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Vocabulary Learning Strategies in the Smartphone and AI Era: Continuity and Transformation among Moroccan EFL Learners

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ABSTRACT

This study investigates vocabulary learning strategies among Moroccan English as a foreign language (EFL) learners in the smartphone and artificial intelligence (AI) era. Rather than assuming that classical vocabulary learning strategies have disappeared, the study examines whether they continue, transform, or become displaced by digital and AI-mediated lexical practices. A mixed-methods cross-sectional survey was administered through printed questionnaires to 105 first-year English Department students at the Faculty of Letters and Humanities, Moulay Ismail University of Meknes. The instrument combined Chou's 33-item vocabulary learning strategies core, as reproduced and discussed in recent validation work, with researcher-developed items on digital vocabulary practices, AI-mediated vocabulary practices, passive exposure, and deliberate digital lexical engagement. Descriptive statistics, internal consistency estimates, Spearman correlations, and thematic coding of open-ended responses were used. Results show that classical vocabulary learning strategies remain present, especially selective attention and activation, but digitally mediated and AI-mediated practices are more frequent. The most common practices included using translation applications, screenshots, social media content, ChatGPT-like tools for explanations and examples, and AI-supported correction of vocabulary use. The findings suggest transformation rather than disappearance: learners continue to engage with vocabulary strategically, but their strategies are increasingly embedded in smartphones, online platforms, and AI tools. The study contributes to vocabulary learning strategy research by distinguishing classical strategies, digitally transformed strategies, AI-mediated practices, and passive exposure in a Moroccan EFL university context.

INTRODUCTION

Vocabulary knowledge occupies a central position in English as a foreign language (EFL) learning because it conditions learners' ability to understand, produce, and negotiate meaning in the target language. Without sufficient lexical knowledge, learners may possess grammatical awareness but remain unable to comprehend texts, participate in communication, or express ideas with accuracy and fluency. For this reason, vocabulary learning has long been treated as a major area of inquiry in applied linguistics and second language acquisition. Within this field, vocabulary learning strategies (VLSs) have received particular attention because they refer not only to what learners know, but also to how they attempt to discover, remember, review, and use new words.

Classical VLS research has generally approached learners as active agents who employ deliberate procedures to deal with unfamiliar lexical items. Schmitt's (1997) taxonomy remains one of the most influential early classifications of these strategies, distinguishing between strategies used to discover the meaning of new words and strategies used to consolidate words once they have been encountered. Later work refined the measurement of vocabulary learning strategies through validated questionnaire instruments. Gu (2018), for instance, updated and

validated an online Vocabulary Learning Questionnaire (VLQ) for ESL learners, while Chou (2024) validated a 33-item short version derived from Gu's instrument.

However, the conditions under which learners encounter and process English vocabulary have changed substantially. Learners are no longer dependent only on classroom instruction, printed dictionaries, vocabulary notebooks, or teacher-mediated explanations. They are increasingly exposed to English through smartphones, online dictionaries, translation applications, social media platforms, streaming services, subtitles, online games, music, and generative AI tools. Nation's (2022) updated account of vocabulary learning is relevant in this respect because it explicitly addresses vocabulary learning beyond the classroom and includes the role of electronic and internet-based resources. Recent work on mobile-assisted vocabulary learning, AI-mediated learning spaces, and generative AI in language education further indicates that technology has become a central component of contemporary language learning environments (Godwin-Jones, 2023; Kohnke *et al.*, 2023; Lin & Lin, 2019).

The present study is situated within this shift. It does not assume that classical vocabulary learning strategies have disappeared among Moroccan EFL learners. Instead, it investigates the extent to which such strategies continue,

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decline, or become reconfigured through smartphones and AI tools. A learner who once consulted a printed dictionary may now use an online dictionary, Google Translate, Reverso, DeepL, or ChatGPT. A learner who once repeated words orally or in writing may now encounter the same words repeatedly through videos, reels, subtitles, games, or songs. Similarly, a learner who once asked a teacher or peer for clarification may now ask an AI chatbot to explain meaning, provide examples, generate synonyms, or correct word use in context.

This issue is particularly relevant in the Moroccan EFL context. Moroccan university learners encounter English through formal instruction, but they also experience English as part of informal digital culture, entertainment, communication, and online interaction. Smartphones may expand access to English, but access alone does not necessarily imply deliberate vocabulary learning. Learners may use digital tools strategically to notice, record, review, and reuse vocabulary. Conversely, they may rely on instant translation, passive exposure, or AI-generated explanations without sustained lexical consolidation. Therefore, the distinction between deliberate strategy use and passive digital exposure becomes central to understanding vocabulary learning in the smartphone and AI era.

The current study contributes to VLS research by examining continuity and transformation among Moroccan EFL learners. It adopts a conceptual position that treats classical vocabulary learning strategies, digitally transformed strategies, AI-mediated vocabulary practices, and passive exposure as analytically distinct but potentially overlapping categories. By doing so, the study moves beyond a simple opposition between traditional and new strategies. It asks how older strategies persist, how they are reshaped by digital tools, and how new forms of lexical engagement emerge in contemporary EFL learning environments.

LITERATURE REVIEW

Vocabulary Learning Strategies: Classical Foundations

Vocabulary learning strategies emerged as an important area of research within the broader field of language learning strategies. They refer to the conscious or semi-conscious actions learners use to discover, retain, retrieve, and use lexical items. Rather than viewing vocabulary acquisition as a passive consequence of exposure, strategy-based approaches emphasize the learner's active role in managing lexical learning. This perspective is especially important in EFL contexts, where classroom time is limited and learners often need to develop independent methods for expanding their vocabulary beyond formal instruction. It is also consistent with recent vocabulary scholarship, which treats vocabulary acquisition, instruction, and assessment as a continuing research agenda (Schmitt, 2019).

Schmitt's (1997) taxonomy classified VLSs into discovery and consolidation strategies. Discovery strategies are used when learners encounter new words and attempt to understand their meanings, for example by guessing

from context, using dictionaries, analyzing word parts, or asking others. Consolidation strategies support retention and later use through repetition, note-taking, memorization, association, grouping, review, and practice. A major strength of Schmitt's taxonomy is its recognition that vocabulary learning is multidimensional, involving noticing, inference, storage, retrieval, and use.

At the same time, Schmitt's taxonomy was developed before smartphones and generative AI became central to learners' everyday language practices. Its categories remain theoretically useful, but the tools through which learners now perform these strategies may have changed. Dictionary use may no longer involve printed dictionaries; social strategies may no longer be limited to teachers and peers; and repetition may occur through repeated exposure to digital content rather than deliberate word-list review.

Validated Instruments for Measuring Vocabulary Learning Strategies

The measurement of vocabulary learning strategies has developed considerably since early taxonomic work. Gu and Johnson's (1996) original questionnaire was influential but long. Gu (2018) later updated and validated an ESL version of the VLQ. The study piloted paper and online response formats and reported a 62-item instrument supported by evidence of content validity, construct validity, internal consistency reliability, and predictive validity. This work is important because it moved VLS research beyond informal strategy lists toward psychometrically evaluated measurement.

Chou's (2024) validation study is especially relevant to the present research. Chou administered 52 items from Gu's (2018) instrument to 556 university students in Taiwan and reported a validated 33-item short version. The short version was presented as useful when administration time is limited or when vocabulary learning strategies are only one part of a wider study. This makes it suitable for the present research, which combines a validated VLS core with additional sections addressing digital and AI-mediated vocabulary practices.

Recent validation work also raises an important methodological issue. Alamer *et al.* (2025) argued that the nine constructs of Chou's VLS questionnaire may be better conceptualized as emergent variables or composites rather than as conventional latent variables. In an emergent-variable view, the items form the construct rather than merely reflect an underlying factor. This point is relevant for the present study because the VLS dimensions are interpreted primarily as composite strategy categories. Internal consistency coefficients are therefore reported descriptively and cautiously, not as sufficient proof that each strategy category is a conventional latent scale.

Vocabulary Learning Beyond the Classroom

Recent vocabulary research increasingly recognizes that lexical development occurs both inside and outside the

classroom. Nation's (2022) updated work is relevant because it gives explicit attention to out-of-class learning and to electronic resources. This shift is important for EFL contexts because learners' vocabulary growth is no longer shaped only by classroom instruction, textbooks, and teacher-directed activities. Instead, learners may encounter English through videos, subtitles, online games, music, social media, mobile applications, online dictionaries, and translation tools.

Out-of-class vocabulary learning complicates the traditional understanding of strategy use. Digital environments may strengthen vocabulary learning by increasing exposure, providing immediate access to meanings, offering multimodal input, and allowing repeated encounters with words in authentic contexts. However, digital access may also encourage superficial processing. A learner may translate a word instantly without attempting to remember it, infer its meaning, record it, or reuse it. Digital exposure should therefore not be automatically equated with vocabulary learning.

This distinction is central to the present study. Smartphones may support classical strategies, but they may also transform them. Dictionary consultation, contextual guessing, repetition, note-taking, and review can all be performed through digital tools. Yet the same tools may also be used only for immediate comprehension. The study therefore examines not only the frequency of strategy use, but also the form and intentionality of that use.

Mobile-Assisted and AI-Mediated Vocabulary Learning

Mobile-assisted vocabulary learning has become a major area of inquiry because smartphones provide portability, immediacy, multimodal input, and access to resources such as online dictionaries, vocabulary applications, pronunciation tools, subtitles, and social media content. Lin and Lin's (2019) systematic review and meta-analysis indicates that mobile-assisted ESL/EFL vocabulary learning has been examined across diverse instructional and technological contexts. Such research supports the need to examine how learners use mobile resources for vocabulary learning, not merely whether they have access to mobile devices.

Generative AI adds a further layer to this transformation. Kohnke *et al.* (2023) describe ChatGPT as a tool with affordances for language teaching and learning while also noting debates and drawbacks. For vocabulary learning, AI tools can explain unfamiliar words, generate examples, suggest synonyms and antonyms, clarify collocations, correct lexical errors, simplify meanings, and create quizzes. Unlike static dictionaries or translation applications, AI systems can provide interactive and customized lexical support.

AI-mediated vocabulary learning also raises questions about depth of processing and learner autonomy. If learners use AI only to obtain instant meanings or ready-made answers, AI may support immediate

comprehension but not necessarily retention. If learners use AI to compare meanings, generate examples, practice use, receive feedback, and review vocabulary, AI may support deeper lexical engagement. Therefore, the present study does not treat AI as inherently beneficial or harmful. It examines how Moroccan EFL learners report using AI tools and whether such use represents deliberate vocabulary learning or immediate lexical assistance.

Research Gap

The existing literature provides strong foundations for studying vocabulary learning strategies. Schmitt's taxonomy offers a classical classification of strategy types; Gu's updated VLQ and Chou's short version provide validated measurement foundations; Nation's updated account extends vocabulary learning beyond the classroom; and recent technology-focused literature draws attention to mobile and AI-mediated language learning. However, less is known about the relationship between classical VLSs and emerging smartphone-mediated or AI-mediated lexical practices in the Moroccan EFL context. The gap addressed by this study is therefore both conceptual and empirical. Conceptually, there is a need to reconsider what counts as a vocabulary learning strategy when learners use smartphones, online dictionaries, translation applications, social media, subtitles, and AI tools. Empirically, there is a need to examine whether Moroccan EFL learners still report using classical strategies, whether those strategies are transformed through digital tools, and whether new AI-mediated practices are emerging. The study addresses this gap by framing vocabulary learning strategies in terms of continuity and transformation rather than disappearance or replacement.

Conceptual Framework and Research Questions

The conceptual framework is built around four interrelated categories: classical vocabulary learning strategies, digitally transformed vocabulary learning strategies, AI-mediated vocabulary learning strategies, and passive digital exposure. These categories are analytically distinct, but they may overlap in learners' actual practices. Classical vocabulary learning strategies refer to strategies traditionally identified in VLS research, including guessing from context, using dictionaries, analyzing word parts, asking others for meaning, repeating words, writing vocabulary notes, grouping words, associating words with images or meanings, reviewing, and using new words in speaking or writing. Digitally transformed strategies refer to traditional strategies now performed through digital tools and environments. The underlying strategy may remain similar, but the medium changes. For example, dictionary use may become online dictionary consultation, and note-taking may become saving words in a mobile notes application or through screenshots.

AI-mediated vocabulary learning strategies refer to learners' use of AI tools to support vocabulary understanding, practice, and use. These may include

asking AI tools to explain unfamiliar words, provide example sentences, generate synonyms, clarify collocations, correct lexical errors, simplify meanings, or create quizzes. Passive digital exposure, by contrast, refers to contact with English through digital content without deliberate attention to vocabulary learning. The study distinguishes exposure from strategic engagement because being surrounded by English does not necessarily mean that learners record, review, or reuse new words. The study is guided by a continuity-transformation framework. Continuity refers to the persistence of classical vocabulary learning strategies. Transformation refers to the relocation or reshaping of these strategies through smartphones, platforms, and AI tools. Replacement refers to cases where learners no longer report using deliberate vocabulary strategies and instead rely mainly on instant translation, AI-generated answers, or passive exposure. Emergence refers to new practices not fully captured by classical taxonomies, especially AI-mediated vocabulary practices.

Research Questions

- RQ1. Which classical vocabulary learning strategies are still reported by Moroccan EFL learners?
- RQ2. How do Moroccan EFL learners use smartphones and digital resources, such as online dictionaries, translation applications, subtitles, social media, videos, music, games, and vocabulary applications, to support vocabulary learning?
- RQ3. How do Moroccan EFL learners use AI tools for vocabulary-related purposes, such as meaning explanation, example generation, synonym and collocation search, correction, practice, and review?
- RQ4. To what extent do learners’ digital and AI-mediated practices represent deliberate vocabulary learning strategies rather than passive exposure or instant lexical assistance?
- RQ5. What patterns of continuity, transformation, replacement, or emergence can be identified in Moroccan EFL learners’ vocabulary learning practices in the smartphone and AI era?

MATERIALS AND METHODS

Research Design

The study adopted a mixed-methods, cross-sectional survey design. The quantitative component measured the reported frequency of classical vocabulary learning strategies, digitally mediated vocabulary practices, AI-mediated vocabulary practices, passive exposure, and deliberate lexical engagement. The qualitative component consisted of open-ended questionnaire responses designed to capture practices and explanations that could not be fully represented through fixed-response items.

The design was non-experimental and did not aim to establish causal relationships between smartphone use, AI use, and vocabulary development. Instead, it examined self-reported patterns of strategy use and lexical engagement within a specific Moroccan university EFL context. The mixed-methods logic was appropriate because the study was both measurement-oriented and exploratory: it measured the frequency of known and newly developed practices while also allowing participants to describe how they actually engage with vocabulary in digital and AI-mediated environments (Creswell & Plano Clark, 2018).

Research Context and Participants

The participants were 105 first-year students enrolled in the English Department at the Faculty of Letters and Humanities, Moulay Ismail University of Meknes. The sample included 55 male students (52.4%) and 50 female students (47.6%). Most participants were 19 years old (67.6%), while 31.4% were 20 years old and one participant, 1.0%, was 21 years old. All participants belonged to the same academic level and disciplinary context, which provided a relatively homogeneous sample of beginning university-level Moroccan EFL learners. Regarding English learning background, 25 participants (23.8%) reported having learned English for three to five years, 77 (73.3%) for six to eight years, and three (2.9%) for more than eight years. In terms of self-perceived English level, 53 participants (50.5%) described themselves as intermediate, 51 (48.6%) as upper-intermediate, and one (1.0%) as advanced. The sample therefore consisted mainly of learners with functional English proficiency who were still developing their lexical repertoire at the university level. Participants also reported high levels of digital engagement. Eight participants (7.6%) used their smartphones for one to three hours per day, 87 (82.9%) for four to six hours, and 10 (9.5%) for more than six hours. Online English exposure was reported as sometimes by 12 participants (11.4%), frequently by 71 (67.6%), and almost always by 22 (21.0%). AI-tool use for English learning was also frequent: 38 participants (36.2%) reported using AI tools frequently, while 67 (63.8%) reported using them almost always.

A convenience sampling strategy was used. Random sampling was practically unfeasible because access to a complete list of the target population was not available and it was not possible to reach all first-year English Department students under randomized conditions. Convenience sampling limits generalizability; therefore, the findings should be interpreted as context-specific evidence from one Moroccan university EFL setting rather than as representative of all Moroccan EFL learners.

Table 1: Participant Background Characteristics

Variable	Category	n	%
Sample	First-year English Department students, Faculty of Letters and Humanities, Moulay Ismail University of Meknes	105	100.0

Gender	Male	55	52.4
Gender	Female	50	47.6
Age	19	71	67.6
Age	20	33	31.4
Age	21	1	1.0
Years learning English	3-5 years	25	23.8
Years learning English	6-8 years	77	73.3
Years learning English	More than 8 years	3	2.9
Self-perceived English level	Intermediate	53	50.5
Self-perceived English level	Upper-intermediate	51	48.6
Self-perceived English level	Advanced	1	1.0
Daily smartphone use	1-3 hours	8	7.6
Daily smartphone use	4-6 hours	87	82.9
Daily smartphone use	More than 6 hours	10	9.5
Online English exposure	Sometimes	12	11.4
Online English exposure	Frequently	71	67.6
Online English exposure	Almost always	22	21.0
AI tools for English learning	Frequently	38	36.2
AI tools for English learning	Almost always	67	63.8

Note. N = 105. Percentages are rounded to one decimal place

Table 2: Sources of Online English Exposure

Source of English exposure	n	%
YouTube	105	100.0
TikTok/Instagram/Facebook	105	100.0
Films/series	101	96.2
Music/songs	103	98.1
Video games	97	92.4
Online courses	9	8.6
English websites/articles	12	11.4
AI tools	105	100.0
Other	0	0.0

Note. Participants could select more than one source; therefore, percentages do not sum to 100

Instrument

Data were collected through a printed questionnaire composed of closed-ended frequency-scale items and open-ended questions. The construction and organization of the questionnaire were informed by general principles of questionnaire design in second language research (Dörnyei & Taguchi, 2010). The questionnaire had six sections: background information, classical vocabulary learning strategies, digital vocabulary practices, AI-mediated vocabulary practices, passive exposure and deliberate vocabulary learning, and open-ended questions. The classical VLS section was based on Chou’s 33-item short VLS questionnaire, which was derived from Gu’s (2018) instrument and validated with university EFL learners (Chou, 2024). The version of the 33 items used in this study followed the item set reproduced and discussed in Alamer *et al.* (2025). The items were grouped into nine

VLS constructs: inferencing, note-taking, dictionary use, oral repetition, activation, visual and auditory encoding, structure encoding, self-initiation, and selective attention. The digital vocabulary practices and AI-mediated vocabulary practices sections were researcher-developed to capture lexical practices not fully represented in classical VLS instruments. These items examined online dictionaries, translation applications, subtitles, social media, videos, games, screenshots, vocabulary applications, AI-generated explanations, AI-generated examples, synonyms and antonyms, collocations, correction of vocabulary use, vocabulary lists, and AI-supported practice. The passive exposure and deliberate learning section distinguished immediate comprehension or exposure from intentional review, reuse, and contextual attention.

Closed-ended items used a five-point frequency scale: 1 = almost never, 2 = occasionally, 3 = sometimes, 4 =

frequently, and 5 = almost always. Open-ended questions asked participants to describe what they do when encountering new English words online, which tools they use most often, how they use AI, whether they still use traditional strategies, and whether smartphones and AI 'with help remembering or only immediate understanding.

Data Collection Procedure

Data were collected using printed questionnaires administered to accessible first-year English Department students. The questionnaire introduction explained the purpose of the study, assured participants that the survey was anonymous, and stated that participation was voluntary. Participants completed the questionnaire individually and were asked to respond according to their actual learning habits rather than socially desirable practices.

After collection, responses were manually coded and entered into a spreadsheet. Closed-ended items were coded numerically from 1 to 5 according to the frequency scale. The three negatively worded self-initiation items were reverse-coded before composite scores were calculated, following the scoring logic used in the VLS instrument. Open-ended responses were transcribed and thematically coded.

Data Analysis

Quantitative data were analyzed in four stages. First, the dataset was screened for missing values, duplicate entries, and inconsistent records. Second, descriptive statistics were calculated for the participant profile, exposure variables, classical VLS constructs, digital vocabulary practices, AI-mediated practices, and passive/deliberate learning items. Third, Cronbach’s alpha was calculated as a supplementary internal consistency index (Cronbach, 1951; Tavakol & Dennick, 2011). Following Alamer *et al.* (2025), however, the VLS constructs were interpreted cautiously as composite or emergent variables, not as ordinary reflective latent factors. Fourth, Spearman rank correlations were used to explore associations between online English exposure, AI-tool use, self-perceived proficiency, and vocabulary practice measures. These correlations were interpreted as exploratory and non-causal.

Qualitative responses were analyzed thematically following the general logic of thematic analysis (Braun & Clarke, 2006). Responses were read repeatedly, coded for recurring actions and explanations, and grouped into broader themes. These themes were used to interpret the quantitative findings and to identify practices that may not be captured adequately by closed-ended questionnaire items.

Ethical Considerations

The study followed standard ethical principles for educational research. Participation was voluntary, and the questionnaire did not request names, student numbers, phone numbers, email addresses, or any direct personal identifiers. Participants were informed that their responses would be used only for academic research purposes. Because all participants were 19 years old or older, the study involved adult university students.

The topic of AI use was treated in general behavioral terms. Participants were not asked to disclose private conversations with AI tools, account information, passwords, or personal data. The study focused only on reported vocabulary learning practices.

RESULTS AND DISCUSSION

Results

Reliability and Descriptive Overview

Table 3 presents the descriptive statistics for the main VLS constructs and the newly developed digital/AI measures. The overall classical VLS index showed a moderate mean score (M = 3.06, SD = 0.60). The highest classical VLS construct was selective attention (M = 4.35, SD = 0.60), followed by activation (M = 3.79, SD = 0.72). By contrast, structure encoding (M = 2.40, SD = 0.78), dictionary use (M = 2.57, SD = 0.80), and oral repetition (M = 2.57, SD = 0.77) had the lowest means.

Digital vocabulary practices (M = 3.83, SD = 0.63) and AI-mediated vocabulary practices (M = 3.82, SD = 0.67) were more frequent than the classical VLS total score. Deliberate digital lexical engagement also showed a relatively high mean (M = 3.84, SD = 0.71). The passive exposure items did not form a coherent scale, as indicated by the negative alpha value; consequently, they were interpreted at the item level rather than as a single scale.

Table 3: Descriptive Statistics and Internal Consistency of the Main Measures

Measure	Items	M	SD	Alpha	Note
Classical VLS total	33	3.06	0.60	0.94	Descriptive overall index
Inferencing	6	3.18	0.76	0.77	
Note-taking	4	3.10	0.74	0.68	Supplementary alpha
Dictionary use	3	2.57	0.80	0.62	Supplementary alpha
Oral repetition	3	2.57	0.77	0.60	Supplementary alpha
Activation	3	3.79	0.72	0.62	Supplementary alpha
Visual and auditory encoding	5	2.77	0.78	0.77	
Structure encoding	3	2.40	0.78	0.61	Supplementary alpha
Self-initiation	3	2.90	0.83	0.62	Supplementary alpha

Selective attention	3	4.35	0.60	0.53	Supplementary alpha
Digital vocabulary practices	12	3.83	0.63	0.87	
AI-mediated vocabulary practices	10	3.82	0.67	0.87	
Passive exposure	4	3.32	0.49	-0.21	Item-level interpretation
Deliberate digital lexical engagement	4	3.84	0.71	0.66	

Note. Alpha values for VLS categories are reported descriptively because the constructs are interpreted as composite/emergent strategy categories rather than ordinary reflective latent factors

Classical Vocabulary Learning Strategies

The results show that classical vocabulary learning strategies have not disappeared, but their use was uneven across strategy types. Selective attention was the strongest classical dimension, suggesting that learners frequently reported knowing which words were important to learn and whether new words needed to be remembered. Activation was also strong, indicating that many learners attempted to use newly learned words in speech, writing,

or real situations.

By contrast, structurally oriented strategies were weak. Participants reported relatively low use of roots, prefixes, suffixes, and word-formation strategies. Dictionary use and oral repetition were also comparatively low, suggesting that some traditional or form-focused strategies may be less central to learners' current practices. These findings indicate continuity in some classical strategies, especially attention and activation, but decline or reduced salience in others.

Table 4: Mean Scores for Classical Vocabulary Learning Strategy Constructs

Classical VLS construct	M	SD
Selective attention	4.35	0.60
Activation	3.79	0.72
Inferencing	3.18	0.76
Note-taking	3.10	0.74
Self-initiation	2.90	0.83
Visual and auditory encoding	2.77	0.78
Oral repetition	2.57	0.77
Dictionary use	2.57	0.80
Structure encoding	2.40	0.78

Note. Items were rated from 1 = almost never to 5 = almost always

Digital Vocabulary Practices

Digital vocabulary practices were frequent overall. The strongest practices were learning vocabulary from social media content (M = 4.36), taking screenshots of useful words or expressions (M = 4.28), using translation applications (M = 4.30), and using online dictionaries (M = 4.01). Songs or lyrics, gaming communities, and smartphone-based review also showed relatively frequent use.

However, not all digital practices were equally strong. Saving words on the phone, using flashcard or vocabulary applications, and searching for examples before using new words had comparatively lower means. This suggests that learners engage heavily with digital vocabulary resources, but their practices are more strongly oriented toward immediate access, exposure, and capture than toward systematic review through vocabulary applications.

Table 5: Digital Vocabulary Practices

Code	Digital vocabulary practice	M	SD	Frequently/Almost always
DVP1	Online dictionaries for meanings	4.01	0.96	78 (74.3%)
DVP2	Translation applications	4.30	0.88	86 (81.9%)
DVP3	Pronunciation via online tools	3.85	1.02	68 (64.8%)
DVP4	Videos/films/series with subtitles	3.56	1.02	56 (53.3%)
DVP5	Social media posts/reels/comments	4.36	0.81	87 (82.9%)
DVP6	Saving words on phone	3.37	1.07	49 (46.7%)
DVP7	Screenshots of useful words/expressions	4.28	0.80	88 (83.8%)
DVP8	Vocabulary/flashcard apps	3.34	1.09	48 (45.7%)
DVP9	Songs or lyrics	4.00	1.05	76 (72.4%)
DVP10	Online games/gaming communities	3.86	0.92	72 (68.6%)

DVP11	Searching examples online	3.31	1.15	47 (44.8%)
DVP12	Smartphone review outside class	3.78	0.97	63 (60.0%)

Note. The final column reports the number and percentage of participants who selected 4 = frequently or 5 = almost always

AI-Mediated Vocabulary Practices

AI-mediated vocabulary practices were also frequent. The most frequent AI-related practices were asking AI tools for example sentences (M = 4.36), using AI to explain unfamiliar words (M = 4.27), and using AI to correct vocabulary use in sentences (M = 4.20). Participants also frequently used AI for synonyms and antonyms, simplification, collocations,

and practice in writing or speaking.

The lowest AI-related practice was generating vocabulary lists for specific topics (M = 2.40). This suggests that students use AI more reactively than proactively: they use AI when they encounter a word, need an example, or want correction, but they are less likely to ask AI to generate structured vocabulary lists for planned learning.

Table 6: AI-Mediated Vocabulary Practices

Code	AI-mediated vocabulary practice	M	SD	Frequently/Almost always
AIVP1	AI explains unfamiliar words	4.27	0.85	84 (80.0%)
AIVP2	AI gives example sentences	4.36	0.81	87 (82.9%)
AIVP3	AI gives synonyms/antonyms	3.97	1.01	75 (71.4%)
AIVP4	AI explains collocations	3.73	1.07	61 (58.1%)
AIVP5	AI explains differences between similar words	3.67	1.09	58 (55.2%)
AIVP6	AI corrects vocabulary use in sentences	4.20	0.94	82 (78.1%)
AIVP7	AI simplifies difficult vocabulary	4.02	0.91	75 (71.4%)
AIVP8	AI creates exercises/quizzes	3.76	0.94	62 (59.0%)
AIVP9	AI generates topic vocabulary lists	2.40	1.10	18 (17.1%)
AIVP10	AI supports practice in writing/speaking	3.77	0.99	60 (57.1%)

Note. The final column reports the number and percentage of participants who selected 4 = frequently or 5 = almost always

Passive Exposure and Deliberate Digital Lexical Engagement

The passive exposure and deliberate learning items revealed a mixed pattern. On the one hand, a substantial proportion of participants reported understanding new English words online without trying to remember them later (64.8%) and translating unfamiliar words quickly without reviewing them (61.0%). More than half also reported believing that watching English content is enough to improve vocabulary (54.3%). These findings

point to the presence of passive or superficial lexical engagement.

On the other hand, deliberate engagement was also evident. Participants frequently reported reusing words learned from digital content (77.1%), paying attention to how words are used in real contexts (76.2%), and making a conscious effort to remember useful words from online content (61.0%). This suggests that passive exposure and deliberate engagement coexist in learners' digital vocabulary practices.

Table 7: Passive Exposure and Deliberate Vocabulary Learning Items

Code	Item	M	SD	Frequently/Almost always
PEDL1	Understand online words but do not remember later	3.88	0.97	68 (64.8%)
PEDL2	Translate quickly without reviewing	3.67	1.09	64 (61.0%)
PEDL3	Watching English content is enough	3.65	1.07	57 (54.3%)
PEDL4	Rarely write down/save online words	2.10	1.05	11 (10.5%)
PEDL5	Reuse words from digital content	4.10	0.96	81 (77.1%)
PEDL6	Review online words after first exposure	3.29	1.16	44 (41.9%)
PEDL7	Pay attention to real-context use	4.22	0.92	80 (76.2%)
PEDL8	Conscious effort to remember useful online words	3.74	1.01	64 (61.0%)

Note. The first four items were interpreted as indicators of passive or superficial exposure, while the final four items were interpreted as indicators of deliberate lexical engagement

Relationships among Exposure, AI Use, and Vocabulary Practices

Spearman rank correlations were used because several

variables were ordinal. The strongest association was between online English exposure and digital vocabulary practices ($\rho = .80, p < .001$), indicating that learners

who reported more frequent online English exposure also reported more frequent digital vocabulary practices. AI-tool use frequency was strongly associated with AI-mediated vocabulary practices ($\rho = .81, p < .001$), as expected.

AI-tool use frequency was also moderately associated with digital vocabulary practices ($\rho = .41, p < .001$) and

deliberate digital lexical engagement ($\rho = .32, p < .001$). Self-perceived English level showed a small negative association with passive exposure ($\rho = -.23, p = .018$), suggesting that higher self-perceived proficiency may be associated with less passive digital lexical behavior. These correlations are exploratory and should not be interpreted causally.

Table 8: Spearman Correlations Among Exposure, AI Use, and Vocabulary Practice Measures

Outcome	Predictor	Spearman rho	p
Digital vocabulary practices	Online English exposure	.80	< .001
Digital vocabulary practices	AI-tool use frequency	.41	< .001
AI-mediated vocabulary practices	Online English exposure	.44	< .001
AI-mediated vocabulary practices	AI-tool use frequency	.81	< .001
Passive exposure	Self-perceived English level	-.23	.018
Passive exposure	Daily smartphone use	.18	.066
Passive exposure	AI-tool use frequency	-.19	.055
Deliberate digital lexical engagement	Self-perceived English level	.18	.061
Deliberate digital lexical engagement	AI-tool use frequency	.32	< .001

Note. Correlations are exploratory because the study used non-probability sampling and self-report data

Open-Ended Responses

The open-ended responses confirmed the quantitative pattern. When asked what they usually do when encountering a new English word online, the most common responses involved AI or ChatGPT (48.6%). Online dictionary use and screenshots were also mentioned, while 19.0% did not answer this question. When asked about the most used digital tool, most participants reported ChatGPT, often referring to speed, clarity, or examples, while a smaller group reported using Google Translate before ChatGPT.

Responses concerning traditional strategies were especially important. Most participants indicated that they no longer used traditional strategies regularly, often because the smartphones or AI tools were easier and more accessible. However, a smaller group reported using traditional strategies sometimes or rarely. This qualitative pattern supports the central interpretation of the study: classical strategies have not entirely disappeared, but many learners now understand vocabulary learning through digital and AI-mediated tools.

Table 9: Thematic Coding of Open-Ended Responses

Question	Theme	n	%
F1: New word online	Look it up using AI / ask ChatGPT	51	48.6
F1: New word online	Check an online dictionary	18	17.1
F1: New word online	Take a screenshot	16	15.2
F1: New word online	No answer	20	19.0
F2: Most used digital tool	ChatGPT, including speed/clarity/examples	83	79.0
F2: Most used digital tool	Google Translate then ChatGPT	22	21.0
F3: How AI is used	Meaning explanation	30	28.6
F3: How AI is used	Synonyms	25	23.8
F3: How AI is used	Meaning and examples	20	19.0
F3: How AI is used	Pronunciation	16	15.2
F3: How AI is used	Context sentences	14	13.3
F4: Traditional VLS use	No / AI or phone is easier and more accessible	86	81.9
F4: Traditional VLS use	Sometimes, but rarely	19	18.1
F5: Function of smartphones/AI	Both remembering and understanding	64	61.0

Note. Open-ended responses were coded into dominant themes. Some questions received incomplete explanations; therefore, counts describe the coded responses available in the dataset

Summary of Findings by Research Question

The findings answer the research questions in a nuanced way. For RQ1, classical VLSs are still present among Moroccan EFL learners, particularly selective attention and activation, but structurally oriented strategies, dictionary use, and oral repetition appear less frequent. For RQ2, learners rely heavily on digital resources, especially translation applications, social media, screenshots, songs, online dictionaries, and smartphone-based exposure. For RQ3, AI is used frequently for explanation, examples, correction, synonyms, simplification, and practice, but less often for planned vocabulary-list generation.

For RQ4, digital and AI-mediated practices include both deliberate and passive tendencies. Many learners rely on immediate translation or AI-based understanding, but they also report paying attention to contextual use and trying to reuse words from digital content. For RQ5, the overall pattern is transformation rather than disappearance. Classical strategies continue selectively, but vocabulary learning is increasingly mediated through smartphones, online platforms, and AI tools.

Discussion

The central finding of this study is that vocabulary learning strategies among these Moroccan EFL learners have not disappeared; rather, they have been transformed. The data show that classical strategies remain present, especially selective attention and activation. Learners still report knowing which words matter, deciding whether new words should be remembered, and attempting to use newly learned words in speaking, writing, or real situations. These findings support the continuity side of the study's framework.

At the same time, the strongest patterns point toward digital and AI mediation. Digital vocabulary practices and AI-mediated vocabulary practices had higher mean scores than the overall classical VLS index. Learners frequently used translation applications, online dictionaries, screenshots, social media content, songs, games, and AI tools. This suggests that vocabulary learning has moved into everyday digital environments. The strategies may no longer appear as traditional study routines, but they continue in altered forms: dictionary use becomes online search or translation; note-taking becomes screenshots; asking for help becomes asking AI; and contextual exposure occurs through social media, subtitles, music, and games.

The prominence of screenshots is especially revealing. Taking screenshots of useful words or expressions was one of the most frequent digital practices. This can be interpreted as a transformed form of vocabulary recording. However, screenshotting does not automatically imply review or retention. It may indicate an intention to preserve lexical material, but without follow-up, it may remain a capture practice rather than a full learning strategy. This distinction is important for teachers because learners may appear digitally active while lacking systematic review routines.

AI use was also widespread, but the pattern was mainly reactive. Learners frequently used AI tools to explain unfamiliar words, generate example sentences, correct vocabulary use, provide synonyms and antonyms, and simplify difficult vocabulary. However, they were much less likely to use AI to generate vocabulary lists related to specific topics. This suggests that AI is often used as an immediate lexical assistant rather than as a planned vocabulary-learning system. Such use is not necessarily weak; it may still support meaning, examples, and contextualized practice. Nevertheless, it points to the need for explicit AI-literacy and strategy training so that learners can move from quick assistance to deeper lexical engagement.

The passive exposure findings complicate the picture. Many participants reported understanding words online without trying to remember them later and translating unfamiliar words quickly without reviewing them. This confirms that digital exposure can remain superficial. Yet deliberate engagement was also present: many learners reported reusing words, paying attention to real-context use, and making conscious efforts to remember useful words from online content. Thus, the smartphone and AI era produces a mixed lexical ecology in which passive exposure and strategic learning coexist.

These findings contribute to the literature by extending VLS research into a digital and AI-mediated context. Classical frameworks such as Schmitt's taxonomy remain useful, but they may not fully capture how learners engage with vocabulary through smartphones and AI. Similarly, validated instruments such as Gu's VLQ and Chou's short questionnaire provide a necessary core, but they need theoretically justified extensions when the research question concerns digital practices. The present study therefore supports a hybrid approach: retain validated VLS measures while adding digital and AI-related items that capture contemporary lexical behavior.

Pedagogically, the results suggest that teachers should not assume that students are strategy-free simply because they do not use traditional notebooks, printed dictionaries, or memorization routines. Many students are strategically active, but their activity is distributed across platforms, applications, and AI tools. Teachers can build on these practices by training learners to transform quick translation into retention, screenshots into review lists, AI explanations into example-based practice, and passive exposure into intentional noticing and reuse. Such instruction would not reject digital tools; rather, it would help students use them more deliberately.

Limitations and Future Research

Several limitations should be acknowledged. First, the study used convenience sampling and was limited to 105 first-year English Department students from one Moroccan university. The findings cannot therefore be generalized to all Moroccan EFL learners, learners from other universities, non-English majors, or secondary school learners. Second, the study relied on self-report

data, which may be affected by memory, social desirability, or participants' interpretations of the items. Third, the digital and AI-mediated sections were researcher-developed. Although they were theoretically motivated and internally consistent at the section level, further validation with larger and more diverse samples is needed. Fourth, the study measured reported practices rather than actual vocabulary gains. It cannot determine whether using AI tools, screenshots, translation applications, or social media exposure leads to better retention, depth of vocabulary knowledge, or productive use. Future research should combine strategy questionnaires with vocabulary tests, learning diaries, screen-recorded tasks, interviews, or longitudinal designs. Fifth, the negative internal consistency of the passive exposure items indicates that passive and deliberate digital behaviors should be refined conceptually and measured with more precise subdimensions in future instruments.

Future studies could compare English majors and non-English majors, first-year and advanced students, or learners from different Moroccan universities. They could also examine how learners prompt AI tools for vocabulary learning and whether prompt quality affects depth of processing, retention, and productive use. Experimental or longitudinal research would be especially useful for determining whether AI-mediated vocabulary practices support durable learning or mainly facilitate immediate comprehension.

CONCLUSION

This study examined vocabulary learning strategies among Moroccan EFL learners in the smartphone and AI era. The findings show that classical vocabulary learning strategies have not disappeared, but their role has changed. Selective attention and activation remain strong, while structural encoding, dictionary use, and oral repetition appear less frequent. At the same time, digital and AI-mediated practices are highly prominent, especially translation applications, screenshots, social media content, online dictionaries, and AI tools for explanations, examples, correction, and simplification.

The overall conclusion is that vocabulary learning strategies are undergoing transformation rather than simple decline. Learners continue to engage with vocabulary, but their strategies are increasingly embedded in smartphones, platforms, and AI-mediated environments. The challenge for vocabulary pedagogy is therefore not to return learners to pre-digital strategies, but to help them use digital and AI tools more intentionally. In this respect, vocabulary strategy instruction in the AI era should focus on noticing, recording, reviewing, reusing, and evaluating vocabulary across both classroom and digital environments.

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