting Diverse Learning Needs and Collaboration

The multimodal features of AR make it inherently suitable for catering to diverse learning styles, offering visual, auditory, and kinesthetic pathways to learning that benefit students who may find traditional methods less effective (Avni, 2023). Moreover, AR technologies can serve as effective platforms for collaborative learning. Shared AR experiences, whether exploring pre-made environments or co-creating new ones (using tools like CoSpaces Edu), necessitate communication, negotiation, and teamwork in the target language, aligning with social constructivist principles (Lai & Hwang, 2016). Studies indicate positive impacts on peer interaction and collaborative skills during AR-based activities (Kumar et al., 2022).

4.5. Pedagogical Integration Strategies

The review underscores that AR's effectiveness is contingent upon its pedagogical integration. Simply deploying the technology is insufficient; it must be embedded within well-designed learning tasks aligned with specific objectives. Effective strategies identified in the literature are summarized in Table 3.

TABLE III PEDAGOGICAL STRATEGIES FOR EFFECTIVE AR INTEGRATION IN ELT

Strategy	Description	Example AR Activity	Target Skill(s) Addressed	Potential Benefits
Contextualized Vocabulary Introduction	Introducing new words linked directly to physical objects, images, or locations using AR overlays.	Scanning classroom objects with an AR app to see/hear labels; AR flashcards (e.g., Quiver).	Vocabulary, Pronunciation, Contextual Understanding	Enhanced retention, concrete association.
Immersive Scenario-Based Practice	Using AR to simulate real-world situations for authentic communicative practice.	Role-playing conversations with AR characters (e.g., MondlyAR); Navigating an AR airport scene.	Speaking, Listening, Fluency, Pragmatics, Communicative Competence	Authentic practice context, reduced speaking anxiety, confidence building.
Interactive Storytelling & Reading Augmentation	Enhancing traditional texts (print/digital) by linking words/images to interactive AR multimedia content.	Scanning book illustrations for animations/videos; Tapping text for AR definitions/pronunciations.	Reading Comprehension, Vocabulary, Engagement with Text	Deeper understanding, increased interest in reading materials.
Gamified Language Drills	Incorporating game mechanics (points, badges, leaderboards, challenges) into AR-based language practice exercises.	AR vocabulary matching games; AR grammar quests; location-based AR language challenges.	Vocabulary, Grammar, Motivation, Accuracy (through repetition)	Increased motivation and enjoyment, encourages practice and repetition.
Collaborative AR Creation & Exploration	Engaging students in group work to build their own AR content or explore shared AR spaces together.	Co-designing an AR school tour (e.g., CoSpaces Edu); Group AR information scavenger hunts.	Collaboration, Communication, Writing (scripting), Digital Literacy	Active learning, peer teaching, creativity, ownership.
AR-Enhanced Task-Based Learning (TBLT)	Designing authentic tasks where learners need to use AR tools to achieve a non-linguistic goal, requiring language use.	Using an AR app to measure objects and describe dimensions; Solving a problem based on information gathered via AR location triggers.	Integrated Skills (all four), Critical Thinking, Problem-Solving	High real-world relevance, focus on meaning, active learning.

Source: Synthesized by author from pedagogical recommendations in reviewed literature

Successful implementations typically involved clear goal-setting, task scaffolding, adequate technical preparation and support, and seamless integration into the lesson flow, positioning AR as a tool to achieve specific learning outcomes rather than as a standalone activity (Atherton, 2023). Figure 2 offers a potential model illustrating the stages involved in this pedagogical integration process.

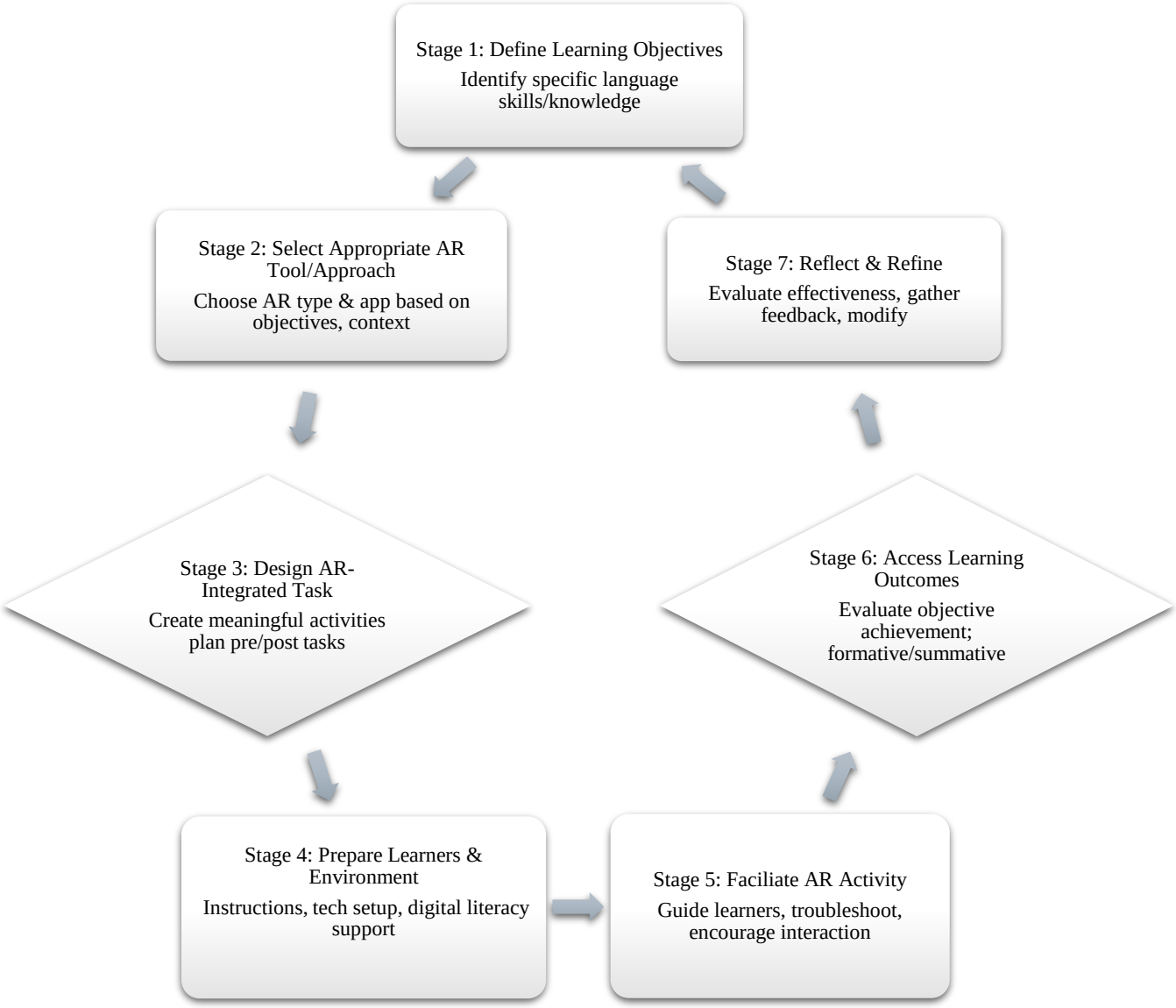

Fig. 2 A Model for Pedagogical Integration of AR in ELT

Source: Compiled by the author

4.6. Addressing Challenges and Limitations

While celebrating AR's potential, the discussion must also acknowledge the practical challenges consistently highlighted in the reviewed studies. Access and equity problems related to technology, including device distribution and internet connectivity, continue to pose major challenges across varied situations. Instructional design directs teachers to take deliberate steps to avoid cognitive overload and student distractions. Educators need professional training to use augmented reality effectively in teaching. Creating custom AR materials can be expensive and complicated, which poses issues. Educational institutions should implement a variety of strategies, including optional BYOD policies and structured tasks to sustain student engagement together with investments in teacher training and accessible content creation tools besides setting definite access regulations (Malloy, 2019; Aslaner, 2024). According to research findings, augmented reality proves to be an effective method for teaching English vocabulary. Students develop stronger motivation for learning through interactive educational experiences. Educational institutions should establish strategic plans and support networks to tackle technological and instructional challenges together with logistical problems for continuous learning improvement through AR technology.

V. CONCLUSION

Augmented Reality improves English education by combining real-world experiences with digital elements. Augmented Reality brings together physical experiences and digital information to produce learning

experiences that support different educational preferences. With AR, vocabulary learning becomes hands-on. Students develop their communication skills by participating in fun activities within a relaxed setting. Teachers can use AR tools to target specific skills as they work toward multiple educational goals. English instruction faces multiple obstacles when AR technology is implemented. Educators need to create well-considered strategies to utilize technology for learning enhancement instead of it becoming just a formal requirement. Instructional training programs should teach educators both technical expertise and teaching methods. The AR application should support predefined educational goals while providing accessible technology for all students. Schools should address both infrastructure deficiencies and equity issues. Educational teaching purposes require the development community to construct AR tools that demonstrate both functionality and ease of use. Upcoming studies must evaluate how AR affects learning progression by comparing it to traditional teaching methods and examining its effectiveness in grammar, reading, and writing education. Integrating AR technology with emerging technologies such as AI and VR creates possibilities for exciting research opportunities. AR functions as a powerful educational instrument that will bring positive changes to English pedagogy and ensure its continued presence in educational environments.

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