FOREIGN LANGUAGES AND VIETNAMESE

EFL STUDENTS' VOCABULARY RETENTION IN SELF-DIRECTED MOBILE LEARNING ENVIRONMENT: THE 'ANYTIME, ANYWHERE' PARADOX

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ABSTRACT: Vietnamese university students are employing self-directed learning (SDL) and mobile English learning resources (MELR) to reach their English language proficiency goals. However, MELR have yet to be sufficiently theorized with regard to the pedagogical potential of long-term vocabulary retention. Grounded in Activity Theory (AT), this mixed-method study investigates systematic factors affecting vocabulary retention and vocabulary knowledge being retained. The data were first collected quantitatively through a survey on 388 EFL undergraduates, then qualitatively from semi-structured interviews, focus groups, and individual learning journals. There revealed an "anytime, anywhere" paradox. While mobile learning tools enabled learning and positive structures, they also reinforced deleterious elements. Besides, the hierarchy of retention pyramids vocabulary dimensions. MELR supported receptive vocabulary retention, most especially the retention of spoken and contextual meaning, but not the productive retention of lexical dimensions such as usage constraints and morphology. It was concluded that vocabulary retention in an SDL context is not an isolated cognitive act but a socially embedded activity dependent on the alignment with technological affordances, learner environmental self-regulation, and community scaffolding to bridge the gap between receptive acquisition and productive mastery.

KEY WORDS: Activity theory; MALL; mobile English learning resources; retention; self-directed learning; vocabulary.

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1. Introduction

Vocabulary knowledge has long been recognized as a fundamental component of second and foreign language proficiency, which can enable students to understand input, express meaning, and participate effectively and meaningfully in communication. According to Wilkins (1972), while grammar gives language its structural skeleton, vocabulary fills in the rest of the needed components. In most EFL (English as a Foreign Language) settings, however, vocabulary retention remains a major challenge, especially in higher education, where academic literacy and autonomous learning are emphasized (Wang et al., 2020).

In response, MALL has emerged as a prominent approach, allowing EFL students to access MELR for vocabulary exposure, review, and practice without time and space restrictions, offering them flexible learning opportunities (Chen et al., 2020). Meta-analytic evidence indicates that mobile learning positively impacts students' vocabulary outcomes, particularly receptive knowledge such as word form recognition and meaning comprehension (Chen et al., 2020; Lin & Lin, 2019). Consequently, MALL is widely regarded as an effective supplement to traditional classroom instruction.

Despite the growing body of research regarding MALL, several issues remain underexplored. Although MALL is often associated with learner-centered activities, most research has anchored itself in a more formal, teacher-centered paradigm, where mobile instruments are used to complete structured

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tasks in controlled conditions (Berge & Muilenburg, 2013; Lai et al., 2022). This contrasts with contemporary language contexts where self-directed learning (SDL) plays a central role, in which students initiate learning activities, select learning tools, set their own goals, and regulate their own learning activities. However, empirical investigations into how students use MELR in real-life, unmonitored situations and the associated learning outcomes of vocabulary retention remain limited.

Moreover, vocabulary retention in SDL contexts is shaped by multiple interacting factors, including the tool itself, learners' motivation and self-regulatory capacity (Gholizadeh & Rahimi, 2023; Guo et al., 2022), the affordances and constraints of mobile technologies (including emerging AI-driven feedback) (Ali et al., 2024; Sato et al., 2013, as cited in Sato et al., 2020), the social influence of peers and teachers (Guo et al., 2022), and the contextual conditions of mobile learning, such as learning in short, interrupted periods of time (Berge & Muilenburg, 2013; Yu & Trainin, 2022). Without considering these interrelated elements, existing research may provide a partial understanding of vocabulary retention.

Furthermore, another concern in MALL research relates to the nature of retention itself. While short-term vocabulary gains are frequently reported (Ali et al., 2024; Xodabande et al., 2022), long-term retention is far less consistently examined (Lin & Lin, 2019). The reliance on short-term post-tests makes it difficult to separate real, permanent lexical gains from temporary gains influenced by novelty effects of new technologies (Stockwell, 2013). As a result, there is insufficient understanding of how vocabulary knowledge dimensions are learned through MELR and consolidated into long-term memory, particularly when learning is self-directed and fragmented across time and contexts.

These constraints point to a theoretical gap. Although sociocultural and cognitive perspectives have informed aspects of MALL research, relatively few studies have adopted AT as a comprehensive framework for examining self-directed mobile vocabulary learning. Via the lens of AT, learning is conceptualized as a mediated, socially situated activity system involving subjects, tools, objects, rules, community, and division of labor (Engeström, 2001). AT particularly highlights systemic contradictions that may shape learning processing. Most MALL studies, however, remain outcome-oriented, providing limited insight into the mechanisms underlying vocabulary retention.

In the Vietnamese EFL higher education context, the need to address these gaps is particularly evident. University students are increasingly required to engage in SDL to meet proficiency requirements (Tuan, 2021), especially in large classes with limited individualized support. While MELR have been widely used, their role in supporting long-term vocabulary retention has not been sufficiently examined or theoretically framed.

Therefore, this study was conducted to address these gaps by investigating vocabulary retention in self-directed mobile learning environments through the lens of AT. The study aimed to provide a nuanced understanding of how vocabulary retention is mediated in real-world SDL practice. It also hoped to address critical gaps in the MALL literature and offer theoretically grounded, context-sensitive insights for enhancing vocabulary learning in higher education settings.

2. Literature Review

Vocabulary knowledge and retention

Vocabulary learning is often seen as the first step on the path to language mastery, which allows students to understand input, convey meaning, and engage in constructive discussions (Nation, 2001; Schmitt, 2010). There is a range of different aspects of vocabulary knowledge, i.e., form, meaning, and use (Nation, 2001), and these can be broken down into receptive and productive dimensions. While receptive vocabulary refers to the ability to recognize and understand words, productive vocabulary refers to the ability to recall and use them accurately in communication (Schmitt, 2010).

Vocabulary retention extends beyond form-meaning recognition to include deeper knowledge, such as a word's grammatical behavior, collocation, and contextual appropriateness (Nation, 2001). However, developing and retaining such knowledge remains a persistent challenge for EFL learners,

particularly in higher education contexts where autonomous learning is increasingly emphasized (Wang et al., 2020; Yu & Trainin, 2022).

MALL and vocabulary retention

MALL has gained prominence due to its effectiveness in promoting vocabulary acquisition (Chen et al., 2020; Lin & Lin, 2019). Mobile technologies can offer students opportunities for flexible, personalized, and frequent exposure to vocabulary across formal and informal settings. Research consistently reports positive impacts of mobile learning interventions on vocabulary outcomes, especially in receptive knowledge (Chen et al., 2020; Lin & Lin, 2019). However, much of the existing research focuses on short-term impacts of MALL and also teacher-controlled learning environments (Lai et al., 2022). The reliance on post-intervention testing makes it difficult to distinguish long-term retention from short-term or novelty effects (Lin & Lin, 2019; Stockwell, 2013). As a result, there is limited understanding of how vocabulary knowledge is sustained over time, especially in self-directed contexts outside the classroom.

SDL within the MALL context

SDL refers to students' ability to take initiative, with or without the help of others, to identify learning needs, set objectives, select resources and strategies, and evaluate outcomes (Knowles, 1975). In MALL contexts, SDL is particularly supported by the ubiquity and connectivity of mobile devices, which provide the ideal infrastructure for "anytime, anywhere" engagement (Lai et al., 2022) and construct personalized "learning ecologies" (Shalini Roy & Gandhimathi, 2025).

Recent studies show that mobile learning environments facilitate both formal and informal learning (Shalini Roy & Gandhimathi, 2025), allowing students to engage with authentic resources and utilize AI-driven tools for feedback, and customize learning content to their specific proficiency levels and interests. However, SDL in mobile contexts is not solely an individual activity. Social factors such as peer interaction and teacher support can influence motivation and persistence (Guo et al., 2022; Kohnke et al., 2020). However, the roles of such factors in long-term lexical retention remain underexplored.

Moreover, the defining feature of mobile learning to support learning in fragmented time introduces cognitive challenges. While micro-learning can increase exposure, it may also limit the depth of processing and increase susceptibility to distraction (Dağdeler et al., 2020; Sage et al., 2020). This may lead to the tension inherent between the affordances and constraints of mobile technologies, which has not been sufficiently conceptualized (Gholizadeh & Rahimi, 2023).

Generative AI and informal platforms as new tools for vocabulary learning

Recent developments in generative artificial intelligence (AI) and digital platforms have expanded the range of tools available for vocabulary learning. AI-based tools can provide contextualized input and individualized feedback, and opportunities for language production, which has turned them into active learning companions (Ali et al., 2024). At the same time, informal platforms such as YouTube and TikTok offer students with multimodel input that supports incidental vocabulary learning via authentic environments (Arndt & Woore, 2018). Despite the findings of these advancements, the literature has not yet provided a systematic account of how such tools are integrated into coherent SDL practices, nor how they collectively influence long-term vocabulary retention (Lai et al., 2022; Wang et al., 2020).

AT as an integrative analytical framework

AT defines learning as a mediated activity involving a combination of the subject, tools, object, rules, community, and division of labor (Engeström, 2001). It emphasizes the systemic tensions and contradictions, such as those between learning goals and digital distraction, or learner autonomy and technological dependence (Ali et al., 2024), which may drive adaptive changes in learning practices. Despite its relevance, AT has rarely been applied in MALL studies to investigate vocabulary learning in self-directed environments (Engeström, 2001). Much of the existing research has focused on isolated variables and learning outcomes rather than on the broader system of interactions that can influence

vocabulary retention (Berge & Muilenburg, 2013). Therefore, the mechanisms underlying vocabulary learning and retention in self-directed mobile environments remained insufficiently understood.

Research gaps

Overall, the literature reveals several gaps. First, studies in MALL predominantly emphasize short-term outcomes, such as vocabulary size and test scores, while giving limited attention to long-term retention and underlying mechanisms (Lin & Lin, 2019). Second, the literature on self-directed and self-regulated learning tends to focus on cognitive and motivational factors, while paying insufficient attention to the complex interplay between learners, tools, and social contexts. Third, few studies adopt a comprehensive, holistic, and theoretically robust approach to examining how these elements interact within a unified system.

Additionally, mobile learning has been recognized to favor receptive vocabulary development over productive use (Lin & Lin, 2019; Yu & Trainin, 2022), leaving the transition from recognition to active use underexplored. These gaps indicate the need for a system-level investigation of vocabulary retention in self-directed mobile learning environments. Therefore, this study adopts AT to examine how the elements of learners, tools, community, and context interact to shape vocabulary retention in SDL with MELR.

3. Methodology

Research Design

This study employed a mixed-methods model using a sequential explanatory design to examine EFL students' vocabulary retention while using SDL with MELR. This approach complements the breadth of quantitative data with the contextual and explanatory depth of qualitative data.

The research unfolded in two phases. Phase 1 involved the completion of a quantitative survey by EFL students and teachers. The findings from phase 1 provided information for the purposive sampling and instrument design for phase 2, which entailed the collection of qualitative data via semi-structured interviews, focus group discussions, and learning journals. The use of multiple qualitative sources in addition to the quantitative data supports the validity, reliability, and trustworthiness of the findings.

Research setting and participants

The study took place at Faculty of Foreign Languages, Industrial University of Ho Chi Minh City, which offers an accredited program of Bachelor of Arts in English Language. The teaching environment is typified by large class sizes with an average of over 40 students per class. According to the regulated syllabi, students must complete a given number of self-study hours. However, how the requirement is practiced and fulfilled is infrequently monitored or enforced. This has made SDL differ among the students in the program, despite its essential role in students' language development and proficiency.

The study included two groups of participants: EFL teachers and students. During the quantitative phase, 509 undergraduate EFL students of all four academic years, aged from 18 to 24, participated in the study. Among the 388 valid responses, most participants (72.3%) reported having studied English for more than 10 years, and the majority (72.4%) rated their English proficiency as neutral on a 5-point scale, with smaller proportions reporting higher or lower levels. Besides, most students (72%) self-reported their vocabulary knowledge as neutral, and there was little variation among the rest. They were sampled using non-probability convenience sampling across all four levels of the undergraduate program, from the first to the final year. In the qualitative phase, 24 students, out of the valid 388 respondents, were selected through purposive sampling. The selection criteria included consideration of academic year and levels of motivation and SDL readiness, allowing for the inclusion of diverse learner profiles and perspectives. However, two participants subsequently withdrew during the learning journal stage. In addition, 57 EFL lecturers from the same institution completed a teacher questionnaire capturing their perspectives on instruction related to SDL. The majority of the teachers (93%) were employed as full-time staff, and approximately 50% reported having more than seven years of teaching experience at the institution.

Instruments and data collection

The data were collected from end of December of 2024 to April of 2025, using four main tools. To begin with, questionnaires were distributed electronically to the teachers and students. The student questionnaire included Likert scale items designed to capture SDL internal and external drivers, patterns of MELR usage, and vocabulary retention. The teacher questionnaire captured the pedagogical roles and practices to support students' SDL. Second, the students' learning journals were collected from 24 volunteer participants, who were documented over a span of 7 weeks. During the data collection period, two students dropped out. The journal entries captured the date, the number of minutes spent learning, the focus of learning, the MELR used, and the vocabulary knowledge the students learned. The learning journals provided data on the students' strategies and learning activities over time. The third tool was the semi-structured interviews, each of which was conducted online within approximately 30 minutes. In order to capture the students' experiences adequately, the interviews were conducted in Vietnamese to avoid any language restrictions. The interviews focused on students' experiences, strategies, and attitudes on vocabulary learning through MELR. The fourth tool was four focus group discussions, which were designed to promote and capture SDL participant collective reflection and the body of SDL practices, experiential interaction, and reflection. At the students' convenience, three student groups agreed to join the on-site discussions, while one group met online; each discussion lasted one hour. The timeline of instrument validation, pilot testing, and data collection is presented in Table 1 below:

Table 1. *Timeline of instrument validation, pilot testing, and data collection for the study*

Timeline	Researcher's activities	Research output
Week 0	Instrument validation and pilot testing	Pilot data
Week 1	Administering student questionnaire	Student survey data
Week 1-4	Administering teacher questionnaire	Teacher survey data
Weeks 2–3	Selecting qualitative participants	Participant profiles
Week 4	Obtaining consent and providing instructions for learning journals	Consent forms
Weeks 5–11	Collecting weekly learning journals documenting students' SDL of RV learning using MELR	Journals entries
Weeks 5–11	Conducting semi-structured interviews (following the schedules suggested by the students)	Interview transcripts
Weeks 13–15	Conducting focus group discussions (following the schedules arranged by the students in each group)	Focus group transcripts

Data analysis

Quantitative data were processed utilizing SPSS version 30. For each data set, descriptive statistics (mean and standard deviation) were used to examine general patterns. One-sample t-tests were used to evaluate whether the mean value of a given variable equaled the neutral value, and Cronbach's alpha was calculated to examine scale reliability and the internal consistency of the items in each scale of the questionnaire.

All qualitative data from the interviews, focus groups, and learning journals were translated into English and fully transcribed. Using NVivo version 15, the data were analyzed by inductive-deductive thematic analysis. Coding was conducted based on the components of second-generation AT, which include Subject, Tools, Object, Rules, Community, and Division of Labor. In addition to these elements, the other components of SDL and MELR were intentionally taken into account during coding. This framework helped systematically analyze the contact and interplay among individual, technological, and sociocultural factors.

Besides, to ensure anonymity while maintaining analytical clarity, a coding system was applied to identify participants in the qualitative data. Each code reflects the participant's profile based on their academic level, grouping category, and individual identifier. For example, the code S3.2.1 refers to a student participant (S), in the third year of study (3), belonging to Group 2 (2) and identified as the first participant within that subgroup (1).

4. Findings and Discussion

4.1. Findings

4.1.1. Factors affecting EFL students' vocabulary retention

According to the quantitative data, vocabulary retention resulting from SDL via MELR was influenced by motivational, content-related, and tool-related constructs. The strongest constructive factors were the students' internal drives and the pertinence of the content. Most students emphasized the motivation to improve their language skills, and even 84.3% felt positively or very positively motivated to retain the words. This was followed by two content-related factors, namely interest in the lesson and vocabulary relevance to daily activities, which were also highly rated, with 82.2% and 81.9%, respectively. Additionally, 77.0% of students reported that test-related motivation supported vocabulary retention.

Regarding tools, 77.5% of students reported that access to a variety of MELR supported their vocabulary retention, while 73.4% found the space-repetition features of the tools helpful. The quality of the learning materials was also rated positively by 73.2% of the participants. However, some negative factors were identified. Approximately 20.5% of the students reported that digital distractions, such as notifications, negatively affected their learning. Only 53.6% perceived the digital environment as supportive of focus.

Qualitative data further revealed that vocabulary retention was associated with the employment of learning strategies and consistency of students' study habits. The participants in the study described the necessity of revising vocabulary to transfer it from short-term to long-term memory. They frequently mentioned Spaced Repetition Systems (SRS) as an effective strategy. One stated, "After recording the words, I apply spaced repetition to engrain them into my memory" (S1.2.3, Journal). Another described a strategy of temporal spacing and said, "I extend the review gaps gradually so I remember longer" (S2.2.2, Focus group). Others described the same phenomenon, saying, "spaced repetition helps with retention" (S1.1.2, Focus group). Student S3.2.2 also described using strategies to review materials in a week to review and master previously learned vocabulary (Interview).

The students also emphasized the importance of contextual learning, reporting that they were able to remember words more easily "when they are in context" (S4.2.3) and that they tried to "learn words in context to remember them better" (S3.2.2, Focus group). Some students reported using output-based strategies, as one student noted, "If I only learn the word… I remember about 30–40%… If I use the word, the retention is definitely higher" (S2.1.2, Focus group). To remember words through usage, they used various inventive micro-tasks, including the insertion of new words into a "joke of the day" (S1.1.1; S1.1.3, Focus group), planning by writing definitions prior to English words (S1.1.1, Interview), using AI to "create a short paragraph" with the target words (S1.1.1, Interview), or teaching others, "I tutor others. Teaching helps me revise and retain vocabulary. While describing or explaining to students or peers, I personally self-reinforce the vocabulary" (S1.1.2, Focus group).

The qualitative data also suggested a connection between retention outcomes and the consistency of study habits. The students emphasized the benefits of study habits to be "significant… if applied consistently over time" (S4.1.1, Focus Group), which could lead to estimated retention rates of "up to 70-80%" (S4.1.2, Focus Group). Therefore, success could be attributed to regular routines, as a student noted, "thanks to consistent use," they retained more vocabulary (S4.2.1, Journal). In contrast, they described "low effectiveness" (S2.2.1, Journal) when they "spent 10-15 minutes a day" and described the same when they "spent little time… and couldn't focus" (S1.2.2, Journal).

Moreover, factors related to the tools were highlighted. The students reported that tools that provided multisensory learning supported vocabulary retention. When describing the combination of texts, graphics, and audio, one student said, "this multi-modal approach helps me remember well" (S4.1.3, Focus group) and described the process as "easier" when he could "see images or interact more" (S1.1.2, Interview). The students particularly appreciated "visual dictionaries" with "pictures that are nice and memorable" (S4.1.1, Focus group). In addition, one student remarked that the app The Coach uses AI to score their pronunciation (S1.1.1, Focus group), and another one appreciated the combination of images, examples, and pronunciation, which "made it easy to visualize" (S2.2.1, Journal).

The automation features of MELR, such as automated messages and reminders, were also noted to be helpful: "The app reminds me to review at the right time" (S1.2.3, Focus group). Some students particularly acknowledged the effectiveness of such a tool as TFlat because it "reminds me the next day" (S4.2.1, Focus group) and "sends us reminders" (All, Focus group). Besides, review sets and gamification features were reported to help students retain what they learned. They mentioned using "flashcards for learned words" (S4.2.1, Journal) and "vocabulary puzzle game[s]" (S3.1.2, Focus group) to aid their memory. Retention was also found to be promoted when MELR anchored content in relevant and authentic sources. One student recalled, "If the word comes from a topic I studied, I remember it better" (S4.2.1, Focus group). Another noted that they listened to "BBC Learning English to understand vocabulary in real-life contexts" (S4.2.1, Journal). The motivational effect and the content facilitating the encoding of new vocabulary, the use of "images, color, and sound", was also noted (S4.1.3, Interview).

Finally, from a social perspective, peer interaction and teacher support were mentioned. Some students reported increased motivation through peer influence. For instance, one participant stated, "Initially, I felt down. But my mate would tell me to study every single day, and because of that, I continued my learning" (S1.1.3, Focus group). Another participant mentioned peer pressure as a source of motivation, stating, "I also look at other students and think, 'Why can they do it but I can't?' For me, it's crucial" (S1.1.2, Focus group). The teachers, on the other hand, were noted to play a role of corrective mediation. One student mentioned this division of labor: "The teacher's role is to give feedback and correction, while I like to take the lead in planning and controlling the objectives" (S3.1.3, Interview). The teacher participants acknowledged this alignment, as 90% reported that their involvement by suggesting materials or embedding MELR tools had a beneficial impact on the students' progression in learning and retention of vocabulary

Nonetheless, the study's findings revealed that the tools used for learning could act as both an aid and an impediment to focus. The students contrasted the stability of the traditional tools with the unpredictability of the digital ones, noting that "learning with pen and paper may help memorize words better, while learning with MELR can be distracting" (S1.1.2, Focus group), and "I mainly study using books offline because I get distracted easily when using the internet" (S3.2.2, Journal). . Another mentioned the distraction with the remark, "I get distracted easily while using my phone. Notifications make me forget to study vocabulary" (S3.2.2, Journal). This "attentional drift" was especially concerning when students used apps that also served as entertainment services, such as TikTok. They shared that "I might start searching for a word but end up scrolling TikTok and forget what I was doing" (S3.2.2, Focus group).

4.1.2. Findings on the vocabulary knowledge EFL students retained via SDL with MELR

The quantitative results indicate that EFL students demonstrated varying levels of retention across different dimensions of vocabulary knowledge when engaging in SDL via MELR. Overall, higher levels of retention were observed in receptive aspects of vocabulary knowledge, particularly form and meaning, while more abstract, productive, and use-related dimensions of vocabulary knowledge were less retained.

(i) Retention of form and meaning

Quantitatively, this study found that the knowledge of form and meaning was retained the most, especially the spoken form, which was rated at 80.7%. The qualitative data indicate that the students frequently engaged in pronunciation-focused activities for "correct pronunciation using digital dictionaries" (S4.2.1, Journal) and paid attention to oral features such as "stress, intonation, and rhythm" (S1.2.3, Journal). For the retention of this knowledge dimension, AI-supported tools were also mentioned. One participant noted that The Coach "offers IPA and uses AI to score your pronunciation and provide feedback" (S1.1.1, Focus group). Some others reported incorporating listening exercises in order to grasp not only the individual sounds but also the concept of "linking" (S3.2.1, Journal) and to "pronounce and stress [words] in sentences" (S1.2.1, Journal).

Similarly, the students have shown relatively high retention of contextual meaning (76.0%). This correlates with the multimedia resources used by the students, such as videos with subtitles, short videos, flashcards, and videos, which are likely to have visual and contextual cues that support semantic processing. Furthermore, retention of written forms (65.7%) and form-meaning pairs (64.2%) was also quite high, indicating the students' ability to remember correct word spellings and their associated definitions.

(ii) Retention of use-related knowledge

In this study, retention of grammatical functions and word combinations was found to be moderate. Collocation knowledge was retained by 63.7% of the participants. Supporting evidence from qualitative data suggests that the students actively consulted digital tools such as Ozdic and corpus-based resources to verify natural word combinations. A student reported using digital resources to verify collocations (S1.1.1). Similarly, grammatical functions of vocabulary (e.g., identifying parts of speech or basic syntactic patterns) were retained by more than 60% of the participants. Students reported focusing on identifying parts of speech and grammatical roles of the vocabulary they were learning. For example, one participant described identifying "what part of speech a word is" and distinguishing related forms such as "'economic' (adjective), 'economics' (noun), 'economist' (person)" (S4.2.1, Journal). Other participants reported examining "definitions, contexts, prepositions, and parts of speech" (S1.2.1, Journal), as well as learning "word families" (S1.2.2, Journal).

(iii) Retention of abstract and contextual meaning

The lowest levels of retention were observed in abstract, metalinguistic, and context-sensitive vocabulary knowledge. Students' retention of word associations (52.3%) and concept reference (51.0%) was at moderate levels. To support understanding, the students reported learning synonyms and antonyms and creating example sentences (S2.2.1, Focus group), used tools such as Thesaurus or ChatGPT to "look up synonyms or double-check meanings" (S2.2.2, Focus group), or used Cambridge dictionaries and Ozdic for lexical relationships (S1.1.1, Focus group). However, poorer retention was observed for vocabulary use constraints (47.7%), and even lower retention was observed for knowledge of word parts (46.6%). The study found that few students hardly engaged in activities related to prefixes, suffixes, or morphological analysis.

(iv)Receptive-productive gap in retained vocabulary knowledge

The study identifies a persistent gap between receptive (recognition) and productive knowledge (usage) being retained. Some students reported that encountering a word again would help to "trigger" their memory, but "applying those words is still a challenge" for them. A participant also expressed that although they recognized and understood words in reading, those words remained "only comprehensible, not applicable," causing them to "replace them with simpler words I already know" when speaking (S2.1.2, Focus group).

The students also mentioned differences in retention depending on how vocabulary was learned and practiced. For example, one student stated, "If I only learn the word but don't use it, I probably remember about 30–40%. But if I use the word, the retention is definitely higher" (S2.1.2, Focus

group). Another participant noted the need for more opportunities to use vocabulary, stating that, "I think I need more speaking practice to apply what I've learned" (S4.2.1, Focus group).

Overall, the findings indicate a pattern of vocabulary retention in which form and meaning were retained at higher levels than use-related and abstract aspects. Besides, multiple dimensions of vocabulary knowledge were found to be retained in students' SDL with MELR, including phonological, structural, and semantic aspects. However, retention levels vary across these dimensions.

4.2. Discussion

4.2.1.Factors mediating vocabulary retention in self-directed mobile learning

The findings indicate that vocabulary retention in SDL with MELR is a multi-determined process shaped by interactions among students, tools, and contextual factors. From an AT perspective, these findings reflect a complex activity system in which retention is mediated by both enabling and constraining elements.

First, the strong role of motivation and content relevance suggests that retention highlights the importance of alignment between students' learning goals and activities. This is consistent with prior studies that cite motivation as a key indicator of success in MALL, as aroused motivation is the driving force of private regulatory processes (Xodabande et al., 2022). Yet, the results reveal a concerning overreliance on extrinsic motivation, as 77.0% of the respondents noted that test performance was a primary motivational factor. While Stockwell (2013) suggests that the excitement of new technology can motivate users, he believes this is an enthusiasm that will eventually diminish, an effect he calls the novelty effect. The overreliance on examination pressure recorded in this study indicates that while mobile technology may be effective in assisting users and in accessing resources, the duration of retention efforts is most likely to be constrained by institutional requirements (Rules) rather than genuine interest. This finding highlights a potential tension between intrinsic learning goals and externally imposed academic demands, which may shape the sustainability of vocabulary retention over time.

The study validates that some combinations of technology, such as repetition and variety of multimedia, are important for retention. The qualitative results identify SRS as a key technique for the successful transition of vocabulary into long-term memory. This parallels the cited works of Seibert Hanson and Brown (2020), in which SRS applications of Anki are shown, at least to some extent, to predict positive results due to an optimized spacing effect, even if some students reported the effect to be tedious. Such multimodal affordances enable dual coding and repeated exposure, which are believed to facilitate encoding and retrieval processes.

However, critical attention should be paid to the dual nature of these tools. The findings showed that MELR could either support or hinder focus. The students compared the consistency of traditional learning tools to the inconsistency of digital learning tools, arguing that mobile learning environments can be distracting. For instance, qualitative data revealed a case of 'attentional drift', where the learning instrument simultaneously became a source of entertainment (e.g., scrolling TikTok). This is in line with previous research that has emphasized the disruptive nature of mobile technologies (Gholizadeh & Rahimi, 2023). From an AT perspective, this is an example of the tool component's systemic contradiction, in that the same means of mediation both enable and inhibit the learning activity. This contradiction adds to the concerns of this study, which is called the "anytime, anywhere paradox," in that greater access and opportunity may not always ensure improved learning outcomes.

On the other hand, the results showed that vocabulary retention via MELR is promoted when students adopt certain strategies with certain levels of consistency in practice. For instance, some participants resorted to an offline study mode to avoid distractions and stay more focused or actively filtered out tools that did not meet their needs to "optimize" their activity systems. The adoption of various strategies, such as spaced repetition, context-based learning, and activity-based output, motivates students to self-direct their learning. This is consistent with previous research that focused on SDL and the role of metacognition and strategy use in maintaining learning outcomes (Nakata, 2011;

Zimmerman, 2000). It also indicates that the 'ubiquitous' nature of MALL, in the absence of effective self-regulation strategies, can lead to the loss of engaged and meaningful cognitive processing. These strategies, in the AT framework, would be viewed as adaptive responses to the activity system, as students adjust their behavior in an attempt to better utilize the tools and the learning opportunities offered.

The findings also illustrate the role of social mediation. The support from peer reminders, teacher feedback, and the act of teaching others was reported to significantly reinforce vocabulary retention. This is consistent with Guo et al. (2022), who noted that peer scaffolding and the 'audience effect' positively and significantly impacted vocabulary learning volume and retention in mobile learning environments. This also aligns with sociocultural perspectives that highlight the role of interaction and scaffolding in the process of language learning (Guo et al., 2022). In the AT's terms, these factors are the community and the division of labor, where learning is not an isolated activity but rather distributed among several individuals. In SDL situations, teachers seem to be the least active participants, suggesting that students are expected to actively self-regulate their learning activities.

Finally, the fragmented character of mobile learning also appears to add some challenges. While MELR can help increase learning exposure by allowing students to learn in short intervals, this microlearning can decrease the depth of learning and pose the risk of cognitive overload (Dağdeler et al., 2020; Sage et al., 2020). This reveals a contradiction between sufficient access to learning resources and low levels of processing depth, which may affect retention. Such tension may also foster the development of adaptive learning practices as students are trying to balance learning flexibility and learning depth (Engeström, 2001).

4.2.2.Vocabulary knowledge being retained by EFL students

The findings show a pattern that can be characterized by stronger outcomes in the receptive and weaker outcomes in the productive and the more abstract dimensions of vocabulary knowledge. This pattern is consistent with research that shows that receptive vocabulary knowledge develops earlier and more extensively than productive vocabulary knowledge (Nation, 2001; Schmitt, 2010).

The students' high retention of spoken form and contextual meaning aligns with the established affordances of MALL. This aligns with previous studies, which have noted the efficiency of mobile devices in retaining word meaning and form (Dağdeler et al., 2020; Lin & Lin, 2019). The most recent literature on AI in education also supports the retention of the spoken form, attributing this to tools such as ELSA and The Coach, which provide phonetic feedback (Ali et al., 2024). Besides, the strong retention of contextual meaning validates the efficacy of multimedia resources. Arndt and Woore (2018) noted that vlog (video blog) texts were more engaging than textual inputs and more effective for meaning recall through visual contextual aids. Sato et al. (2020) also found that mobile applications with multimodal interfaces facilitate easier recall of target vocabulary. This supports the Dual Coding Theory, which is prevalent in MALL literature, suggesting that overlapping visual and verbal inputs can improve encoding (Yu & Trainin, 2022). Therefore, the prevalence of input-rich, multimodal resources in MELR appears to facilitate retention through repeated exposure and contextualized understanding.

The retention rates for collocations and grammatical functions reflect a common limitation in MALL. Although tools can present patterns, deep internalization of usage rules is more challenging than surface-level recognition. Dağdeler et al. (2020) acknowledged the use of mobile apps for learning collocations and pointed out that although the use of such apps greatly benefited the students' collocational receptive knowledge in the short term, it does not guarantee that students will achieve long-term retention or productive mastery of collocations compared to the use of non-digital methods. Given these modest results, the AT framework would suggest that the tensions emerge within the activity system. While the Tools (corpus resources) provide access to the grammatical rules, the Subject appears to lack a Division of Labor (e.g., teacher guidance or peer correction) that would help fully deconstruct and internalize these complex grammatical rules during autonomous study.

The weakest retention in word associations, usage constraints, and word parts highlights a critical gap in self-directed mobile learning: the limited acquisition of "depth" of vocabulary knowledge. The low retention of word parts (morphology) in the current findings suggests that the students were not engaging in the "analyzing" level of cognitive strategies, which Lai et al. (2022) found to be less commonly reported in self-directed mobile learning compared to lower-order strategies such as "remembering". Additionally, the low retention of usage constraints (register, formality) aligns with Lin and Lin (2019), who noted that mobile learning frequently centers on form-meaning matching exercises, which, in turn, leads to shallow vocabulary knowledge. Therefore, without the Community element (e.g., feedback from native speakers or instructors on cultural appropriateness), the Subject may struggle to grasp the social use of language. This is where the Tools show a primary contradiction within themselves from an AT perspective. Although designed with efficiency, gamification, and "bite-sized" learning (Kohnke et al., 2020) in mind, mobile apps (MELR) still construct environments that favor surface learning. In doing so, they reinforce the learning paradox in which the Tool (shallow cognitive engagement) and the Object (deep lexical communicative competence) contradict each other. This paradox was especially evident in the case of abstract morphological knowledge and sociolinguistic nuance, which are often learned through deep-processing tasks.

These findings corroborate what is frequently referred to as the chronic "receptive-productive gap" in MALL literature. In particular, this literature suggests that while mobile tools are effective at developing recognition of form/meaning, deeper, productive, and sociolinguistic mastery of vocabulary knowledge remains beyond reach without additional pedagogical support (Lin & Lin, 2019; Yu & Trainin, 2022). In this study, the gap can be further understood as a mismatch between the affordances of MELR and the demands of productive language use. The finding that MELR primarily support vocabulary recognition rather than active use also aligns with the well-documented receptive–productive gap in MALL. Meta-analytical evidence indicates that while mobile interventions yield large effects on receptive vocabulary, gains in productive vocabulary remain substantially smaller (Lin & Lin, 2019). Similarly, Dağdeler et al. (2020) reported significant improvements in receptive knowledge retention but no measurable advantage in productive vocabulary compared with traditional instruction. Furthermore, students' perceptions that "using" vocabulary leads to stronger retention than merely "learning" it resonate with research on deliberate practice. This reveals that mobile applications, by themselves, do not facilitate vocabulary acquisition unless students actively respond and apply that knowledge; even then, optimal results occur when there is some form of instruction. Sage et al. (2020) propose a similar perspective and assert that deep lexical learning requires higher-level encoding beyond the low-level recall, which is typically afforded by standard mobile tools. The use of AI, such as speech recognition and pronunciation feedback, may provide the necessary scaffolding to transform retained vocabulary into active communicative ability (Ali et al., 2024). From an AT perspective, the gap points to an imbalance in mediation, as the tools strongly support input processes, but output-based practice is not. This imbalance may limit the ability to turn vocabulary knowledge from recognition to use.

In general, differences across the vocabulary knowledge dimensions indicate that students selectively engage with certain aspects of vocabulary more than others, which may partially depend on the accessibility of available tools. This may lead to uneven development in vocabulary knowledge across dimensions.

Overall, the findings indicate that MELR-based SDL reinforces the students' vocabulary retention in a hierarchical way. This means that retention of vocabulary at lower levels, such as recognition and comprehension, is more robust than at higher levels, such as usage and abstraction. This hierarchical pattern highlights the importance of a balanced learning framework that encompasses both input and output activities in order to promote mastery of vocabulary at deeper levels.

5. Conclusion

This study expands upon the systemic factors that EFL students encounter when trying to retain vocabulary in SDL contexts using MELR. Using AT as a framework, the findings suggest that vocabulary retention goes beyond a cognitive process of simple memorization and is instead a socially and tool-mediated activity constructed through the interaction of the learner (Subject), digital resources (Tools), and the learning ecology, including Community, Rules, and Division of Labor.

The study, therefore, claims that MELR, as learning tools, provide the necessary conditions to support the retention of receptive vocabulary, particularly lexical items and their meanings. The study revealed that the MELR's technological features, such as social interactivity, multimodal input (text, pictures, and videos), audio-visual stimuli, and spaced repetition, support repeated exposure, efficient encoding, and short- and medium-term retention. These features also enable students to integrate vocabulary learning into their day-to-day activities beyond the traditional classroom.

However, a persistent and significant receptive–productive gap was identified. While MELR effectively support recognition and comprehension, they seem less successful in mediating the transformation of receptive knowledge into productive, communicative use. From the AT viewpoint, this reflects a systemic misalignment between the mediating tools and the learning object. Although students aim to attain functional mastery of the vocabulary, the tools of MELR primarily provide receptive scaffolding and processing support. Without explicit, pedagogical structural intervention to facilitate productive use, vocabulary knowledge may remain at the level of recognition.

The study also identified a critical systemic contradiction inherent in mobile-mediated SDL. It was the dual nature of mobile devices that functioned as tools for both learning and entertainment. While they could support flexible, anytime-anywhere learning, they also introduce attentional drift, cognitive overload, and competition from non-learning applications. This contradiction highlights the need for students to develop appropriate self-regulation strategies to manage competing affordances within mobile environments.

Importantly, the study emphasizes the role of social scaffolding and intrinsic motivation in resolving these systemic tensions. Support from teachers, peers, and AI-mediated interactions contributes to sustained engagement and persistence beyond exam-driven pressures. Thus, vocabulary retention in SDL via MELR is not an individual outcome but the result of a dynamic process shaped by interactions within a broader activity system.

Overall, the study contributes to the MALL literature by demonstrating that effective vocabulary retention in SDL is contingent on the alignment of technological affordances, learner agency, and sociocultural mediation. By applying Activity Theory, the study advances a systemic understanding of vocabulary learning as a mediated, dynamic, and socially embedded process, rather than a purely individual cognitive outcome.

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Khả năng ghi nhớ từ vựng của sinh viên học tiếng Anh như một ngoại ngữ trong môi trường học tập di động tự định hướng: Những mâu thuẫn nội tại của việc học tập "mọi lúc, mọi nơi"

Tóm tắt: Sinh viên đại học Việt Nam ngày càng sử dụng hình thức học tập tự định hướng và các tài nguyên học tiếng Anh di động nhằm nâng cao năng lực tiếng Anh. Tuy nhiên, vai trò sư phạm của các nguồn tài nguyên này đối với việc ghi nhớ từ vựng dài hạn vẫn chưa được nghiên cứu và lý giải đầy đủ trong các công trình trước đây. Trên cơ sở Lý thuyết Hoạt động, nghiên cứu này sử dụng phương pháp hỗn hợp nhằm phân tích các yếu tố mang tính hệ thống ảnh hưởng đến khả năng ghi nhớ từ vựng và các khía cạnh kiến thức của từ vựng được sinh viên ghi nhớ. Dữ liệu nghiên cứu được thu thập thông qua khảo sát với 388 sinh viên đại học học tiếng Anh như ngoại ngữ, kết hợp với phỏng vấn bán cấu trúc, thảo luận nhóm và nhật ký học tập cá nhân. Kết quả cho thấy sự tồn tại của một nghịch lý học tập "mọi lúc, mọi nơi." Trong khi các công cụ và tài nguyên học tập di động tạo điều kiện thuận lợi cho việc học linh hoạt và hình thành các thói quen học tập tích cực, chúng đồng thời cũng làm gia tăng các yếu tố gây xao nhãng và cản trở quá trình tiếp thu kiến thức từ vựng ở mức độ chuyên sâu. Bên cạnh đó, kết quả nghiên cứu cho thấy sự khác biệt rõ rệt giữa các khía cạnh từ vựng mà sinh viên học và ghi nhớ. Các nguồn tài nguyên học từ vựng di động chủ yếu hỗ trợ ghi nhớ từ vựng ở mức tiếp nhận, đặc biệt là ghi nhớ âm thanh và nghĩa trong ngữ cảnh của từ, trong khi việc nắm kiến thức về những ràng buộc khi sử dụng từ vựng và kiến thức về hình thái từ của sinh viên còn hạn chế. Nghiên cứu kết luận rằng việc duy trì từ vựng trong bối cảnh học tập tự định hướng không chỉ là một quá trình nhận thức cá nhân mà còn là một hoạt động mang tính xã hội, trong đó công cụ công nghệ đóng vai trò trung gian. Khả năng ghi nhớ từ vựng lâu dài của sinh viên phụ thuộc vào sự kết hợp giữa đặc tính hỗ trợ của công nghệ, năng lực tự điều chỉnh học tập của người học, và sự hỗ trợ từ cộng đồng. Sự tương thích giữa các yếu tố này có thể giúp thu hẹp khoảng cách giữa việc nắm kiến thức thụ động và khả năng sử dụng từ vựng một cách chủ động.

Từ khóa: Ghi nhớ từ vựng; học tập định hướng; lý thuyết hoạt động; tài nguyên học tiếng Anh di động; từ vựng.