The Impact of Mobile Augmented Reality Applications on Improving EFL Composition Skills of Early Childhood Education Students and their Engagement

A Research paper by:

Dr. Samah Rizk R. Al-Refaey

Associate Prof., Curriculum& Instruction (TEFL),

Faculty of Education,

Mansoura University

E-mail: samahr@mans.edu.eg

2023

The Impact of Mobile Augmented Reality Applications on Improving EFL Composition Skills of Early Childhood Education Students and their Engagement

By:

Samah Rizk R. Al-Refaey

Ast. Prof., Curriculum& Instruction (TEFL), Faculty of Education, Mansoura University

E-mail: samahr@mans.edu.eg

Abstract:

The current research investigated the impact of mobile augmented reality (MAR) applications on EFL composition skills and engagement of second-year students at the Faculty of Early Childhood Education enrolled in the Teaching in English-specific program. A quasi-experimental approach was adopted using pre-post administration to two independent groups design. The study instruments included a composition skills test, an analytical rubric for scoring it, and an engagement in writing scale. Five main written composition sub-skills were specified for target participants: content and development of ideas, organization, accuracy, word choice, and mechanics. The research sample consisted of ninety second-year English-specific program female students at the Faculty of Early Childhood, Mansoura University. They were divided into two groups: an experimental group of forty- five students (n= 45) taught the proposed MAR treatment, and a control group (n = 45) taught using the conventional method. Six selected units presented with the ARLoopa application's integration within pre-, while-, and post-composition stages were taught to students throughout ten sessions. Results revealed that the mobile AR applications greatly enhanced students' EFL written composition skills and engagement in writing, as there were statistically significant differences between the experimental and control group students' mean scores on the pre- and post- administrations of the research instruments. Finally, recommendations and suggestions for further

research were proposed, providing practical insights for educators, researchers, and policymakers in the field of education and language learning.

Key Words: Mobile Augmented Reality, EFL written composition skills, Engagement, Early childhood Education.

أثر تطبيقات الواقع المُعزز باستخدام الهاتف النقَّال على تحسين مهارات التعبير الكتابي باللغة الإنجليزيَّة لدى طالبات كلية التربية للطفولة المبكرة وانخراطهنَّ فيها

ا.م.د/ سماح رزق رمضان الرفاعي

قسم المناهج وطرق التدريس ـ كلية التربية ـ جامعة المنصورة

مستخلص البحث

تناول البحث الحالي أثر استخدام تطبيقات الواقع المُعزز باستخدام الهاتف النقَّال لتحسين مهارات التعبير الكتابي باللغة الإنجليزيَّة والانخراط فيها لدى طالبات الفرقة الثانية بكلية التربية للطفولة المبكرة والملتحقات ببرنامج التدريس باللغة الإنجليزيَّة. تمَّ تبني المدخل شبه التجريبي ذي التصميم القبلي– البعدي باستخدام مجموعتين مستقلتين. شملت أدوات الدراسة اختبار مهارات التعبير الكتابي مصحوبًا بمقياس أداء متدرج لتصحيحه، وكذلك مقياس الانخراط في الكتابة. تمَّ تحديد خمس مهارات أساسيَّة للتعبير الكتابي للعينة المستهدفة وهي كالتالي: المحتوى، وتنمية الأفكار، التنظيم، الدقة النحويَّة، اختيار المفردات، وفنيات الضبط الكتابي. تكوَّنت عينة البحث من تسعين طالبة بالفرقة الثانية ببرنامج التدريس باللغة الإنجليزيَّة بكلية التربية للطفولة المبكرة بجامعة المنصورة. تمَّ تقسيمهنَّ إلى مجموعتين؛ إحداهما تجريبيَّة (ن= ٤٥) تمَّ التدريس لهنَّ باستخدام تطبيق الواقع المُعزز، والأخرى ضابطة (ن= ٤٥) تمَّ التدريس لهنَّ باستخدام الطريقة المعتادة. تمَّ تقديم المحتوى الخاص بست وحدات في الكتابة باستخدام تطبيق ARloopa للواقع المُعزز الذي تمَّ دمجه من خلال أنشطة مراحل قبل وأثناء وبعد الكتابة، وذلك على مدى عشر جلسات تدريبيَّة. أوضحت النتائج أن المعالجة القائمة على استخدام تطبيق الواقع المُعزز على الهاتف النقَّال كان لها أثرٌ كبيرٌ على تحسين مهارات التعبير الكتابي باللغة الإنجليزيَّة والانخراط فيها؛ حيث كانت هناك فروقٌ دالة إحصائيًّا بين متوسطات درجات طالبات المجموعتين التجريبيَّة والضَّابطة في كل من التطبيقين القبلي والبعدي لأدوات البحث. وأخيرًا، تمَّ اقتراح عدد من التوصيات والمقترحات لبحوث مستقبليَّة.

الكلمات الدالة: تطبيقات الواقع المُعزز على الهاتف النقَّال، مهارات التعبير الكتابي باللغة الإنجليزيَّة، الانخراط في الكتابة، كلية التربية للطفولة المبكرة.

Introduction:

English serves a crucial function in global communication as an international language. Acquiring proficient English composition abilities is essential for effective daily communication and professional relationships. Owing to ongoing technological breakthroughs, textual communication is gaining paramount significance in education, business, and various other sectors worldwide. This ability necessitates robust verbal proficiency and additional capabilities, including critical thinking, leading to the perception that it is more difficult to acquire than other competencies (Santanatanon & Chinokul, 2022). English writing serves as a significant mode of language output, facilitating the expression of emotions, beliefs, and ideas, while also reflecting learners' proficiency in comprehensive language use. Students' proficiency in English written composition skills is evidenced at both the micro level, including vocabulary, grammar, and sentence structure, and at the macro level, encompassing text organization, logical reasoning, and argumentation. Consequently, composing in a foreign language presents significant challenges for beginning language learners.

While composition is a crucial skill for successfully communicating new ideas and concepts, writing in a foreign language poses significant obstacles for many language learners. Numerous studies have highlighted the primary difficulties faced by EFL university students. These include apprehension about receiving corrections from instructors (Saud, Jufri, Rahman & Salam, 2014), struggles with planning, drafting, revising, and assessing their work, as well as challenges in creating coherent and well-structured texts free of errors (Abd-Alfatah, 2013; El-Bassuony, 2017). These challenges always lead to students' disengagement in composition activities and many other problems.

EFL students often struggle with formulating and organizing ideas, choosing suitable vocabulary, and expressing these thoughts clearly and cohesively in written texts (Richard & Renandya, 2002). The challenges arise because English in the EFL context is regarded as a mandatory subject primarily for examination purposes rather than as a means of communication. Additionally, many educators emphasize equipping students with extensive vocabulary pertinent to specific topics and offering guiding questions to assist them in organizing their thoughts into coherent paragraphs. Thus, instruction in composition primarily aids students in generating texts that are free of errors and adhere to established language models. Conversely, it fails to assist EFL students in understanding and mastering essential features such as audience, purpose, context, and linguistic conventions of text, which are critical components of any text type.

Wang (2005) asserts that composition poses a challenge for numerous educators as well. They allocate considerable time to rectifying students' compositions. Despite teachers' efforts, students' compositions continue to be subpar, grammatically flawed, and lacking in variety and sentence structure use. The underlying cause of this issue is the lack of learner engagement in their educational process. Furthermore, the ever-evolving nature of technology and digital tools presents its challenges. Given the continuous evolution of educational platforms and applications, educators must refine their instructional approaches to stay aligned with the latest trends and best practices. Students can better conquer their composition challenges when they learn through an enjoyable process that stimulates all their senses (Rostami & Hoveidi, 2014; Saud, Jufri, Rahman & Salam, 2014).

Educational research increasingly focuses on student engagement (Lee et al., 2021). This focus demonstrates a burgeoning comprehension of the significance of student

engagement and its beneficial influence on motivation and academic performance (Guthrie et al., 2012). Although educational research emphasizes engagement, it is seldom investigated in written form (Ives et al., 2022). Writing engagement is regarded as an essential component of the writing process, as it is necessary at every stage of the writing process, during which students plan, revise, and modify their work (Graham et al., 2018).

Engagement often represents the degree of a student's active participation in a learning activity. It is a comprehensive term that encompasses students' levels of attention, curiosity, interest, readiness to utilize their language competence, and a range of learning skills to achieve advancement. Engagement is essential in writing and language learning, as it is necessary at every phase of the writing process, including planning, revising, and editing (Reeve, 2012; Philp& Duchesne, 2016). The learner involvement theory was formulated by Alexander Astin in 1984. Subsequently, it was renamed the "Engagement Theory," which defines engagement as "the extent of physical and psychological energy that the student invests in the academic experience." This theory asserts that a more successful student possesses higher engagement, which correlates with improved learning outcomes (Astin, 1993, p. 297; cited in Akbari, Naderi, Simons& Pilot, 2016).

Researchers often regard engagement in learning as a meta-construct that includes several dimensions related to a person's dedication to learning (Appleton et al., 2008; Fredricks et al., 2004; Jimerson et al., 2003). Despite this, the exact quantity and features of these dimensions remain a subject of debate. Some scholars adopt a three-dimensional framework, dividing it into affective, behavioral, and cognitive components (Fredricks et al., 2004; Jimerson et al., 2003; Lam et al., 2012), while others expand this model to four dimensions by including a social element (Appleton et al., 2006).

Affective writing engagement involves the interest and enjoyment students experience while writing, while behavioral writing engagement encompasses their participation, effort, and persistence. Cognitive writing engagement focuses on strategy use and self-regulation, and social writing engagement is related to the degree of collaboration and interaction among students during the writing process (Alexander, 2018; Fredricks et al., 2004; Guthrie et al., 2012; Lee et al., 2021; Parsons et al., 2018). This interpretation is consistent with the view of writing engagement as advocated by current theories that emphasize the social nature of writing and learning (Graham & Harris, 2013; Ives et al., 2022). Moreover, the tremendous advancement of social media platforms has provided young individuals with numerous avenues for written expression, each with its inherent restrictions and advantages, which have contributed to developing a writer's skills and personality (Elf, 2016).

Effective instruction significantly affects writing engagement (Graham, 2019). Effective writing instruction enhances students' ability to express themselves clearly, creatively, and persuasively, thus enabling writing engagement and promoting writing performance. However, educators encounter new challenges in engaging students and developing their written composition skills owing to the speedy progression of technology and the spread of digital communication tools. While still valuable, traditional methods of teaching composition may not be enough to capture the attention and meet the needs of today's digitally native learners.

The integration of information technology in education has resulted in substantial modifications in learning and instruction. Mobile learning (M-learning) has transformed the conventional paradigm, enabling students to benefit from educational resources from any location via virtual classrooms and online instructional platforms. Digital learning tools, like e-books and interactive

software, enhance the potential for new and engaging learning experiences. Consequently, Safar, Al-Jafar, and Al-Yousefi (2017) asserted that educational institutions must adapt to rapid information and communication technology (ICT) advancements. It is essential to devise instructional tools that align with a technologically sophisticated culture, as these methods enhance the productivity of both educators and students. Moreover, the swift advancement of AR technology has rendered it applicable to other disciplines. It also facilitates essential educational objectives and fosters creativity in educational endeavors. Since the release of Pokémon Go, the most famous location-based AR game, augmented reality has received substantial interest in education and language acquisition. AR technology undoubtedly represents the educational technology of the future.

Augmented reality (AR) techniques had only recently emerged, and AR applications were restricted to the use of bulky devices, including head-mounted displays or a comprehensive suite of peripheral devices, several years ago. Recently, augmented reality (AR) devices and software development tools have advanced and developed into adaptable due to the progression of information technology, allowing even smartphones and tablets equipped with cameras to facilitate AR interactions (Chen et al., 2013). Augmented reality approaches integrate components of the physical setting with computer-generated virtual visuals, offering dynamic visualizations and interactive simulations alongside 2D material (Specht et al., 2011). Researchers have indicated that mobile-based augmented reality applications in education are more successful than traditional textbooks (Bitter & Corral, 2014) and enhance learners' motivation.

Augmented Reality (AR) has historically been linked to Virtual Reality (VR) within a mixed reality continuum. Augmented reality integrates real-world elements to provide digital information,

amplifying the immersive experience for users. A standard definition of Virtual reality (VR) is "an artificial environment generated by a computer system that simulates a real situation" (Fernández, 2017, p. 2). Virtual reality (VR) offers a wholly simulated experience, while augmented reality (AR) aligns more with the actual setting. AR interaction is characterized by real-time interactivity, the inclusion of both static and dynamic content, the blending of physical and virtual spaces, and the provision of 3D imagery (Rice, 2007).

Augmented Reality (AR) holds significant importance in educational settings. It integrates the physical and digital realms, facilitating immersive and interactive learning experiences for students. In the educational realm, augmented reality aids in visualizing abstract concepts by enabling students to view them within real-world environments. This technology supports interactive simulations, letting students experiment without the risks of physical harm. Location-based learning through AR allows the exploration of historical sites or geographic locations directly from the classroom. In addition to providing valuable skills training, AR encourages both collaborative and personalized approaches to learning. Augmented reality enhances motivation, enjoyment, and inclusiveness in learning by improving educational accessibility. This technology offers improved assessment and prompt feedback. Finally, integrating AR into education enhances creativity, boosts student engagement, and aligns the learning experience with contemporary demands (Wedyan et al., 2022).

Nonetheless, various concerns must be meticulously evaluated when implementing AR in education; obstacles to AR integration persist, including the practical constraints of AR applications, the level of teacher engagement and administrative backing, unfamiliarity with AR system operation, and the potential for excessive information on the AR display to produce detrimental

learning outcomes. Furthermore, the AR learning tools must also satisfy the primary educational goals for the target subject matter (Wang, 2017). Further, as far as the researcher is informed, the majority of studies conducted to explore the effectiveness of using AR applications in enhancing language-related variables focused on early educational stages, either kindergarten or elementary stages (Chen& Chan, 2019; Redondo et al., 2019; Wu, 2019; Chen, 2020; Tsai, 2020; Wen, 2020; Bin Homran& Altalhab, 2021). Thus, there is a research gap related to verifying the effectiveness of using these applications in the university stage. Thus, it is feasible to deduce that AR-based technology in language instruction is a novel research domain. Consequently, more research is required to be conducted in diverse educational settings to investigate the effects of AR technology in various dimensions and obtain more generalizable results.

Considering the importance of composition skills for today's EFL learners, the challenges they face in developing and practicing them, and their disengagement during composition activities, it becomes clear that more engaging, up-to-date techniques for teaching EFL composition skills are needed for more effective composition instruction.

Context of the problem

Faculty of Early Childhood Education students need to have a good command of verbal and written communication skills to teach the children in the preschool stage in a simple, competent and fruitful manner. Those students who are enrolled in the specific program for Teaching in English need to enhance their English language skills as they study most courses of the program in English. They study a course entitled "Composition and Conversation" in the second year of their preparation program. While the researcher was teaching them this course, she observed that their general level of English was very weak and below

expectations. They struggled to express their ideas clearly, with their composition containing numerous grammatical errors and a lack of organization. They lacked the fundamental composition sub-skills that enabled them to be competent prospective teachers.

A composition skills pilot test was prepared and distributed to students to determine their level of composition skills. A preliminary rubric was designed to score the test. The descriptive statistics of the results of the pilot study are presented in table (1) below:

Table 1: Results of the composition skills pilot study test

skill	Max. score	Mean	SD	Percentage
Content	٤	**1.77**	**0.898**	**44.25%**
Organization	٤	**1.73**	**0.785**	**43.25%**
Accuracy	٤	**1.5**	**0.805**	**37.75%**
Word choice	٤	**1.67**	**0.758**	**41.75%**
Mechanics	٤	**1.7**	**0.877**	**42.5%**
Total	**20**	**8.37**	**3.487**	**41.85%**

The results in Table (1) illustrate that second-year students at the Faculty of Early Childhood Education have observable weaknesses in their EFL composition skills that should be enhanced.

Statement of the problem:

According to the researcher's observations, the literature review, and the findings from the pilot study, the problem addressed in the current research is outlined as follows:

Second-year students in the 'Teaching in English' program have weak composition skills and experience disengagement from composition activities in general. Thus, an augmented reality application was attempted aiming to enhance composition skills and re-engage students in these activities.

Questions of the research:

The current research sought to answer the following main question:

How do mobile augmented reality applications enhance the EFL composition skills of Early Childhood Education students and their engagement in writing?

The main question was divided into the following sub-questions:

1. What are the features of a mobile augmented reality application that could be utilized to enhance composition skills and engagement of second-year early childhood education students?
2. What is the impact of mobile augmented reality applications on the composition skills of Early Childhood Education students?
3. What is the impact of mobile augmented reality applications on engagement in writing of Early Childhood Education students?

Hypotheses:

The current research verified the following hypotheses:

1. There is a significant statistical difference between the mean scores of students in the experimental and control groups on the composition skills post-test, with the experimental group outperforming the control group.
2. There is a significant statistical difference between the mean scores of the experimental group students on the pre-and post-administrations of the composition skills test favoring the post-administration.
3. There is a significant statistical difference between the mean scores of the experimental and control group

participants on the post-administration engagement in writing scale, favoring the experimental group.

4. There is a significant statistical difference between the mean scores of the experimental group participants on the pre-and post-administrations of the engagement in writing scale favoring the post-administration.
5. There is a positive correlation between the second-year students' composition skills and their engagement in writing.

Instruments and Materials:

In the current research, the researcher developed and administered the following instruments:

1. A composition skills test to assess the students' composition skills both before and after applying the proposed intervention.
2. An analytical rubric for grading the composition skills test.
3. An engagement in writing scale.
4. A teacher's manual for implementing the AR application-based treatment for improving EFL composition skills.

Purpose of the research:

The present research aimed at:

1. Identifying the impact of mobile augmented reality applications on EFL composition skills of Early Childhood Education students.
2. Identifying the effect of mobile augmented reality applications on engagement in writing of Early Childhood Education students.

Significance of the research:

The present research is anticipated to make contributions to the following:

1. Drawing the attention of EFL specialists towards the importance of integrating AR technology in teaching as a promising means of enriching instruction for better results in student learning.
2. Assisting students in enhancing their composition skills in an engaging way compatible with their interests.
3. Drawing the interest of EFL researchers towards augmented reality technologies as a promising approach for developing language skills and its suitability for the current era.
4. Enriching literature concerning the possibility of utilizing AR applications for developing language skills and engagement in learning.

Delimitations of the research:

The scope of the current research was confined to the following delimitations:

1. A sample of second-year female students at the Faculty of Early Childhood Education enrolled in the "Teaching in English" specific program.
2. Some composition skills suitable for those students, as determined by the course description, where composition skills comprised content and development of ideas, organization, accuracy, word choice, and mechanics.
3. The first semester of the academic year 2022/ 2023.
4. The ARLoopa augmented reality application.

Definition of terms:

Mobile Augmented Reality Applications

Azuma's original definition (1997, 2016) states, "AR is conventionally described as a system including three key elements: a combination of real and virtual content, the interaction in real time and the registration in 3D."

Specht et al. (2011: 119) defined AR as "a system that enhances a person's primary senses (vision, aural, and tactile) with virtual or naturally invisible information made visible by digital means."

A popular definition provided by Laine (2018: 2) identifies mobile AR as "a type of AR in which a mobile device (smartphone or tablet) displays and interacts with virtual content, such as three-dimensional (3D) models, annotations, and videos, that is overlaid on top of a real-time camera feed of the real world".

The current research adopted the definition of Laine (2018).

EFL composition skills

Nunan (2003: 88) indicated that composition or writing "is an intellectual activity of finding ideas and thinking about how to express and arrange them into a statement and paragraph that is clear to be understood by the people". This implies that student writers must demonstrate and organize their ideas into a good composition.

In addition, Brown (2001) described writing skills as "a different set of competencies that EFL learners should have, such as how to generate and organize ideas coherently, how to use discourse markers and rhetorical conventions cohesively in the composition, how to revise and edit the composition for clearer meaning, and how to produce a final product".

Composition is procedurally defined as a set of competencies that EFL learners should master to express their thoughts and feelings and communicate effectively with others. These competencies include content and idea development, organization, grammatical accuracy, word choice, and the use of mechanics.

Engagement in writing

According to Wang et al. (2017), engagement in learning can be conceptualized as "a multidimensional construct with four dimensions: behavioral, emotional, cognitive, and social."

The behavioral component encompasses students' active engagement in a task or activity, influenced by either intrinsic or extrinsic motivation. The emotional component encompasses students' good feelings regarding an activity and their Willingness to follow the teacher's instruction. The cognitive dimension encompasses learners' self-regulation skills, focus, and advanced cognitive capabilities. Students must be deliberate in their approach to activities and be prepared to invest effort to understand complicated concepts or acquire challenging skill sets. Finally, the social element refers to students' interactions, dedication, and sense of support and involvement in learning activities oriented toward academics (Bond & Bergdahl, 2022; Prior, 2006, quoted in Parsons et al., 2018; Wang et al., 2017). The elements of engagement are interconnected and mutually dependent.

Engagement in writing is operationally defined as a multi-dimensional construct representing cognitive, affective, behavioral, and social involvement in writing tasks. When students are engaged in a writing activity, they feel enjoyment and positive feelings, participate actively in the task, become thoughtful and purposeful in their approach to writing tasks, and collaborate, communicate, and actively participate with their peers throughout the writing stages for more support and constructive feedback.

Review of literature and related studies:

The following section elaborates on the main variables of the current research: EFL composition skills, engagement in writing, and mobile augmented reality.

Composition skills:

Composition skills are fundamental in language learning as they enable learners to convert the language they learned in the classroom into precise vocabulary to articulate their emotions and viewpoints through writing. Researchers propose that educators assess students' writing cognitive abilities and offer appropriate learning scaffolding to convert their internal thoughts into articulated expressions and aid them in retrieving experiences pertinent to the writing subjects. Given that the attributes of augmented reality (AR), including real-time interactivity, integration of static and dynamic content, and the fusion of real and virtual environments, have demonstrated advantages for learning, AR methodologies could be utilized to develop internal and operational factors as scaffolding, thereby allowing learners to independently plan and compose articles for self-practice (Wang, 2017).

Composition consists of various stages: planning, drafting, responding, revising, editing, reviewing, and publishing. The drafting phase might be shaped by the planning and revision stages, functioning as either the starting point of writing or its opposite. The writing process has interrelated stages that influence one another. The process commences with the planning phase, executed through several activities designed to stimulate students' interest in writing. The second stage is drafting, during which students concentrate on writing while overlooking their grammatical inaccuracies. The subsequent phase involves revision and editing, which addresses

students' work and is succeeded by assessment and publication (Saud et al., 2014).

Composition is essential for education, employment, and daily activities in technology-driven cultures. It is necessary for several communication platforms, such as tweeting, texting, and composing emails. Composition enhances learning by allowing students to visibly and permanently document, connect, analyze, personalize, and manipulate essential concepts inside a text. Despite its importance, not every student develops composition proficiency (Graham et al., 2018).

Effective composition necessitates a diverse set of skills, encompassing the capability to produce well-structured paragraphs and coherent ideas, develop pertinent content, and possess linguistic competencies such as sentence construction, grammatical accuracy, and proficiency with vocabulary. Moreover, composition necessitates language fluency and integrating various metacognitive skills to produce specific details and information essential for developing an essay topic. Instructing learners on the aspects and skills of writing is essential while offering them contextually relevant situations and authentic objectives for their writing (Troia et al., 2013; Graham, 2008; Aydin & Yildiz, 2014).

Additionally, instructing students in the composition process is essential. Writing is a multifaceted skill with several stages and processes, including prewriting, drafting, revising, and editing (Tompkins, 2010). Composition typically follows a sequential process. The process commences with prewriting, wherein students gather and develop ideas. Students compose and refine their paper multiple times during the second stage, outlining. Students engage in editing and proofreading activities. Editing entails reviewing the paper for errors in sentence structure. Proofreading entails reviewing the final version of a document for typographical or handwriting errors (Oshima & Hogue, 2007). Students are guided

throughout these stages to compose essays that demonstrate well-organized ideas within paragraphs, coherent content development, proper sentence flow, and compliance with correct conventions (Amin, 2016).

Numerous studies have explored written composition practices assisted by learning technology, whereas augmented reality techniques have been infrequently investigated. Zaini and Mazdayasna (2015) investigated the effectiveness of computer-based instruction in helping college students refine their English writing skills. The research divided participants into two groups: one employing traditional methods and the other utilizing Microsoft Word Office software for writing. The results indicated that the computer-based instruction group demonstrated higher performance levels than the alternative group, producing high-quality paragraphs. Ting (2015) employed augmented reality techniques to facilitate Chinese writing instruction for elementary school students. This study analyzed the learning outcomes associated with augmented reality versus picture-based instruction in educational contexts. The results demonstrated that both groups exhibited enhancements in their writing skills. The AR group students exhibited more favorable attitudes towards writing instruction; however, no significant differences were observed in their writing content and skills performance. Jeong (2016) used Google Docs, a cloud-based tool, to aid Korean college students in improving their English writing skills. Through the platform, students submitted their writing and received immediate feedback from teachers and peers. The study highlighted learners' positive reception of the feedback process, which facilitated active communication and promoted greater autonomy during class participation.

Engagement in Writing:

Student engagement is among the most fundamental elements of 21st Century education. The theory of learning engagement is

grounded in two prominent educational theories: John Dewey's "Learning by Doing" and Jean Piaget's Constructivism. Both promote student engagement in problem-solving and delegate the primary responsibility for learning to the learner (Inman, 2001). It entails significant engagement and exceptional effort in the learning process. It consequently serves a vital function in the process of language acquisition, as passive learners cannot master a language effectively. Research into student engagement and ways to increase it has captured the attention of educators and researchers for many years (Stroud, 2013).

Fredricks, Blumenfeld, and Paris (2004) characterized engagement as a construct with multiple dimensions comprising cognitive, behavioral, and emotional components. Engagement is identified by key attributes, including interest, effort, concentration, active participation, and emotional responsiveness. Engaged students demonstrate concentrated energy and attention and experience emotional effects from the learning process. Engagement, as defined by Skinner and Pitzer (2012), refers to "constructive, enthusiastic, willing, emotionally positive, and cognitively focused participation in learning activities at school" (p. 22).

Cognitive engagement refers to the extent of a student's commitment to the learning process. It entails being reflective, strategic and prepared to invest the requisite effort in understanding intricate concepts or acquiring challenging skills. Additionally, it requires continuous attention and cognitive effort (Helme & Clarke, 2001), frequently incorporating self-regulation strategies. A variety of indicators can be used to assess cognitive engagement, such as asking questions, building upon peer comments, sharing ideas, providing evaluative feedback, offering directions, explanations, or information, justifying arguments, using gestures and facial expressions, engaging in private speech, and participating in

exploratory discussions (Gunn & Hollingsworth, 2012; Philp& Duchesne, 2016; Henrie et al., 2015).

Behavioral engagement is commonly defined as the amount of time spent on tasks or the level of participation exhibited. Being "on-task" corresponds to behavioral engagement, encompassing participation in academic, social, or extracurricular activities. This engagement is essential for favorable academic results and decreasing dropout rates (Fredricks & McCloskey, 2012; Henrie et al., 2015).

Emotional engagement involves the intensity of both positive and negative reactions towards teachers, peers, academic endeavors, or educational establishments. Skinner, Kindermann, and Furrer (2009) define it as motivated participation in learning activities. They identified enthusiasm, interest, and enjoyment as key indicators of positive emotional engagement, while anxiety, frustration, and boredom were seen as signs of negative emotional engagement (disaffection). Emotional engagement encompasses purposefulness, autonomy, and students' perceptions of interaction or lack of interaction with their peers in the classroom (Henrie et al., 2015; Philp & Duchesne, 2016).

Philp and Duchesne (2016) argue that, despite not being part of all engagement models, the social dimension of interaction should be emphasized in language learning as a core element of engagement. This social dimension explores the connections of identification and belonging among students, their peers, and teachers (Pekrun & Linnenbrink-Garcia, 2012; Wentzel, 2012). Activities help cultivate feelings of inclusivity, belonging, purpose, socialization, and connection among peers (Eldegwy et al., 2018). Social engagement in the classroom is demonstrated through the implicit norms of cooperation and active listening, punctuality, and the maintenance of an equitable teacher-student position of power (Pekrun & Linnenbrink-Garcia, 2012; Wentzel, 2012).

Merely participating in tasks does not ensure that students gain the benefits teachers hope for. Behavioral engagement entails actively participating in class activities; generally, the more students engage, the more coursework they can complete within a set timeframe (Coates, 2005). However, a teacher cannot reliably assess the quality of students' engagement solely based on their visible actions. Additional benefits arise when students complete the assigned work (demonstrating behavioral engagement) and feel optimistic about their assignments and interactions with peers (indicating emotional engagement). Furthermore, if these same students are not only fulfilling their assignments and enjoying the process but also actively seeking different strategies to comprehend and master their coursework (showing cognitive engagement). In that case, a teacher can reliably conclude that the students are genuinely engaged in their tasks (Stroud, 2013).

Students exhibiting high engagement in learning demonstrate active participation in tasks and maintain positive emotions regarding classwork and their learning environment. They will also psychologically engage in mastering skills necessary to complete assigned tasks (Stroud, 2013). Evidence exists that correlates student engagement with favorable academic performance, and it is considered an important predictor of student achievement (Fredricks, 2013; Gunn& Hollingsworth, 2012; Kuh et al., 2007; Ladd & Dinella, 2009; Skinner & Pitzer, 2012; Smallwood & Ouimet, 2009). Engagement is a vital factor in students' academic progress. It serves as a pivotal factor in cultivating academic resources throughout the academic year and for the entirety of a student's educational journey. Nonetheless, it is also plausible that students who attain commendable academic outcomes may exhibit disengagement from learning tasks and school activities (Willms, 2003; Zyngier, 2008). The absence of agreement over the definition of student engagement underlies these contradictory findings.

Kuh (2009) asserts that student engagement encompasses significant participation and effort in the learning process. Students must access and engage with each teaching procedure. Teachers should provide engaging and motivating activities to ensure positive student engagement. Janes et al. (2000) assert that "The teacher acts as a guide facilitator. The teachers create opportunities for students to work cooperatively, solve problems, do authentic tasks, and construct their meaning. They learn along with the students" (p.28). Identifying the best techniques to engage a specific group of learners allows educators to customize lessons that emphasize the learners' key characteristics while minimizing attention to less preferred aspects within the class (Koch Junior, 2015).

Various strategies and practices enhance student engagement in learning, including cooperative learning strategies, authentic learning tasks, literature circles (Clarke, 2013), classroom technology integration (Alsowat, 2016), student-led conferences with portfolios, and self-assessment (Olson, 2008). Gunn and Hollingsworth (2012) acknowledged the effectiveness of enhancing student engagement through 21st-century instructional methods and practices, including advanced technologies and applications for differentiated instruction. Educators should prioritize student engagement in the learning process, adopting the role of facilitators who encourage learners to be accountable for their learning.

Fredricks and McColskey (2012) identified several standard methods for assessing engagement. Self-report surveys are the predominant method for evaluating student engagement. These tools prove especially valuable in measuring emotional and cognitive engagement, which are not directly observable and must be deduced from actions. Experience sampling (ESM) allows participants to utilize electronic paging devices or alarm watches over a designated timeframe. Students respond to ESM signals by completing a self-report questionnaire that includes enquiries regarding their location,

activities, and cognitive and affective responses. Teacher checklists or rating scales represent an alternative approach for assessing student engagement. Specific teacher rating scales incorporate items that assess both behavioral and emotional engagement, whereas others represent a multidimensional engagement framework. Several studies have employed interview techniques to measure school engagement. Observational methods at both individual and classroom levels have been employed to assess engagement.

AR in composition instruction:

Technology significantly influences the lives of individuals, particularly college students. Technological advancements have transitioned the language classroom from traditional language labs to the integration of digital tools, with students increasingly identified as digital natives. Augmented Reality (AR) is a novel technology that addresses the motivational and technological requirements of students in contemporary language instruction. Educators prioritize 21st-century skills by integrating new technologies into lesson plans to enhance instructional quality for their students (Kamnoetsin, 2014; Helwa, 2019).

Augmented Reality (AR) is crucial in improving language learning by offering a more interactive and hands-on educational experience. Augmented reality facilitates the instruction of vocabulary and phrases through enhanced visual and contextual methods. Integrating virtual elements into a physical environment enables students to observe and engage with objects and scenarios that provide context for applying language in a more authentic manner. Secondly, augmented reality enhances learning by providing real-life simulations. Students may engage in practical communication scenarios, such as ordering food at a restaurant or participating in social activities, which improve everyday communication skills in the target language. Additionally, augmented reality can enhance student engagement by facilitating

interactive learning experiences. Students may utilize AR devices to access supplementary content, including video, audio, or images, thereby enhancing their comprehension of cultural and linguistic contexts. Students can generate their own augmented reality content, including storyboards, presentations, or AR-based art projects, thereby actively participating in the learning process and enhancing their expressive skills in the target language. Utilizing the advantages of augmented reality in language learning enables educators to design experiences that enhance engagement, practicality, and relevance, thereby significantly improving students' language proficiency (Bozzelli et al., 2019; Wedyan et al., 2022).

Technology is advancing rapidly, and AR is an innovative field continuously evolving. Azuma et al. (2001) assert that augmented reality seeks to improve user interaction with the real world by integrating 3D virtual objects within actual environments. This extends beyond visual channels to also engage auditory channels. Therefore, AR effectively connects virtual and physical environments (Özçelik, Yangin Ekşi, & Baturay, 2022). This approach improves the effectiveness and appeal of teaching and learning (Kesim & Ozarslan, 2012). AR enhances the learning experience by fostering engagement and interactivity, thereby boosting student motivation for active participation. AR applications enable educators to develop immersive content, facilitating contextual scenarios in which students can engage in practical language use relevant to daily life. Augmented reality can enhance information retention through the use of visualization and simulation techniques. Students demonstrate improved retention and comprehension of course material when visually engaged and directly interacting with the content. Furthermore, augmented reality facilitates a tailored learning experience that aligns with each student's comprehension level, particularly in the context of

language acquisition (Olim & Nisi, 2020; Sanabria & Arámburo-Lizárraga, 2017).

According to Laghari et al. (2021) and Scrivner et al. (2019), Augmented Reality (AR) and Virtual Reality (VR) are technologies that alter our perception of reality. AR enhances the real world by offering an interactive experience that merges physical elements with digital information. In contrast, VR creates a fully immersive digital environment that simulates reality, replacing the physical world. AR and VR offer user interfaces and applications designed to immerse users in interactive digital settings, with the potential to enhance both traditional and online learning (Al-Azawi et al., 2019; Liou et al., 2017). Both can facilitate immersive learning experiences and enhance learner engagement. Technology promotes the creative and integrated dissemination of knowledge and information, thereby enhancing student motivation (Tiwari, Bhaskar & Pal, 2023; Rojabi, Setiawan & Munir, 2023).

Santos et al. (2016) describe AR as integrating virtual elements with real environments, where computer-generated content is embedded in the physical world, giving the illusion that virtual objects coexist with real ones. This emerging technology is becoming increasingly popular in education due to its potential advantages for teaching and learning. Yuen, Yaoyuneyong, and Johnson (2011) assert that AR serves multiple educational purposes, including engaging and motivating students, facilitating the teaching of subjects lacking real-world experience, enhancing collaboration among students and instructors, promoting creativity and imagination, allowing students to assume responsibility for their learning, and fostering an authentic learning space that supports diverse learning preferences.

Augmented Reality (AR) is classified into two primary categories: location-based and vision-based. Location-based AR, or GPS-based AR, involves associating digital content with particular

geographic locations, enabling users to measure the distance from their current position to various other places using a mobile device with GPS capabilities. Integrating GPS, gyroscope, compass, and camera data allows for delivering environmental insights (Dunleavy & Dede, 2014; Godwin-Jones, 2016). Another form is vision-based AR, which focuses on image recognition technologies to determine the location of physical objects in the real world, enabling the precise placement of virtual elements linked to these objects. The tracking system comprises two types: marker-based and markerless. A marker-based tracking system employs static images to activate a visual overlay, which includes supplementary content such as 3D models, videos, and animations. For registering 3D images, certain labels, including QR codes, are essential. On the other hand, a markerless tracking system does not depend on labels; it can trigger virtual images by scanning any part of the real environment. These labels, QR codes, and virtual images are called "triggers" or "markers." Markers or triggers can be inserted in various locations and contexts. The AR application detects markers via the camera, allowing 3D images or other actions to be displayed on the device screen (Godwin-Jones, 2016; Khoshnevisan & Len, 2018; Khoshnevisan, 2019).

Constructivism, sociocultural theory (SCT), and connectivism are prominent language acquisition and learning theories that inform the application of augmented reality (AR), as certain characteristics of these theories align with AR (Sommerauer & Müller, 2018; Zhang, Wang & Wu, 2020). Wang et al. (2018) suggested that augmented reality-supported learning represents a modern theoretical framework. This approach is grounded in constructivism, facilitating knowledge acquisition within a contextualized environment. AR-based language materials enable learners to acquire, internalize, and construct knowledge, facilitating its application in productive tasks through critical thinking and

kinaesthetic skills. A fundamental aspect of SCT is the significance of the Zone of Proximal Development (ZPD). The primary connection between SCT and AR is associated with scaffolding. Augmented reality technology enables language learners to collaborate within a contextualized environment (Godwin-Jones, 2016). Collaboration in this context facilitates social interactions and scaffolding among language learners. Connectivism, a contemporary theory, focuses on establishing connections between technology-enhanced learning environments and learning opportunities while encouraging interaction and collaboration among learners (Greenwood & Wang, 2018). AR technology, being context-based, enables learners to connect their skills with a real contextualized environment, enhanced through multiple modes (Godwin-Jones, 2016).

Mobile augmented reality (AR) refers to the implementation of AR technology on mobile devices, wherein virtual objects are superimposed onto the real world as viewed through the device rather than through a personal computer. Augmented reality environments on mobile devices are advancing and present significant potential for educational and training applications. Jamali, Shiratuddin, and Wong (2014) present recent works and applications in various fields related to AR and MAR in their research. MAR refers to equipment that facilitates augmented reality, such as smartphones or tablets, characterized by its compact size and portability (Beder, 2012; Karagozlu & Ozdamli, 2017). AR offers applications that enable students to engage with the real world by integrating virtual information. Augmented reality applications on tablets and mobile devices may facilitate a swift advancement of AR technology. AR can leverage technology familiar to students and integrate it with familiar locations, thereby facilitating the transition of learning from traditional classrooms to the environments in which students reside. Promoting informal

learning can effectively engage students by extending their learning to environments that facilitate connections with content, contextual locations, and peers (Muñoz, 2017). MAR technology facilitates the mobilization of the learning environment, independent of location and time while providing flexibility tailored to students' needs.

Numerous scholars have explored the impact of augmented reality on education to connect real and virtual environments effectively. Employing diverse methods and advancing technology can enhance the quality of education. Recent advancements in technology have facilitated the effective use of augmented reality with mobile devices. Studies on AR in education revealed various features and affordances promising for enhancing education. First, AR provides accessible learning materials at any location and at any time. It provides portable and cost-effective learning materials as alternatives to paper-based textbooks, models, posters, or printed manuals. Second, it does not necessitate any specialized equipment. Currently, the majority of adolescents possess smartphones equipped with cameras, facilitating immediate access to augmented reality (Özçelik, Yangin Ekşi & Baturay, 2022). Additionally, it enhances comprehension of abstract concepts. Visualization allows learners to comprehend abstract concepts more effectively, enhancing their understanding of various subjects (Wu, 2019; Shelton & Hedley, 2002; Kurniawan et al., 2024). In addition, it offers authentic, contextual, situational, collaborative and social learning environments (Squire& Jan, 2007; Dunleavy et al., 2009; Wu, 2019). It engages learners' attention and enhances their motivation (Di Serio et al., 2012; Kesim& Ozarslan, 2012; Elsayed& Al-Najrani, 2021). It enhances learner engagement and fosters the development of critical thinking and problem-solving abilities (Dunleavy et al., 2009). It is applicable across multiple cases and fields, making it suitable for various levels of education and training.

In language education, AR demonstrated effectiveness as a means for developing various language skills at various educational stages. For example, it proved effective in eliciting higher levels of engagement and more positive attitudes (Lee, 2021). Finally, Costuchen, Darling, and Uytman (2020) conducted an experimental study on vocabulary retention with 62 Spanish students in the English language teacher training department. Findings confirmed the benefits of AR-based instruction on the retention level of learners.

With specific reference to composition skills, a study by Wang (2017) examined composition skills by providing an AR-based writing support system to 30 twelfth-grade students. The control group utilized paper-based writing support materials, whereas the experimental group employed both AR-based learning materials and paper-based support to accomplish the writing task. The results indicated that intermediate-level students experienced the greatest improvement in composition skills through the use of AR approaches.

Helwa (2019) demonstrated the effectiveness of mobile augmented reality applications in enhancing student teachers' EFL descriptive writing skills and their motivation for the English language. Lin, Liu, and Chen (2022) investigated the influence of augmented reality-enhanced writing tools on students' writing outcomes. An AR-supported context-aware ubiquitous writing application (ARCAUW) was designed to boost language learners' retention, motivation, and self-regulated cognitive skills in writing. The results indicated that both groups improved their writing performance, with the ARCAUW group demonstrating better writing retention, motivation, and self-regulation. The study indicated that implementing innovative applications in academic writing courses enhances writing outcomes for learners by facilitating self-regulated writing proficiency. The study by Koç,

Altun, and Yüksel (2022) found that using AR-based materials moderately influenced the writing skills of high school students. Findings showed that students had favorable views of the AR-enhanced writing experience.

Methodology:

Participants:

Participants in the current research were ninety (N= 90) female students enrolled in the second grade of the specific program "Teaching in English" at the Faculty of Early Childhood Education. This program qualifies those students to teach kindergarten children in the language, experimental, and international kindergartens in the corresponding schools. Their ages ranged between nineteen and twenty years old. They had almost the same experience in learning English, starting from their first year of the primary stage.

Design of the research:

This study employed a quasi-experimental design with pre-post assessments conducted on two independent groups. The study aimed to evaluate the impact of a mobile augmented reality application on EFL composition skills and engagement among the Faculty of Early Childhood Education students.

procedures

First, designing the instruments and materials for the research

Instruments and materials used in the current research were designed by the researcher as follows: (available with the researcher upon request)

1-The EFL Composition skills test:

The test was designed to assess the level of second-year students at the Faculty of Early Childhood Education in EFL composition

skills before and after applying the proposed AR treatment. The difference in their scores on the pre-and post- administrations of the test- if any- would be attributed to the effect of the proposed treatment. The course description was reviewed to check the composition skills prescribed for them. The skills included mechanics of writing, word choice, accuracy, content and development of ideas, and organization. The initial version of the test included two paragraph writing questions.

To validate the test, it was presented to a group of five jurors, who assessed the questions for coverage of target skills, appropriateness for participants, clarity of language, and proposed modifications to the questions. The jurors agreed that the questions were accurate and suitably formulated to assess the target composition skills. The internal consistency and reliability of the EFL composition skills test were estimated through the test pilot administration to (30) second-year students other than participants in the main research. The results of this pilot study were as follows:

First, the internal consistency was estimated through two procedures: a) the correlation coefficient between the score of each question and the total score of the skill being assessed was estimated, and the results are shown in the following. Table:

Table 2: The correlation between the score of each item and the total score of the skill in the composition skills test

Sub-skills	questions	Corr. Coeff.	Sub- skills	questions	Corr. Coeff.
Content and development of ideas	1	0.929**	Word choice	1	0.791**
	2	0.915**		2	0.78**
Organization	1	0.794**	Mechanics	1	0.907**
	2	0.811**		2	0.902**
Accuracy	1	0.808**			
	2	0.85**			

** significant at 0.01 level

Table (2) illustrates that the correlation coefficients between the score of each question and the total score of the skill are positive at the 0.01 level, which supports the composition skills test's valid internal consistency.

b) the correlation coefficient was estimated between each skill's and test's scores. Results are displayed in the following table:

Table 3: The correlation between the score of each skill and the total score of the composition skills test

Sub- skills	Corr. Coeff.	Sig.
Content& ideas	**0.8**	**0.01**
Organization	**0.81**	**0.01**
Accuracy	**0.897**	**0.01**
Word choice	**0.791**	**0.01**
Mechanics	**0.925**	**0.01**

The results illustrated in Table (3) clearly show that correlation coefficients were positive and statistically significant at the (0.01) level, which means that the test has a high level of internal consistency.

Second, the reliability of the test was assessed by estimating the Cronbach-Alpha coefficient (α), which indicates the degree of interrelatedness among test items and the correlation of each item with the total test score. Results are displayed in the following table:

Table (4): Values of Cronbach- Alpha reliability coefficient for the composition skills test

The composition skills test	No. of subskills	α
	10	**0.894**

The overall reliability coefficient of the test was 0.894, suggesting that the composition skills test is reliable and suitable for use as one of the research instruments.

The test duration was also calculated by adding up the time spent by all the pilot study students to complete the test and dividing it by their number (30). Thus, 45 minutes would provide an average time for the students to answer the test questions.

2-The EFL Composition Skills Rubric:

A rubric to score the composition skills test was developed and included in the final version of the test. The rubric employed an analytic approach, detailing each sub-skill across multiple levels, with performance indicators assigned specific scores at each level. The rubric utilized a four-point scale: 1 indicates poor performance, 2 signifies needs improvement, 3 represents acceptable performance, and 4 denotes distinguished performance. The rubric employed a 4-point scale designed to differentiate quality and facilitate grading. The use of an odd number of score points was avoided due to the tendency of observers to converge on the mean, as the middle score often serves as a "dumping ground" (Arter & McTighe, 2001: 31). The rubric in its initial form was presented to jurors for validation. Significantly, a few changes were made to the rubric indicators, which were established in their final form.

Reliability of the rubric:

The reliability coefficient of the rubric was determined through inter-rater assessment of the same student's performance. The coefficient of agreement was determined between their estimates utilizing the "Cooper" equation. The percentage of agreement is calculated as follows: (number of agreements / (number of agreements + number of disagreements)) × 100. The researcher requested a colleague to serve as a co-rater following the presentation of the test and its rubric and a review of its content and instructions by evaluating the performance of three students not involved in the main study. The agreement coefficient was computed for each student. The table below presents the coefficient of agreement regarding the performance of the three students: **Table 5: Coefficient of Agreement on the performance of the three students**

Coeff. Agree. For 1st student	Coeff. Agree. For 2nd student	Coeff. Agree. For 3rd student
87%	**90%**	**89%**

The mean coefficient of agreement between the two observers, as indicated by the previous table, is 88.66%, demonstrating a high level of reliability for the rubric.

Results in Tables 2, 3, 4, and 5 indicate that the test and its rubric were highly reliable, meaning they were reliable instruments for measurement.

3-An Engagement in Writing Scale

The engagement scale was designed to assess engagement in writing of second-year English section students at the Faculty of Early Childhood Education before and after conducting the experimental treatment. The scale consisted of forty items distributed to the four dimensions of engagement: cognitive, emotional, behavioral, and social engagement. Each dimension included 10 statements. Some negative statements were distributed throughout the scale to ensure the validity of students' responses. A 5-point Likert scale (1= Strongly Disagree, 2= Disagree, 3= Not Sure, 4= Agree, 5= Strongly Agree) was used to reflect students' responses.

The scale's validity was assessed by presenting it to a group of specialists in TEFL and psychology (N=6) for evaluating the statements concerning appropriateness and clarity. The jurors expressed their perspectives, noting that the scale was clear and suitable for evaluating students' engagement in writing through mobile AR applications.

To estimate the scale's construct validity, it was piloted on a sample of (30) students other than participants in the main study. The internal consistency of the engagement scale was determined by calculating the correlation coefficient between the score of each

item and the total score for its corresponding dimension, and by measuring construct validity (hypothetical consistency) through the correlation between the scores of each dimension and the overall scale score. The following tables display the values of the correlation coefficients and their significance levels.

Table 6: Values of correlation coefficients between items of the scale and their correspondent dimensions

Dimension	St. No.	r	Dimension	St. No.	r
A. Cognitive Engagement	1	0.812**	C. Behavioral Engagement	1	0.738**
	2	0.774**		2	0.842**
	3	0.94**		3	0.7**
	4	0.825**		4	0.708**
	5	0.749**		5	0.659**
	6	0.848**		6	0.694**
	7	0.628**		7	0.588**
	8	0.681**		8	0.666**
	9	0.667**		9	0.49**
	10	0.91**		10	0.559**
B. Emotional Engagement	1	0.602**	D. Social Engagement	1	0.745**
	2	0.824**		2	0.81**
	3	0.755**		3	0.54**
	4	0.691**		4	0.78**
	5	0.744**		5	0.68**
	6	0.863**		6	0.62**
	7	0.651**		7	0.78**
	8	0.523**		8	0.76**
	9	0.462**		9	0.79**
	10	0.677**		10	0.71**

***** significant at 0.01 level***

Results in Table (6) indicate that correlation coefficients between the scale items and their corresponding dimensions were positive and statistically significant at the 0.01 significance level, indicating a strong correlation.

Table 7: internal consistency coefficients of the scale

Dimensions	r	Sig.
A. Cognitive Engagement	0.94	0.01
B. Emotional Engagement	0.901	0.01

Dimensions	r	Sig.
C. Behavioral Engagement	0.91	0.01
D. Social Engagement	0.89	0.01

Statistics in Table (7) indicate that correlation coefficients between the scale dimensions and the total score were positive and statistically significant at the 0.01 level, indicating that the engagement scale had a high internal consistency.

The reliability of the engagement scale was assessed through Cronbach's Alpha method. The values of Cronbach's Alpha coefficient calculated for the scale are demonstrated in the following table:

Table 8: Values of Alpha reliability coefficient for the engagement scale

Dimensions	No. of statements	α
A. Cognitive Engagement	10	0.929
B. Emotional Engagement	10	0.872
C. Behavioral Engagement	10	0.857
D. Social Engagement	10	0.825
Total	40	0.966

Results in Table (8) indicate that the reliability coefficient for the whole scale was 0.966, which reflects that the scale was highly reliable and proved suitable for administration.

Second: The features of the mobile AR treatment:

To achieve the purpose of the research, the researcher designed instructional support materials that would be used as triggers for the Mobile Augmented Reality (MAR) application used in the current research.

Objectives of Mobile Augmented Reality (MAR)- Based treatment:

The treatment aimed at developing EFL composition skills and engagement in writing among second-year students enrolled in the English section at the Faculty of Early Childhood Education,

Egypt. The target composition sub-skills included the following: content and development of ideas, organization, accuracy, word choice, and mechanics. Additionally, engagement in writing was comprised of four dimensions: cognitive, emotional, behavioral, and social engagement.

Content of Mobile Augmented Reality (MAR)- Based treatment:

The content comprised a variety of topics, situations, tasks, and discussions designed to develop EFL composition skills and engagement in writing. They were suitable for the second-year students enrolled in the English section at the Faculty of Early Childhood Education, Mansoura University.

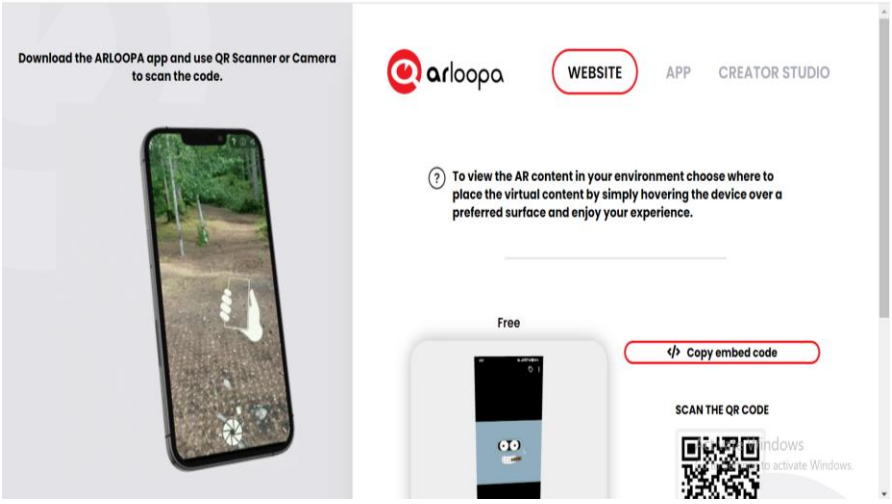
Framework of Mobile Augmented Reality (MAR) Application-based treatment

The treatment lasted for about two months. The researcher engaged with the students for two hours weekly over a ten-week period and facilitated communication through a WhatsApp group for enquiries at any time. Week (1) was specified for pre-administration of the research instruments and orientation for using the mobile AR application, while week (10) was allotted for post-administration of instruments. Each session was organized according to the following stages: introducing objectives, procedures which included warm-up, pre-writing, while-writing, and post-writing and finally, feedback and reflection.

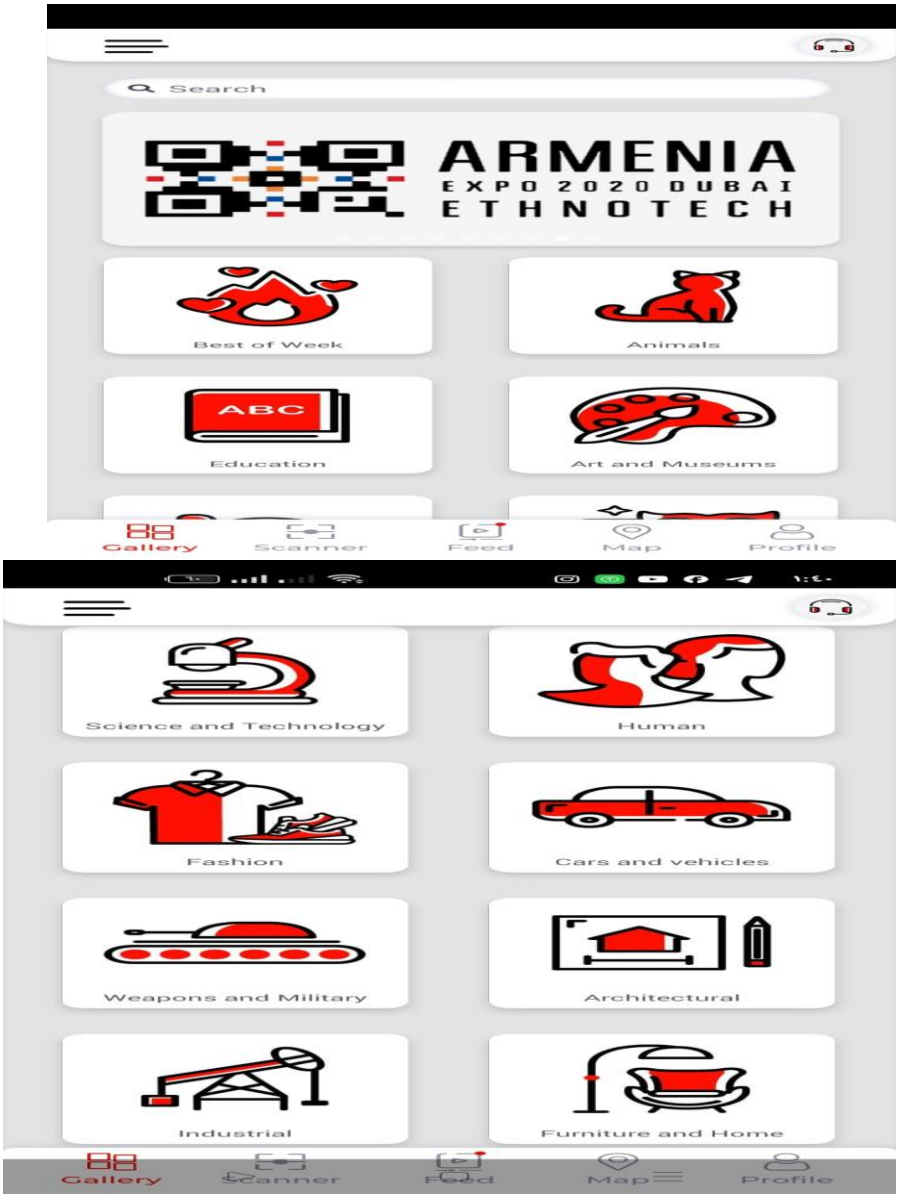
During the instructional procedures, the AR application was integrated within the various writing stages in a way that suited the purpose of each stage, and the activities designed for achieving these purposes. Two modes of vision-based AR composition support materials were employed: first, marker-based AR, which utilizes a static image to activate a visual overlay that includes attached additional content such as 3D models, videos, and

animations; and second, markerless AR, which enables the use of real objects as triggers by scanning their immediate surroundings. A mobile AR application called ARLoopa was implemented as an easy-to-use augmented reality application to activate the writing support triggers. ARLoopa is a complimentary application available for iOS and Android platforms. It employs sophisticated image recognition to integrate the physical environment with dynamic interactive content, including videos and animations. It also has a gallery where instructors can find ready-made AR projects covering many fields, such as science, math, geology and astronomy, that can be used as enriching materials for writing activities. The interface of the App. is illustrated in screenshots below:

Screenshot 1: The Interface of the ARLoopa App Website



Screenshot 2: The interface of the ARLoopa mobile app



(Source: ARLOOPA - Augmented and Virtual Reality App and Game Development Company. https://www.arloopa.com/)

The Arloopa application serves as an augmented reality visualization instrument that integrates the physical and digital realms. It integrates virtual content within a real environment, facilitating engaging, interactive, and meaningful experiences. The

application comprises several sections: AR scanner, 3D Models, Library, Feed, and Map. It delivers content with marker-based, markerless, and location-based dimensions, providing varied options for creating AR-supported materials.

The researcher integrated marker-based writing materials into learning sheets using AR techniques. Learners scanned the triggers on these sheets with devices like smartphones or tablets equipped with cameras, which then displayed the writing materials, including videos, audio, animations, referable sentences, and writing support. They were utilized with most of the writing activities throughout the various writing stages. On the other hand, markerless or authentic scene materials were used with topics related to outdoor topics, where students wandered around various locations to collect information that would help them write about the required topic.

Arloopa mobile application was then downloaded to students' mobile phones or tablets as an easy-to-apply augmented reality application to support them in writing. The AR technique improved information representation by integrating the real scene perceived by the student with a virtual scene produced by mobile devices, resulting in semi-realistic information services. The interactive and attractive animations and triggers attracted the students' attention and increased their interest in learning composition skills.

The experimental intervention:

The present research employed an equivalent group design consisting of experimental and control groups. The subsequent steps were executed:

- **Pre-intervention**

Before the experimental treatment commenced at the start of the first semester of the academic year 2022/2023, second-year students' composition skills and engagement were assessed.

Homogeneity among participants in the control and experimental groups was confirmed by administering the composition skills test and the engagement scale prior to the implementation of the experimental treatment. Tables (9) and (10) display whether there was any significant difference between the control and experimental groups concerning the pre-administration of the research instruments.

Table 9: Comparing control and experimental groups on the pr-administration of the composition skills test

Skills	Groups	N	Mean	Std. Deviation	t Value	f	Sig
Content	Experimental	45	2.11	0.804	0.71	88	Not Sig
	Control	45	2	0.674			
Organization	Experimental	45	2.2	0.757	1.421	88	Not Sig
	Control	45	2	0.564			
Accuracy	Experimental	45	2.44	0.693	0.304	88	Not Sig
	Control	45	2.49	0.695			
Word choice	Experimental	45	2.18	1.051	0.436	88	Not Sig
	Control	45	2.09	0.874			
Mechanics	Experimental	45	1.4	1.116	1.66	88	Not Sig
	Control	45	1.78	1.042			
Total	Experimental	45	10.33	1.907	0.059	88	Not Sig
	Control	45	10.36	1.64			

According to the results in Table (9), no statistically significant difference was found between the mean scores of the control and experimental groups on the pre-administration composition skills test, with "t" values being insignificant at the 0.05 significance level.

Table 10: Comparing control and experimental groups on the pr-administration of the engagement scale

Domains	Groups	N	Mean	Std. Deviation	t Value	df	Sig
A. Cognitive Engagement	Experimental	45	16.04	3.861	0.589	88	Not Sig
	Control	45	16.56	4.357			
B. Emotional	Experimental	45	22.18	2.570	0.886	88	Not

Domains	Groups	N	Mean	Std. Deviation	t Value	df	Sig
Engagement	Control	45	21.64	3.113			Sig
C. Behavioral Engagement	Experimental	45	20.16	4.833	0.538	88	Not Sig
	Control	45	20.71	4.962			
D. Social Engagement	Experimental	45	21.6	2.973	0.471	88	Not Sig
	Control	45	21.93	3.695			
Total	Experimental	45	79.98	9.25	0.373	88	Not Sig
	Control	45	80.84	12.557			

According to the results in Table (10), no statistically significant difference was found between the mean scores of the control and experimental groups on the pre-administration of the engagement scale, with "t" values being insignificant at the 0.05 significance level.

The results of the pre-administration of the research instruments established the homogeneity of both the control and experimental groups. Any variance in performance could be attributed to the effect of the proposed treatment.

- **The intervention**

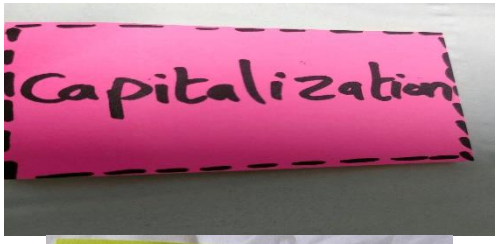
The AR-based treatment was applied to the experimental group. The control group studied the same course, “Composition and Conversation”, using the conventional lecture-based method without using the mobile AR application. The intervention was carried out during the first term of the 2022/2023 academic year. The experimental treatment procedures were outlined as follows:

- ✓ An orientation session was conducted for the second-year Faculty of Early Childhood Education students who represented the experimental group. The researcher clarified the objectives of the treatment, its stages and features, and the nature of the Mobile Augmented Reality application. The researcher also presented the research instruments for pre-administration.

- ✓ The treatment included implementing ten sessions in addition to the orientation and the concluding sessions. Students followed the same phases in all sessions, where the mobile AR application was integrated.
- ✓ The researcher installed the ARLoopa app and created an account, then instructed her students to download the app from the App Store or Google Play and set up their own accounts.
- ✓ The researcher started creating AR triggers for her students. When students scan these cards, an audio, video, or animation pops up as scaffolds for writing.
- ✓ The researcher organized students into five groups, each consisting of nine, to facilitate collaboration, communication, and learning among them.
- ✓ To assist participants in acquiring English vocabulary and expressions for writing, the researcher utilized AR-based mobile learning materials. The mobile content enabled participants to explore nearby scenic locations, enhancing their understanding of buildings, places, and points of interest in English. For instance, when students direct a mobile phone in a specific direction, the system rapidly identifies their location, and the integrated camera automatically documents the surrounding environment. Consequently, the AR-based mobile learning material produces pertinent information, such as the names and descriptions of the buildings. The captured images and generated data will be presented on the mobile phone display. Students can click a designated trigger on the screen to access detailed information about a specific building or scenic spot. The AR-based mobile learning material improved the development and expression of

ideas and information, offered visual descriptions, and enhanced information accessibility.

- ✓ Cards used as triggers stimulated writings, images, videos, or audio files previously integrated and attached to these pre-prepared triggers, which contributed to clarifying writing mechanics, grammatical structure, an idiom or expression to be used in writing, and the like. Trigger cards looked like the following:



- ✓ Each session started with a lead-in activity that helped students engage with the topic. Then, the writing stages proceeded in sequence, using the Mobile AR application. By the end of the session, exit tickets were distributed to students to assess the session.
- ✓ Students were asked to reflect upon the session in their reflective log to aid them in engaging in their learning and development.
- ✓ A WhatsApp group was established to facilitate student interaction by allowing them to share their paragraphs with peers.

- ✓ The participants utilized the information from the descriptions in the AR-based mobile learning material for their compositions.

- **Post−intervention**

The instruments, namely the composition skills test and the engagement scale, were administered post-treatment to assess improvements in students' composition skills and engagement levels in both the control and experimental groups.

Results:

The results of the research are presented in terms of the research hypotheses as follows:

Testing the first hypothesis:

The "t" test for independent groups was used to verify the first hypothesis: The mean scores of the experimental and control group students on the post-administration of the composition skills test show a statistically significant difference, favoring the experimental group. The table below presents (t) values along with their statistical significance.

Table 11: Comparing the performance of the control and experimental groups on the post-administration of the composition skills test

Skills	Groups	N	Mean	Std. Deviation	t Value	df	Sig
Content& ideas	Experimental	45	7.18	0.65	21.78	88	0.01
	Control	45	4.02	0.723			
Organization	Experimental	45	7.11	0.573	21.62	88	0.01
	Control	45	3.56	0.943			
Accuracy	Experimental	45	7.04	0.706	14.2	88	0.01
	Control	45	4.4	1.031			
Word choice	Experimental	45	7.07	0.72	16.67	88	0.01
	Control	45	3.31	1.328			
Mechanics	Experimental	45	7.04	0.737	18.6	88	0.01
	Control	45	3.58	1.011			

Skills	Groups	N	Mean	Std. Deviation	t Value	df	Sig
Total	Experimental	45	35.44	2.989	24.67	88	0.01
	Control	45	18.87	3.375			

Table (11) indicates that the mean scores of the experimental group students across all five composition sub-skills and the total score exceeded those of the control group. Furthermore, the t-values were all significant at the 0.01 level, suggesting a statistically significant difference between the experimental and control groups on individual skills and the overall score of the post-administration composition skills test, with the experimental group outperforming the control group. The students in the experimental group demonstrated superior composition skills compared to those in the control group, as indicated by the results of the composition skills test. Thus, the first hypothesis was verified and accepted.

Testing the second hypothesis:

A t-test for dependent samples was employed to verify the second hypothesis: "There is a statistically significant difference between the mean scores of the experimental group students on the pre- and post-administrations of the composition skills test, favoring the post-administration." The results are presented in Table 12.

Table 12: Comparing the performance of the experimental group on the pre-and post- administrations of the composition skills test

Skills	Measurement	N	Mean	Std. Deviation	t Value	Df	Sig	)η2(
Content	Pre	45	2.11	0.804	37.17	44	0.01	0.969
	Post		7.18	0.65				
Organization	Pre	45	2.20	0.757	36.6	44	0.01	0.968
	Post		7.11	0.573				
Accuracy	Pre	45	2.44	0.693	31.29	44	0.01	0.957
	Post		7.04	0.706				
Word choice	Pre	45	2.18	1.051	28.47	44	0.01	0.949
	Post		7.07	0.72				

Skills	Measurement	N	Mean	Std. Deviation	t Value	Df	Sig	)η2(
Mechanics	Pre	45	1.4	1.116	29.95	44	0.01	0.953
	Post		7.04	0.737				
Total	Pre	45	10.33	1.907	55.02	44	0.01	0.986
	Post		35.44	2.989				

Table (12) demonstrates that the t-value is significant at the 0.01 level for each specific skill as well as for the total score. This indicates a significant difference in the mean scores of the experimental group students between the pre-and post-administrations of the composition skills test, with the post-administration scores benefiting from the mobile AR application. The table indicates that the effect size levels of the mobile AR application-based treatment on the target composition skills of the experimental group students were substantial. Accordingly, since t-values, in addition to the effect size, confirmed the significant positive effect of the mobile AR application-based treatment on students' composition skills, the second hypothesis of the research was proved and accepted.

The third hypothesis stated that "There is a statistically significant difference between the mean scores of the experimental and control group students on the post-administration of the Engagement in writing Scale in favor of the experimental group". In order to verify this hypothesis, the researcher used "t" test for independent groups to identify the significance of the differences. The following table illustrates (t) values and their statistical significance.

Table 13: Comparing the control and experimental groups on the post-administration of the Engagement in writing Scale

Domains	Groups	N	Mean	Std. Deviation	t Value	df	Sig
A. Cognitive Engagement	Experimental	45	42.91	4.177	20.62	88	0.01
	Control	45	26.58	3.286			
B. Emotional Engagement	Experimental	45	43.60	4.56	14.83	88	0.01
	Control	45	29.24	4.623			
C. Behavioral Engagement	Experimental	45	45.71	3.389	25.9	88	0.01
	Control	45	27.22	3.384			
D. Social Engagement	Experimental	45	45.56	3.381	25.573	88	0.01
	Control	45	26.93	3.525			
Total	Experimental	45	177.78	14.172	25.585	88	0.01
	Control	45	109.98	10.731			

The data presented in Table (13) indicate that the mean scores of the experimental group students across all four dimensions of engagement, as well as the overall engagement scale score, surpassed those of the control group. Furthermore, all t-values were significant at the 0.01 level, indicating a statistically significant difference between the mean scores of the experimental and control groups on the post-administration of the engagement in writing scale, favoring the experimental group. The students in the experimental group demonstrated superior performance in writing engagement compared to those in the control group, as indicated by the engagement scale. Consequently, the third hypothesis was verified and accepted.

Verifying the fourth hypothesis:

The "t" test for dependent groups was used to verify the fourth hypothesis, which is "There is a statistically significant difference between the mean scores of the experimental group students on the pre-and post-administrations of the engagement in writing scale in favor of the post-administration." Results are illustrated in Table (14).

Table 14: Comparing the experimental group on the pre-and post-administrations of the Engagement in writing scale

Domains	Measurement	N	Mean	SD.	t Value	Df	Sig.	η2
A. Cognitive Engagement	Pre	45	16.04	3.861	30.84	44	0.01	0.956
	Post		42.91	4.177				
B. Emotional Engagement	Pre	45	22.18	2.57	26.17	44	0.01	0.94
	Post		43.6	4.56				
C. Behavioral Engagement	Pre	45	20.16	4.833	27.52	44	0.01	0.945
	Post		45.71	3.389				
D. Social Engagement	Pre	45	21.6	2.973	33.28	44	0.01	0.962
	Post		45.56	3.381				
Total	Pre	45	79.98	9.25	35.99	44	0.01	0.967
	Post		177.78	14.172				

The results in Table (14) indicate a statistically significant improvement in the Engagement in Writing Scale scores for the experimental group, with the post-administration mean (177.78) markedly exceeding the pre-administration mean (79.98). This highlights a substantial increase in engagement following the intervention. The values of "t" were statistically significant at (0.01) level, indicating that the mobile AR program was effective in developing engagement in writing for the targeted sample. Moreover, the table illustrates that the effect size of the mobile AR application on the engagement of the experimental group students was high. The analysis of t-values and the effect size validated the substantial positive effect of the mobile AR application on enhancing students' engagement. Therefore, the fourth hypothesis was confirmed and accepted.

The fifth hypothesis stated, "There is a positive correlation between the composition skills and engagement in writing". The researcher utilized Pearson's simple correlation coefficient to verify the hypothesis by examining the correlation between the experimental group students' performance on the composition skills test and their engagement in writing scale scores. Results are illustrated in the following table:

Table 15: Correlation coefficient between EFL writing skills and Engagement

r	Composition skills test	Sig.
Engagement scale	**0.872**	**0.01**

Table (15) highlights a significant and strong positive correlation between EFL composition skills and writing engagement, as evidenced by the (r) value at the 0.01 significance level. Consequently, the fifth hypothesis was successfully verified and accepted.

Discussion:

This research aimed to examine the impact of a mobile AR application on improving EFL composition skills and writing engagement among second-year English section students at the Faculty of Early Childhood Education. The findings revealed a statistically significant difference at the 0.01 level between the mean scores of the experimental and control groups on the post-administration of the composition skills test, with the experimental group outperforming the control group. Additionally, a statistically significant difference was found between the experimental group students' mean scores on the pre- and post-administrations of the composition skills test, favoring the post-administration. The application of the proposed treatment utilizing the mobile AR application improved the EFL composition skills of second-year English section students at the Faculty of Early Childhood Education. Moreover, a statistically significant difference at the 0.01

level was observed between the experimental and control groups' mean scores on the post-administration of the writing engagement scale, favoring the experimental group. Furthermore, a statistically significant difference was observed between the mean scores of the experimental group students on the pre- and post-administrations of the engagement scale, with the post-administration scores being higher. The study identified a positive correlation between EFL composition skills and engagement, indicating that heightened engagement can significantly improve composition skills and vice versa.

The present research provides evidence for the positive impact of using mobile augmented reality applications as a framework for developing instructional materials for teaching and developing composition skills of second-year English section students at the Faculty of Early Childhood Education and their engagement in writing. The findings of the current research corroborate the previous relevant studies that investigated the effect of using mobile AR applications on developing various skills and learning dimensions, such as developing reading comprehension (Nichols, 2012), improving teaching effectiveness and thus improving students' writing, oral language and total English scores (Short, Fidelman& Louguit, 2012; Koura& Zahran, 2017), and improving reading fluency (Gates& Feng, 2018).

The results could be attributed to the benefits of incorporating mobile AR applications as innovative and vivid techniques for teaching language skills and improving student learning. It has beneficial features that aid students in achieving high levels of performance in language skills as it offers linguistic and content knowledge that enables effective and unrestricted writing. It equips students with the necessary vocabulary and expressions for proficient writing. Some students reported that the information displayed on the AR screen would vanish when the camera was

moved away from the trigger, potentially hindering their learning experience. This aligns with the findings of Di Serio et al. (2012), which indicate that a lack of experience in operating the AR system may lead to negative learning outcomes.

Generally speaking, students who participated in the research expressed their satisfaction with and enthusiasm about how they practiced their composition skills in the English sessions. They found it different, encouraging, interesting, and engaging. They were especially interested in the idea of having the opportunity to further the various activities implemented in the sessions, which enabled them to interact together and understand various composition component sub-skills and practice them with the aid of their instructor. In addition, their engagement in writing increased as the composition activities based on mobile AR agitated their enthusiasm to participate and show their full potential in achieving high levels of thinking and learning.

The mobile AR application facilitated a systematic approach, allowing students to implement it effectively and practice the specific composition skills targeted. Students exhibited increased confidence and improved their writing skills. The application of mobile AR technology improved students' composition skills. The topic was effectively introduced, with ideas substantiated by relevant details and examples. The presenters employed appropriate vocabulary and expressions in articulating their ideas. Students utilized appropriate punctuation marks and capitalization conventions. They implemented paragraph indentation, maintained spacing between words and syllable divisions, and ensured correct spelling of words. Furthermore, they communicated the meaning accurately and clearly, employed precise and correct word forms, and utilized appropriate expressions. The authors crafted appropriate introductions and conclusions for their paragraphs, developed a body centered on a singular main idea supported by

sufficient details, employed transition words and phrases, utilized lexical connectors and coherence markers, and implemented logical transitions to maintain a smooth flow of ideas and sentence structure.

Moreover, classroom and time management were challenging for the instructor, yet when students got engaged in the activities and got motivated to learn and participate in interesting and engaging activities, the issue of classroom and time management became manageable. Further, the classroom atmosphere reflected the apparent and prevailing collaboration, communication, and cooperation among students to make progress throughout the experiment. Mobile AR technology provides a non-threatening and engaging learning environment, one of the essentials of language learning. The presentation of information utilizes multiple modalities, including auditory elements, animations, and images. Consequently, it enhanced the interactivity, practicality, engagement, and enjoyment of the learning experience. Therefore, these results are consistent with Solak and Cakır (2015), Wang (2017), Helwa (2019), Lin, Liu& Chen (2022), and Koç, Altun and Yüksel (2022).

In addition, MAR increased student engagement by implementing activities and tasks that facilitated student participation and interaction, engaged multiple senses in writing exercises, and fostered interest and enjoyment in the learning process. Additionally, through MAR, students can acquire experiential learning, enhancing their confidence and autonomy. These results are consistent with Di Serio et al. (2012), Kesim and Ozarslan (2012), Henrie, Halverson, and Graham (2015), Huisinga (2017), Elsayed and Al-Najrani (2021), and Lee (2021).

Conclusions:

The research findings indicated that the participants' EFL composition skills improved after implementing the Mobile Augmented Reality (MAR) Application. Their engagement in writing also increased. The effectiveness of Mobile Augmented Reality (MAR) application-based treatment may stem from the diverse activities, tasks, and strategies offered to students. Implementing the Mobile Augmented Reality (MAR) Application revealed significant findings regarding students' opportunities for experiential learning. It highlighted their belief that collaborative and enjoyable activities could foster enhanced learning and skill development.

Recent technological advancements enhance the interaction with media content and improve learning quality. Consequently, the utilization of mobile learning tools has risen. The abundance of digital learning resources and communication tools in mobile learning enhances engagement in the educational process. In recent years, mobile phones have evolved into a platform for augmented reality (AR). Mobile devices are integral to daily life, and their educational applications have been examined by researchers globally. Mobile applications utilized in education, as well as mobile Augmented Reality (MAR) applications, exemplify these possibilities. MAR applications in education provide learning support by connecting a user's real-world context with a digital overlay through various patterns (Ozdamli & Hursen, 2017; Ternier et al., 2012).

In conclusion, mobile AR is becoming an essential field of study for developing EFL language skills and other affective language-related variables in all educational stages.

Recommendations:

In the light of the results of the current research, the following recommendations are suggested:

1. Much attention should be directed to orienting student teachers at the Faculties of Early Childhood Education and Education about using AR technology in their academic study and teaching. Mobile AR is becoming an inevitable demand in the current age and is significant for students in their academic study, language development, and future careers as teachers.
2. Curriculum planners and stakeholders should investigate more possible opportunities for integrating and utilizing mobile AR technology in teaching EFL skills that help teachers in their teaching and save effort through concise and precise procedures with the availability of opportunities to show their creativity in teaching.
3. Researchers should pay more attention to validating the advantages of AR technology in developing language skills and other affective language-related variables.
4. Faculty professors should integrate AR technology in their teaching practices to model its use for their students. They should also highlight its use in their methodology courses so that their students are fully aware of its advantages and ways of integration in teaching.

Suggestions for further research:

Based on the findings and recommendations of the current study, the following research topics are suggested:

- Investigating the impact of mobile AR technology on developing various language skills in various educational stages.

- The effectiveness of AR technology in professional development in developing EFL teachers' digital creative teaching competence.
- Investigating the effect of AR technology on developing language skills for special educational needs students.

References

Abd-Alfatah, N. A. (2013). The effect of a program based on brainstorming strategy in developing writing paragraph for preparatory stage students. *Studies in Curricula and Teaching Methods*, (193), 58-67.

Akbari, E., Naderi, A., Simons, R.& Pilot, A. (2016). Student engagement and foreign language learning through online social networks. *Asian-Pacific Journal of Second and Foreign Language Education*, 1(4), 1:22.

Al-Azawi, R., Albadi, A., Moghaddas, R. and Westlake, J. (2019), "Exploring the potential of using augmented reality and virtual reality for STEM education", *Learning Technology for Education Challenges: 8th International Workshop*, LTEC, Zamora, Spain, July 15-18, 2019. Proceedings, Vol. 8, pp. 36-44, Springer International Publishing.

Al-Buainain, H. (2009). Students' Writing Errors in EFL: A Case Study. *Journal of Faculty of Education: The University of Alexandria*, 19 (01), 311-351.

Alexander, P. A. (2018). Engagement and literacy: Reading between the lines. *Journal of Research in Reading*, *41*(4), 732–739.

Amin, E. (2016). Using "Wikis" in Developing Writing Performance and Motivation among EFL Students at Majmaah University. *Journal of Faculty of Education, Benha University*, 105 (1): 1- 34.

Appleton, J., Christenson, S. & Furlong, M. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45, 369-386.

Appleton, J., Christenson, S., Kim, D., & Reschly, A. (2006). Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of School Psychology*, 44, 427–445.

Arter, J. & McTighe, J (2001). *Scoring Rubrics in the Classroom: Using Performance Criteria for Assessing and Improving Student Performance*. CA: Corwin Press

Aydin, Z., & Yildiz, S. (2014). Using wikis to promote collaborative EFL writing. *Language Learning& Technology 18*(1), 160–180.

Azuma, R. T. (1997). A survey of augmented reality. *Presence: Teleoperators and Virtual Environments*, 6, 355-385.

Azuma, R. T. (2016). The most important challenge facing augmented reality. *Presence: Teleoperators and Virtual Environments*, 25(3), 234-238.

Beder, P. (2012). *Language learning via an android augmented reality system.* Unpublished master thesis, Blekinge Institute of Technology, Sweden.

Binhomran, K. & Altalhab, A. (2021). The impact of implementing augmented reality to enhance the vocabulary of young EFL learners. *The JALT CALL Journal*, *17*(1), 23-44.

Bitter, G.& Corral, A. (2014). The potential of augmented reality apps. *International Journal of Engineering Science Invention*, 3(10), 13-17.

Bond, M., & Bergdahl, N. (2022). Student engagement in open, distance, and digital education. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education.* (pp. 1-16). Springer.

Bozzelli, G., et al. (2019). An integrated VR/AR framework for user-centric interactive experience of cultural heritage: The

ArkaeVision project. *Digital Applications in Archaeology and Cultural Heritage,* 15, e00124.

Brown, H. D. (2001). *Teaching Principles: An Interactive Approach to Language Pedagogy* (2nd Ed.). San Francisco: San Francisco State University.

Chen, C. (2020). AR videos as scaffolding to foster students' learning achievements and motivation in EFL learning. *British Journal of Educational Technology, 51*(3), 657-672.

Chen, R., & Chan, K. K. (2019). Using augmented reality flashcards to learn vocabulary in early childhood education. *Journal of Educational Computing Research, 57*(7), 1812-1831.

Chen, D., Chen, M., Huang, T., & Hsu,W. (2013). Developing a mobile learning system in augmented reality context. *International Journal of Distributed Sensor Network*, 1- 8.

Chohan, S. R., & Hu, G. (2022). Strengthening digital inclusion through e-government: Cohesive ICT training programs to intensify digital competency. *Information technology for development*, 28(1), 16-38.8.

Costuchen, A. L., Darling, S., & Uytman, C. (2020). Augmented reality and visuospatial bootstrapping for second-language vocabulary recall. *Innovation in Language Learning and Teaching*, 1-12.

Di Serio, Á., Ibáñez, M. B., & Kloos, C. D. (2012). Impact of an augmented reality system on students' motivation for a visual art course. *Computers & Education*, 68, 586–596.

Dunleavy, M., Dede, C., & Mitchell, R. (2009). Affordances and limitations of immersive, participatory augmented reality simulations for teaching and learning. *Journal of Science Education and Technology, 18* (1), 7-22.

Dunleavy, M., & Dede, C. (2014). Augmented reality teaching and learning. In: J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (eds.), *Handbook of research on educational communications and technology* (pp. 735-745). Springer.

El-Bassuony, J. M. (2017). The role of the multisensory approach in developing English writing skills and metacognitive awareness of struggling writers at the preparatory stage. *Studies in Curricula and Teaching Methods*, (226), 41-95.

Eldegwy, A., Elsharnouby, T.& Kortam, W. (2018). How Sociable is Your University Brand? An Empirical Investigation of University Social Augmenters' Brand Equity. *International Journal of Educational Management*, 32 (5): 912–930.

Elf, N. (2016). Taught by bitter experience: a timescales analysis of Amalie's development of writer identity. In T. Cremin & T. Locke (Eds.), *Writer identity and the teaching and learning of writing* (pp. 215–231). Routledge.

Ellis, R. (2002). *The Study of Second Language Acquisition*. Oxford: Oxford University Press.

Elsayed, S. A., & Al-Najrani, H. I. (2021). Effectiveness of the augmented reality on improving the visual thinking in mathematics and academic motivation for middle school students. *Eurasia Journal of Mathematics, Science and Technology Education*, *17*(8), em1991.

Fernandez, M. (2017). Augmented-Virtual Reality: How to improve education systems. *Higher Learning Research Communications*, 7(1), 1–15.

Fredricks, J., Blumenfeld, P.,& Paris, A. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74* (1), 59-109.

Fredricks, J. & McColskey, W. (2012). The measurement of student engagement: A comparative analysis of various methods and student self-report instruments. In S. L. Christenson, A. L. Reschly & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 763-782). Boston, MA: Springer.

Fredricks, J. A., Wang, M.-T., Schall Linn, J., Hofkens, T. L., Sung, H., Parr, A., & Allerton, J. (2016). Using qualitative methods to develop a survey measure of math and science engagement. *Learning and Instruction*, *43*, 5–15.

Godwin-Jones, R. (2016). Augmented reality and language learning: From annotated vocabulary to place-based mobile games. *Language Learning and Technology, 20* (3), 9–19.

Graham, S. (2008). *Effective writing instruction for all students: Written for renaissance learning*. USA: Renaissance Learning, Inc.

Graham, S. (2019). Changing how writing is taught. *Review of Research in Education*, *43*(1), 277–303.

Graham, S.& Harris, K. R. (2013). Designing an effective writing program. In S. Graham, C. A. MacArthur,& M. Hebert (Eds.), *Best practices in writing instruction* (pp. 3–25). Academic Press.

Graham S., Liu K., Aitken A., Ng C., Bartlett B., Harris K. R.& Holzapel J. (2018). Balancing reading and writing instruction: A meta-analysis. *Reading Research Quarterly*, 53, 279–304.

Greenwood, A.T.& Wang, M. (2018). Augmented reality and mobile learning: theoretical foundations and implementation. In: Crompton H., Traxler J. (Eds), *Mobile Learning and Higher Education: Challenges in Context* (pp. 41-55). Routledge.

Gunn, T.& Hollingsworth, M. (2012). Improving Student Engagement with 21st Century Learning Practices, *Northwest Journal of Teacher Education*, 10 (1), Article 1.

Guthrie, J. T., Wigfield, A., & You, W. (2012). Instructional contexts for engagement and achievement in reading. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 601–634). Springer.

Helme, S., & Clarke, D. (2001). Identifying cognitive engagement in the mathematics classroom. *Mathematics Education Research Journal, 13*(2), 133–153.

Helwa, H. (2019). Using Mobile Augmented Reality (MAR) Applications to Improve Student Teachers' EFL Descriptive Writing Skills and Motivation Towards English Language. *The Educational Journal, Sohag Faculty of Education,* 64, 1-66.

Henrie, C.; Halverson, L.& Graham, C. (2015). Measuring student engagement in technology-mediated learning: A review. *Computers & Education*, 90, 36-53.

Huisinga, L. A., (2017). Augmented reality reading support in higher education: Exploring effects on perceived motivation and confidence in comprehension for struggling readers in higher education: unpublished doctoral dissertation, Iowa State University, Ames, Iowa.

Hussein, M., El shirbini, I., & Al Ashri, A. (2013). The effectiveness of writing conferences and peer response groups strategies on the EFL secondary students' writing performance and their self-efficacy. *Full-text ERIC Document*, No. ED540769.

Inman, James. (2001). At First Site: Lessons from Furman University's Center for Collaborative Learning and

Communication. Retrieved on December 28, 2017, from http://aw.co10state.edu/artic1es/inman2001.

Ives, S. et al. (2022). Students' Writing Engagement. In T. Hodges, *Handbook of Research on Writing Instruction Practices for Equitable and Effective Teaching*, IGI Global.

Jamali, S.S., Shiratuddin, M.F., & Wong, K.W. (2014). A Review of Augmented Reality (AR) and Mobile-Augmented Reality (mAR) Technology for Learning in Tertiary Education. *The International Journal of Learning in Higher Education, 20* (2). Available online at https://www.researchgate.net/publication/261429841.

Jeong, K. O. (2016). A study on the integration of Google Docs as a web-based collaborative learning platform in elf writing instruction. *Indian Journal of Science and Technology*, 9 (39), 1-7.

Jimerson, S., Campos, E.& Greif, J. (2003). Toward an understanding of definitions and measures of school engagement and related terms. *California School Psychologist*, 8, 7- 27.

Kamnoetsin, T. (2014). Social Media Use: A Critical Analysis of Facebook's Impact on Collegiate EFL Students' English Writing in Thailand" (2014). Seton Hall University Dissertations and Theses (ETDs). 2059.Available online at http://scholarship.shu.edu/dissertations/2059.

Karagozlu, D. & Ozdamli, F. (2017). Student Opinions on Mobile Augmented Reality Application and Developed Content in Science Class. *TEM Journal, 6*(4), 660-670.

Kesim, M.& Ozarslan, Y. (2012). Augmented reality in education: current technologies and the potential for education. *Procedia - Social and Behavioral Sciences*, 47, 297 – 302

Khoshnevisan, B., & Le, N. (2018, April). Augmented reality in language education: a systematic literature review. In: Wb. James, C. Cobanoglu (Eds.), *Proceedings of the Global Conference on Education and Research (GLOCER) Conference* (Vol. 2, pp. 57-71). University of South Florida-M3 Center Publishing. https://revistia.org/files/articles/ejed_v4_i2_21/Panagiotidis.pdf

Khoshnevisan, B. (2019). Teacher education meets emerging technologies: Augmented Reality (AR). *TEIS Newsletter*

Koç, Ö., Altun, E., & Yüksel, H. G. (2022). Writing an expository text using augmented reality: Students' performance and perceptions. *Education and Information Technologies,* 27(1), 845-866.

Laine, T.H. (2018). Mobile Educational Augmented Reality Games: A Systematic Literature Review and Two Case Studies. *Computers, 7*(19), 1- 28.

Lam, S.; Wong, B.; Hongfei Y.& Liu, Y. (2012). Understanding Student Engagement with a Contextual Model**.** In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 403- 419). Boston, MA: Springer.

Lee, J. (2021). EFL students' engagement, attitudes, and task participation in augmented reality mobile games and pleasure reading. *Multimedia-Assisted Language Learning,* 24(4), 75-106.

Lee, Y., Jang, B. G., & Conradi Smith, K. (2021). A systematic review of reading engagement research: What do we mean, what do we know, and where do we need to go? *Reading Psychology*, *42*(5), 1–37.

Lin, V., Liu, G. Z., & Chen, N. S. (2022). The effects of an augmented-reality ubiquitous writing application: A comparative pilot project for enhancing EFL writing instruction. *Computer Assisted Language Learning*, *35*(5-6): 989-1030.

Liou, H.H., Yang, S.J., Chen, S.Y. and Tarng, W. (2017), "The influences of the 2D image-based augmented reality and virtual reality on student learning", *Journal of Educational Technology and Society*, 20 (3):110-121.

Matcha, W., & Awang Rambli, D. R. (2011). Preliminary investigation on the use of augmented reality in collaborative learning. *Communications in Computer and Information Science*, 254(4), 189- 198.

McDougall, J., Readman, M., & Wilkinson, P. (2018). The uses of (digital) literacy. *Learning, Media and Technology*, 43(3), 263-279

Muñoz, H. (2017). *Supporting Technology for Augmented Reality Game-Based Learning*. Unpublished doctoral dissertation, University of Girona, Catalonia, Spain.

Myers, V. (2002). A Comparison of Descriptive Writing of First Graders Using Free choice Journaling versus Topical Journaling. (*An online ERIC database Full text No. ED 471384*).

Nunan, D. (2003). *Practical English Language Teaching.* Singapore: McGraw Hill.

Olim, S.& Nisi, V. (2020). "Augmented reality towards facilitating abstract concepts learning." In Entertainment Computing–ICEC 2020: 19th IFIP TC 14 International Conference, ICEC 2020, Xi'an, China, November 10–13, *Proceedings* 19 (pp. 188-204). Springer International Publishing.

Oshima, A., & Houge, A. (2007). *Introduction to academic writing.* (3rd edition). White Plains, N Y: Pearson Education, Inc.

Özçelik, N.; Yangin Ekşi, G.& Baturay, M. (2022). Augmented Reality (AR) in Language Learning: A Principled Review of 2017-2021. *Participatory Educational Research (PER), 9 (4): 131-152.*

Ozdamli, F. & Hursen, C. (2017). An Emerging Technology: Augmented Reality to Promote Learning. *iJET*, *12*(11), 121-137.

Parsons, S. A., Malloy, J. A., Parsons, A. W., Peters-Burton, E., & Burrowbridge, S. C. (2018). Sixth grade students' engagement in academic tasks. *The Journal of Educational Research*, *111*(2), 232–245.

Pekrun, R., and L. Linnenbrink-Garcia. (2012). "Academic Emotions and Student Engagement." In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement*, 259–282. Boston, MA: Springer.

Philp, J., & Duchesne, S. (2016). Exploring engagement in tasks in the language classroom. *Annual Review of Applied Linguistics*, 36, 50-72.

Redondo, B., Cozar-Gutierrez, R., Gonzalez-Calero, J. A., & Ruiz, R. S. (2019). Integration of augmented reality in the teaching of English as a foreign language in early childhood education. *Early Childhood Education Journal*, 48, 147-155.

Reeve, J. (2012). A self-determination theory perspective on student engagement. In S. Christenson, A. Reschly & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 149–172). Boston, MA: Springer.

Rice, J. W. (2007). New media resistance: Barriers to implementation of computer video games in the classroom.

Journal of Educational Multimedia and Hypermedia, 16(3), 249- 261.

Richards, J. C., & Renandya, W. A. (Eds.). (2002). *Methodology in language teaching: An anthology of current practice.* New York: Cambridge University Press.

Rojabi, A.; Setiawan, S.& Munir, A. (2023). Potentials and Challenges of Mobile Augmented Reality in the Metaverse for an Engaging Online Course. *MEXTESOL*, 47(4), 1-11.

Rostami, A. & Hoveidi, A. (2014). Improving descriptive writing skills using blog-based peer feedback. *International Journal of Language Learning and Applied Linguistics World (IJLLALW),* 5(2), 299-308.

Safar, A., Al-Jafar, A. & Al-Yousefi, Z. (2017). The Effectiveness of Using Augmented Reality Apps in Teaching the English Alphabet to Kindergarten Children: A Case Study in the State of Kuwait. *EURASIA Journal of Mathematics Science and Technology Education, 13*(2), 417-440.

Salem, F. (2017). Improving students' writing descriptive text using mind mapping teaching strategy of the tenth-grade students of SMA NEGERI 4 Kupang in academic year 2017/2018. *International Journal of Research, 5*(12), 147-154.

Sanabria, J. & Arámburo-Lizárraga, J. (2017). "Enhancing 21st-century skills with AR: Using the gradual immersion method to develop collaborative creativity." *Eurasia Journal of Mathematics, Science and Technology Education,* 13(2), 487-501.

Santanatanon, T.& Chinokul, S. (2022). Exploring and Analysis of Student Engagement in English Writing Grammar Accuracy Based on Teacher Written Corrective Feedback. *PASAA*, 63: 35- 65.

Santos, M. *et al.* (2016). Augmented reality as multimedia: the case for situated vocabulary learning. *Research and Practice in Technology Enhanced Learning*, 11, Article no. 4

Saud, S., Jufri, A., Rahman, M.A. & Salam. (2014). Learning Devices Development on Descriptive Writing for Foreign Language Based on Berlo's SMCR Communication Model of Secondary School Student. *Journal of Language Teaching and Research, 5*(5), 1033-1041.

Scott, S. (2008). *Writing skills revisited*. New York: Strategic Book Publishing

Shelton, B. E., & Hedley, N. R. (2002). Using augmented reality for teaching Earth-Sun relationships to undergraduate geography students. *The First IEEE International Workshop Augmented Reality Toolkit*, Darmstadt, Germany, pp. 8.

Skinner, E.; Kindermann, T. & Furrer, C. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement*, 69, 493-525.

Skinner, E. A., & Pitzer, J. R. (2012). Developmental dynamics of student engagement, coping, and everyday resilience. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 21-44). Boston, MA: Springer.

Solak, E.& and Cakir, R. (2016). Investigating the Role of Augmented Reality Technology in the Language Classroom. *Croatian Journal of Education, 18* (4), 1067-1085. (An online ERIC database full text No. *ED752959*).

Sommerauer, P., & Müller, O. (2018). Augmented Reality for Teaching and Learning-a literature Review on Theoretical and Empirical Foundations. *Twenty-Sixth European Conference on Information Systems (ECIS2018), Portsmouth, UK*, 2 (1), 31-35.

Specht, M., Ternier, S., & Greller, W. (2011). Mobile augmented reality for learning: A case study. *Journal of the Research Center for Educational Technology*, 7(1), 117-127.

Squire, K. D., & Jan, M. (2007). Mad City Mystery: Developing scientific argumentation skills with a place-based augmented reality game on handheld computers. *Journal of Science Education and Technology, 16*(1), 5-29.

Stroud, R. (2013). Increasing and maintaining student engagement during TBL. *Asian EFL Journal*, 59, 28-57.

Ternier, S., Klemke, R., Kalz, M., Ulzen, P., & Specht, M. (2012). AR learn: augmented reality meets augmented virtuality. *Journal of Universal Computer Science, 18*(15), 2143-2164.

Ting, H. Y. (2015). The Effects of Applying Augmented Reality on Fourth-Grade Students' Writing and Attitude. Unpublished master dissertation. National Taipei Education University.

Tiwari, Ch., Bhaskar, P.& Pal, A. (2023). Prospects of augmented reality and virtual reality for online education: a scientometric view. *International Journal of Educational Management,* 37 (5):1042-1066.

Tompkins, G. (2010). *Teaching writing: Balancing process and produc*t (5th ed.). New York: Pearson.

Troia, G., Harbaugh, A., Shankland, R., Wolbers, K.& Lawrence A. (2013). Relationships between writing motivation, writing activity, and writing performance: Effects of grade, sex, and ability. *Reading and Writing, 26* (1). 17-44.

Tsai, C. (2020). The effects of augmented reality to motivation and performance in EFL vocabulary learning. *International Journal of Instruction, 13*(4), 987-1000.

Wang, D. (2005). Urban Splendor: Selected Writings of Wang. *A Collection of Essays Discussing the History of Modern Literary Creation in Three Cities: Hong Kong, Shanghai, and Taipei*, (7), Cosmos Books.

Wang, M.-T., Fredricks, J., Ye, F., Hofkens, T., & Linn, J. S. (2017). Conceptualization and assessment of adolescents' engagement and disengagement in school. *European Journal of Psychological Assessment*, 35(4), 592-606.

Wang, M. T., Degol, J. L., & Henry, D. A. (2019). An integrative development-in-sociocultural-context model for children's engagement in learning. *American Psychologist*, 74(9), 1086-1102.

Wang, Y. H. (2017). Exploring the effectiveness of integrating augmented reality-based materials to support writing activities. *Computers& Education, 113*, 162-176.

Wedyan, M., Falah, J., Elshaweesh, O., Alfalah, S.& Alazab, M. (2022). Augmented reality-based English language learning: importance and state of the art. *Electronics*, 11(17), 2692.

Wen, Y. (2020). Augmented reality enhanced cognitive engagement: Designing classroom-based collaborative learning activities for young language learners. *Education Technology Research and Development*, 69, 843-860.

Wentzel, K. (2012). "Part III Commentary: Socio-Cultural Contexts, Social Competence, and Engagement at School." In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of Research on Student Engagement*, 479–488. Boston, MA: Springer.

Wojciechowski, R., & Cellary, W. (2013). Evaluation of learners' attitude toward learning in ARIES augmented reality environments. *Computers & Education*, 68, 570-585.

Wu, M. (2019). The applications and effects of learning English through augmented reality: a case study of Pokémon Go. *Computer Assisted Language Learning*, *34* (5- 6), 778- 812.

Yuen, S. C., Yaoyuneyong, G., & Johnson, E. (2011). Augmented Reality: An Overview and Five Directions for AR in Education. *Journal of Educational Technology Development and Exchange, 4*, 119–140.

Zaini, A. & Mazdayasna, G. (2015). The impact of computer-based instruction on the development of EFL learners' writing skills. *Journal of Computer Assisted Learning,* 31(6), 516-528.

Zhang, D., Wang, M., & Wu. J.G. (2020). Design and implementation of augmented reality for English language education. In G. Vladimir (Ed.), *Augmented Reality in Education*. Springer International Publishing.