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Impact of Augmented Reality App on EFL Young Learners' Vocabulary Learning Engagement in a Seamless Learning Environment

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Abstract: Despite that Augmented Reality (AR) has been integrated into English as a Foreign Language (EFL) instruction, few studies have been conducted, focusing on AR -supported vocabulary learning both inside and outside the classroom at a primary level. Against this background, this quasi-experimental study aimed to examine the impact of an AR app – VocabGo on primary students' vocabulary learning engagement under the 'pedagogical framework of AR-supported vocabulary acquisition in a seamless learning environment' in the context of a private school in Shenzhen, China. Mixed research methods were adopted. The study lasted 22 weeks. Seventy-two Grade 4 students from a private school in Shenzhen were randomly divided into three groups (N = 24 per group). Group 1 used VocabGo both in-class and out-of-class, Group 2 used VocabGo in-class only, and Group 3 used VocabGo out-of-class only. Data collection involved student pre- and post-engagement questionnaires, student focus group interviews, and log data. The research findings show that students in Group 1 outperformed significantly those in Group 2 and Group 3 in learning engagement in cognitive, behavioural, emotional and agentic dimensions. This indicates that AR-supported vocabulary acquisition in a seamless learning environment is conducive to students' vocabulary learning engagement in all dimensions. This study contributes to the literature in substantiating the effectiveness of AR-supported vocabulary learning in a seamless learning environment for young learners in an EFL context, particularly in Mainland China.

Keywords: Augmented reality, English as a Foreign Language (EFL), vocabulary learning, engagement

1. Introduction

Vocabulary knowledge plays a crucial role in successful language comprehension and use (Nation & Webb, 2011). English as a Foreign Language (EFL) vocabulary learning across different contexts in a seamless learning environment has gained substantial recognition. A 'seamless learning' refers to a learning process that happens across various contexts, including formal and informal settings, virtual and physical spaces and individual and social spaces (Wong & Looi, 2021). Recent studies on augmented reality (AR)-supported English as a second language (ESL) vocabulary learning in a seamless learning environment have shown much promise in enhancing learners' motivation, cognitive engagement and outcomes (Wen, 2021; Wu et al., 2021). An investigation conducted by Wu et al. (2021) found that AR-assisted vocabulary learning activities were perceived as more enjoyable and stimulating by Chinese EFL learners, leading to higher engagement and intrinsic motivation levels. Wen (2021) reported that students in the experimental group outperformed those in the control group in

cognitive engagement due to longer time spent on getting used to AR-supported ESL language learning.

Huang et al. (2021) in their review study on AR and VR applications in language education found that the studies have focused more on learning motivation that have led to increased learning outcomes and less on engagement and satisfaction, which is echoed by the most recent review on AR-supported language learning by Shadiev and Liang (2023). In addition, other challenges and concerns about AR-supported vocabulary learning remain such as the majority of studies having been conducted in classrooms or laboratories, the learning activities having been prescribed by the researchers and teachers where learners have had limited opportunities to consolidate and use the newly learned words outside the classroom leveraged by AR technologies, existing studies having been generally conducted over a short term, rarer studies having been conducted in EFL contexts, like China.

In view of these issues, this study aimed to investigate the impact of an AR app - VocabGo AR on EFL pupils' vocabulary learning engagement both inside and outside the classroom in a primary school in Mainland China. Next section presents the research design and the design of the VocabGo app.

2. This study

2.1 Design of the VocabGo app

The AR app named VocabGo was newly developed by the first author and her research team to enhance ESL young learners' vocabulary learning across different settings in a seamless learning environment. Premised on Mayer (1997)'s generative theory of vocabulary learning with technology, dual-coding theory (Paivio, 2014), second language acquisition (Nation, 2006) and the concept of seamless learning (Wong & Looi, 2011), the design of the AR app focuses on enhancing learners' vocabulary learning using AR identified real-world objects/picture with triggered vocabulary in authentic learning environments across different settings.

VocabGo app runs on mobile devices with iOS and Android systems. It consists of four modes: (1) 'Find' mode; (2) 'Go' mode; (3) 'Explore' mode; and (4) 'Challenge' mode (see Song et al., 2023 for detailed explanations). The teacher can define the words within the curriculum unit and input them into VocabGo before students' learning.

Considering the integration of AR into EFL young learners' vocabulary learning in China is still in its infancy, in this study, students only allowed to use 'Find' mode and 'My Collection' both inside and outside the classroom. In 'Find' mode, students can scan the real objects with identified newly learned English words included in the current curriculum unit; and in 'My Collection', the scanned objects using 'Find' mode can be automatically saved in the category of pictures with newly learned words (picture-word cards) in the current learning unit.

2.2 Pedagogical framework

The pedagogical design aims to examine learners' engagement in vocabulary learning both inside and outside the classroom supported by the AR app – VocabGo in primary schools in Hong Kong (refer to Figure 1). The design consists of activities where the VocabGo app was adopted to support both in and out-of-class activities. To be specific, in-class activities aim to engage learners in the first three stages of vocabulary acquisition (a) encounter a new word; (b) get its form; and (c) understand its meaning with the form supported by 'Find' mode on VocabGo. Out-of-class activities in real-life settings aim to involve learners in consolidating the word, and using the word using 'Find' mode, and 'My Collection' on the VocabGo app.

2.3 Quasi-experimental design

This quasi-experimental study adopted mixed research methods were adopted, lasting 22 weeks. Seventy-two Grade 4 students from a primary school in Mainland China were randomly

divided into three groups (N = 24 per group). Group 1 used VocabGo both in-class and out-of-class, Group 2 used VocabGo in-class only, and Group 3 used VocabGo out-of-class only. All groups of students use the same study time in and out of class no matter whether they used the VocabGo or not. Teachers and parents monitored their study time. Data collection involved student pre- and post-engagement questionnaires on behavioural, cognitive, emotional and agentic dimensions with 18 items on a 5-point Likert scale (Zainuddin et al., 2020), student focus group interviews, and log data (number of picture-word cards). The research procedure is presented in Figure 2.

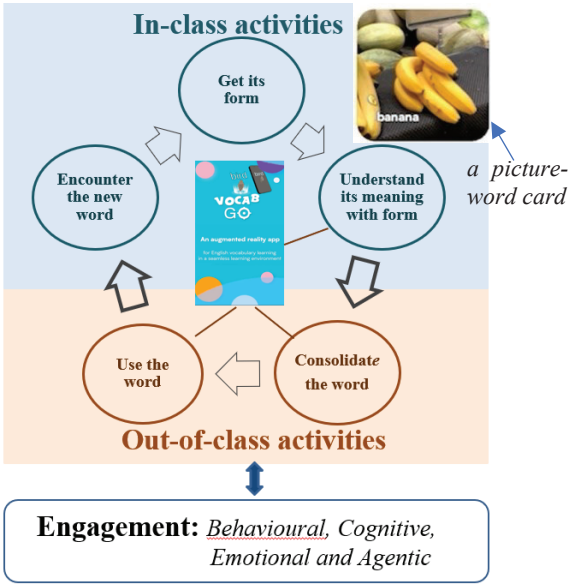

Figure 1. Pedagogical framework.

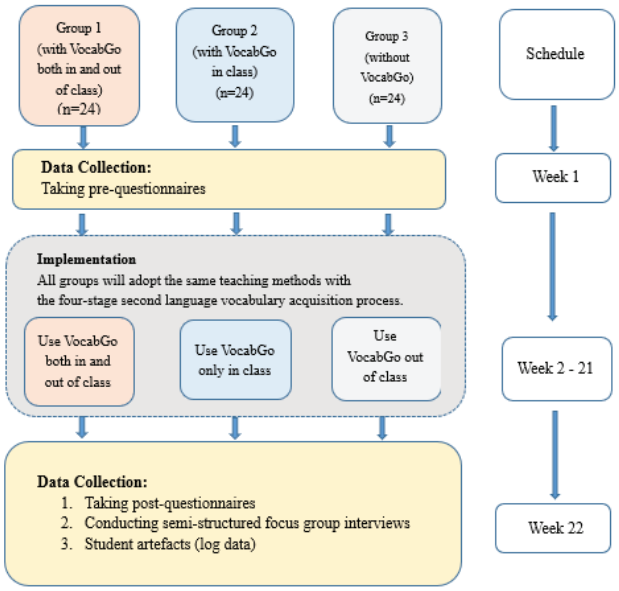

Figure 2. Research procedure.

Both qualitative and quantitative data analysis methods were adopted.

3. Results

The post-questionnaire results showed that there were significant differences in engagement levels across all dimensions between Group 1 and Groups 2 and 3 with Group 1 having the highest engagement level. The results also showed that there was a significant difference between Group 2 and Group 3 with Group 2 having a higher engagement level.

The focus group interview data analysis results indicate that students in Group 1 reported their most enjoyable and engaging experiences than those in the other two groups.

In terms of the number of picture-word cards collected in 20 weeks, Group 1 collected 6392, Group 2 collected 5172 and Group 3 collected 4861 picture-word cards.

4. Discussion

The findings of this study indicate that AR-supported vocabulary learning in a seamless learning environment is conducive to young learners' learning engagement in a EFL context such as Mainland China, which contributes to the literature. Future research will focus on the impact of the AR app – VocabGo on students' vocabulary learning outcomes, and the relationship between learning engagement and outcomes to inform curriculum design.

Reference *(more references will be included in the presentation due to space limitation)*

Zainuddin, Z., Shujahat, M., Haruna, H., & Chu, S. K. W. (2020). The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system. *Computers & Education*, *145*, 103729.