



Contrasting the Effects of Massed vs. Spaced Practice of English Phrasal Verbs and Idioms Using WordUp on EFL Learners' Writing Performance

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Original Research Abstract

Received:
31 January 2025

Revised:
24 February 2025

Accepted:
1 October 2025

Published in Issue:
19 October 2025

Acquiring proficiency in English phrasal verbs and idioms presents a significant challenge for EFL learners. This study investigates the efficacy of massed and spaced practice, delivered through the innovative WordUp AI app, on the writing performance of intermediate EFL learners. A quasi-experimental design was employed, involving 35 female EFL learners aged 12-16 ($M_{age} = 14$) selected through convenience sampling. Participants were divided into three groups: massed practice, spaced practice, and control. The OPT and PET tests were used to assess participants' homogeneity and writing performance. The massed and spaced practice groups received instruction via the WordUp AI app, each with distinct methodologies, while the control group followed traditional learning methods. Results from a one-way ANCOVA revealed that the spaced practice group significantly outperformed the other groups in the post-test. These findings underscore the potential of the WordUp app as a valuable tool for vocabulary acquisition and writing skill development. English language teachers are encouraged to explore the use of spaced practice and AI-powered language learning tools to enhance student outcomes.

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Keywords: Artificial Intelligence, Idioms, Massed Practice, Phrasal Verbs, Spaced Practice, WordUp, Writing

Cite this article: Zaker, A., & Tavakoli, M. (2025). Contrasting the effects of massed vs. spaced practice of english phrasal verbs and idioms using WordUp on EFL learners' writing performance, *Journal of New Trends in English Language Learning*, 4 (Special Issue), Article si-03. <https://doi.org/10.57647/JNTELL.2025.si-03>

1. Introduction

Linguistic competence, encompassing both receptive and productive abilities, is paramount for effective communication. Among these skills, writing holds significant importance in both personal and professional contexts (Goh & Vandergrift, 2021; Zaker & Pourhassan, 2025). To achieve proficiency, learners must master a range of foundational elements, including

grammar, vocabulary, phrasal verbs (PVs), idioms, cohesion, and coherence (González et al., 2010; Nosratinia et al., 2013; Zaker, 2015). A deep understanding of PVs and idioms is crucial for skilled writing, as their appropriate use serves as a reliable marker of language proficiency. For decades, language educators have explored various methodologies to cultivate learners' vocabulary, phrasal verb, and idiom knowledge in second or foreign language contexts

(Chou, 2020; Nosratinia et al., 2015). A recent and increasingly popular approach involves leveraging technology, such as computer applications, to introduce novel vocabulary and enhance learning experiences (Zaker & Bajelany, 2025). This technological integration is widely believed to foster learner autonomy (Wulandari, 2017) and engagement (Prasetyawati & Ardi, 2020), mitigate learner stress and anxiety (Pasaribu, 2016), and sharpen cognitive abilities (Pasaribu & Iswandari, 2019). The 21st-century learner, often termed the "tech-savvy" or "digital native" generation (Kazu & Issaku, 2020), demands educational systems, including language instruction, to adapt to their unique learning preferences and capabilities. To cater to this new generation, a technology-driven pedagogical approach has emerged as a preferred and effective method. Furthermore, the recent COVID-19 pandemic has underscored the critical role of technology-based instruction through Learning Management Systems (LMSs). As educational institutions worldwide transitioned to online learning, LMSs proved indispensable in both continuing educational programs and mitigating the spread of the virus. The significant emphasis placed on PVs and idioms in high-stakes language proficiency exams like IELTS and TOEFL reflects their pervasive use in native English. PVs, typically composed of a verb and a prepositional particle, present a unique linguistic challenge. While similar to idioms in their non-literal meaning (Teng, 2020), PVs can be particularly perplexing due to the often tenuous connection between their literal and figurative interpretations. For example, the PV "pick up," while literally suggesting a physical action, often conveys metaphorical meanings such as "to learn" or "to collect". Recent advancements in computer technology and artificial intelligence (AI) offer promising solutions to the enduring challenges faced by English Language Learners (ELLs) in acquiring PVs and idioms (Roohani & Heidari Vincheh, 2023). WordUp, a cutting-edge language learning app developed by Paymon Khamooshi and Somayeh Aghnia in Sutton, England in 2019, exemplifies this potential. By leveraging innovative technology and contemporary language teaching methodologies, WordUp aims to streamline the language learning process, making it more engaging and practical. Through the integration of AI and effective learning techniques, WordUp aspires to democratize English language learning, empowering individuals globally to acquire language skills efficiently, regardless of their specific goals or geographical location. Since its 2019 launch, WordUp has garnered over 6 million installations (WordUp Help Center, 2019). Despite a growing body of research in foreign language learning, several areas remain relatively unexplored. These

include the efficacy of such apps in fostering learners' knowledge of English PVs and idioms, and the extent to which apps like WordUp contribute to the development of writing skills. While the literature on second language (L2) writing is extensive, it has often overlooked the critical role of idioms and PVs in crafting coherent and well-structured texts. Additionally, few studies have delved into the potential of AI-powered apps to assist learners in acquiring and effectively utilizing PVs and idioms to enhance the quality of their writing. Moreover, the comparative efficacy of WordUp in massed and spaced practice modalities for enhancing learners' comprehension of PVs and idioms, as well as their writing proficiency, remains unexplored. The debate surrounding massed versus spaced learning has a rich history in education (Miles, 2014). Glenberg (1979) posited that distributing learning over specific time intervals, thereby allowing for repetition and recall, optimizes learning outcomes. This phenomenon, known as the spacing effect, is further amplified by the lag effect, which suggests that greater intervals between learning sessions enhance retention. Conversely, massed practice involves the concentrated delivery of learning material within a single session (Seabrook et al., 2005), while numerous studies have investigated and compared the learning outcomes of spaced and massed instruction in English Language Teaching (ELT; Engel, 2022; Lotfolahi & Salehi, 2017; Nakata, 2015; Namaziandost et al., 2018; Mashhadi et al., 2017; Miles, 2014), research specifically examining the comparative effectiveness of massed and spaced practice of PVs and idioms with AI-powered apps remains limited. Notably, no prior research has explored the impact of massed and spaced practices of PVs and idioms using WordUp on learner achievement. To address these research gaps, this study aims to answer the following research questions:

- Does massed practice of English phrasal verbs and idioms by WordUp have any statistically significant effect on EFL learners' writing performance?
- Does spaced practice of English phrasal verbs and idioms by WordUp have any significant effect on EFL learners' writing performance?
- Is there any significant difference between massed and spaced instruction of English phrasal verbs and idioms by WordUp on EFL learners' writing?

2. Methodology

2.1. Participants

The participants comprised 35 female intermediate-level learners aged 12 to 16 ($M_{age} = 14$), selected via convenience sampling from two language institutes in Karaj, Iran. All participants shared a common first

language, educational background, and general English proficiency level. To ensure homogeneity in English language proficiency, participants were administered the Oxford Placement Test at the beginning of the study.

2.2. Instruments

Four instruments were employed for both instructional and data collection purposes: the Oxford Placement Test, two versions of the Preliminary English Test writing tasks administered pre- and post-intervention, the WordUp AI application, and a corpus of 112 English PVs and idioms.

2.2.1. Oxford Placement Test (OPT)

This is a test of English language proficiency for foreign or second language learners. It reports test takers' proficiency scores at seven proficiency levels. It was designed by Oxford University to provide educational centers with a fast and valid method of placing learners into appropriate English classes. This test was administered before intervention to check the three groups' homogeneity before intervention.

2.2.2. Preliminary English Test (PET) Writing Tasks

The part 2 writing test was selected and was given to the three groups before and after intervention to check the possible effects of massed and spaced instruction of PVs and idioms with WordUp AI on their writing performance. The writing task was selected based on their relevance to the instructed PVs and idioms so that the students could use them in their essays. Each essay was corrected by two independent raters based on the rating scale of PET, and the mean of their scores for each participant was considered the final writing score.

2.2.3. English PVs and Idioms

112 frequently used English PVs and idioms were selected for instruction and practice in the three conditions (control, massed, and spaced) in the intervention sessions. The PVs and idioms were selected carefully from the textbooks *The Ultimate Phrasal Verb Book* (Hart, 2017) and *Idioms Organizer* (Wright, 2002) from among those which the participants had not studied in their past courses before. Examples of such PVs and idioms are: *to make up your mind*, meaning *to make a decision or settle on an opinion*, or *to level with someone*, meaning *to be honest with someone*.

2.2.4. WordUp AI

The latest version of this app was installed on two different devices for massed and spaced groups so that they could participate in massed or spaced instructional sessions using the app. The WordUp AI app is an online

tool designed for practicing new vocabulary, PVs, and idioms in English, as well as their skills, particularly speaking and writing, through the appropriate use of these newly learned words and phrases in sentences. WordUp was developed by an Iranian couple, Paymon Khamooshi and Somayeh Aghnia, in Sutton, England, in 2019.

2.3. Procedure

Initially, 35 female EFL learners were selected through employing convenience sampling strategy. The paper-and-pencil version of the OPT was administered to all students across the three classes:

The control group, which consisted of 10 participants and received conventional explicit instruction on idioms and PVs with no use of WordUp AI; the massed instruction group, which included 12 participants and received massed instruction with WordUp AI; and the spaced instruction group, which comprised 13 participants and received spaced instruction with WordUp AI.

This study was conducted in two different institutes. The massed and spaced groups were located at the Kish-Day Institute in Fardis, Karaj, Iran, while the control group was situated at Sadeghi-Hariri Institute in Karaj, Iran. At the outset, students took the institution's specific placement test to ensure homogeneity. Random assignment was not feasible due to the intact nature of the classes.

The OPT was administered to further confirm their homogeneity. All three groups completed a writing pre-test, and their mean scores were compared to assess their writing proficiency.

Additionally, the participants' mean scores on the OPT were compared to evaluate their general English proficiency. Following this stage, the treatment phase commenced. The control group received regular instruction on PVs and idioms taught using conventional explicit teaching methods without the use of WordUp AI. All three groups had the same total time dedicated to PVs and idioms, but they practiced this time in different ways.

2.3.1. The Massed Instruction Group

The massed group participated in five 56-minute instruction and practice sessions on English PVs and idioms using WordUp AI for 5 consecutive sessions, out of a total of 14 sessions. Although there was a gap between their practice sessions, the group concentrated on 56-minute practice without breaks. They received a total of 280 minutes of instruction.

2.3.2. The Spaced Instruction Group

The spaced group engaged in 20-minute instruction and practice sessions on the same English PVs and idioms using WordUp AI for 14 consecutive days.

While they practiced every session without any gaps, their individual practice sessions were shorter than the massed group. Overall, they received a total of 280 minutes of instruction. After intervention, all three groups completed another type 2 PET writing test and their mean scores were compared to explore the potential differences resulting from different treatments. Furthermore, each group's performance on the pre and

post-tests of writing was compared to determine whether their performance changed as a result of massed or spaced instruction with the WordUp. For ethical considerations, the students' names were removed from all documents, including the OPT, pre-tests, and post-tests, to protect their identities. Table 1 below illustrates the procedure. It is essential to mention that this study adhered to all relevant ethical guidelines and considerations. Participants provided informed consent, and measures were put in place to ensure confidentiality and privacy.

Table 1. The Research Procedure Including the Pre-Test, Intervention, and the Post-Test

	Pre-Test	Intervention	Post-Test
Control Group	OPT & PET Writing Test	Regular instruction; no use of WordUp AI	PET Writing Test
Massed Instruction Group	OPT & PET Writing Test	Massed instruction with WordUp AI	PET Writing Test
Spaced Instruction Group	OPT & PET Writing Test	Spaced instruction with WordUp AI	PET Writing Test

The study was also designed to maximize benefits while minimizing risks, and participant dignity and the right to withdraw from the study at any time were fully respected (Zaker, 2024).

3. Results

The study employed a quasi-experimental design (Mackey & Gass, 2012) involving three groups: two experimental and one control. Participants were assessed before and after the intervention, which varied in modality: traditional, spaced, or massed. The dependent variable was participants' writing performance. The design was considered quasi-experimental since it was almost impossible to meet all the requirements of true experimental studies in social sciences, including Applied Linguistics studies (Zaker & Nosratinia, 2021). The following sections detail the statistical analyses conducted to address the research questions.

3.1. Preliminary Analyses

The data collated in this study were analyzed using One-Way ANOVA, and One-Way ANCOVA. These statistical methods, besides their own specific assumptions which will be reported when discussing the main results, assume normality of the data. Initially, inspecting the skewness and kurtosis indices for the OPT and writing tests indicated that these values were all within the ranges of ± 2 . Thus, it was concluded that the

present data did not show any significant deviation from normality (George & Mallery, 2020). Furthermore, results of the Pearson Correlations indicated that there were significant agreements between the two raters on pretest ($r(33) = .696$ representing a large effect size, $p < .05$), and posttest ($r(33) = .831$ representing a large effect size, $p < .05$) of writing. A One-Way ANOVA (Table 2) was run to compare the massed, spaced and control groups' means on the OPT test in order to show that the three groups were homogenous in terms of their general language proficiency prior to the main study. It should be noted that the assumption of homogeneity of variances, as explored through the Levene's test, was retained on the OPT test. ($F(2, 32) = .019$, $p > .05$), indicating that the groups were homogenous in terms of their variances on the OPT test. As reported in Table 2, the results ($F(2, 32) = .095$, $p > 0.05$, $\eta^2 = .006$ representing a weak effect size) indicated that there were not any significant differences between the three groups' means on the OPT test.

Table 2. One-Way ANOVA of the Oxford Placement Test by Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.303	2	.652	.095	.910
Within Groups	220.240	32	6.882		
Total	221.543	34			

3.2. Addressing the Research Questions

The three research questions raised in this study were explored through One-Way ANCOVA which assumes normality of data, reliability of instruments, linearity of relationship between pretest and posttest of writing, homogeneity of regression slopes, and homogeneity of variances of groups. It also requires that there should not be too high correlations among covariates. The posttest

of writing had a single covariate, i.e., pretest of writing. The assumptions are discussed below.

As reported in Table 3, the significant results of the linearity test ($F(1, 34) = 5.73, p < .05, \eta^2 = .222$ representing a large effect size) rejected the statistical null-hypothesis that the relationship between posttest of writing and pretest was not linear. In other words; there was a linear relationship between pretest and posttest of writing.

Table 3. Testing Assumption of Linearity of Relationship Between Pretest and Posttest of Writing

			Sum of Squares	df	Mean Square	F	Sig.
Posttest * Pretest	Between Groups	(Combined)	13.233	6	2.206	1.332	0.276
		Linearity	9.502	1	9.502	5.738	0.024
		Deviation from Linearity	3.731	5	0.746	0.451	0.809
	Within Groups		46.367	28	1.656		
	Total		59.600	34			
Eta Squared		0.222					

As reported, in Table 4, the non-significant interaction between covariate (pretest), and the independent variable ($F(1, 29) = 1.02, p > .05$, Partial $\eta^2 = .066$ representing a moderate effect size) indicated that

that the statistical assumption that the relationships between pretest and posttest of writing were linear across the three groups was supported.

Table 4. Testing Homogeneity of Regression Slopes Posttest of Writing by Groups with Pretest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Group	11.183	2	5.592	8.447	.001	.368
Pretest	3.952	1	3.952	5.971	.021	.171
Group * Pretest	1.352	2	.676	1.021	.373	.066
Error	19.197	29	.662			
Total	314.750	35				

The non-significant results of the Levene's tests ($F(2, 32) = 1.66, p > .05$; Table 5) indicated that the assumption of homogeneity of variances was retained on posttest of writing test after controlling for the effect of pretest. Table 6 shows the three groups' means on posttest of writing test after controlling for the effect of pretest. The results showed that the spaced group ($M = 3.87, SE = .230$) had the highest mean on posttest of writing after controlling for the effect of pretest. This was followed by massed ($M = 2.33, SE = .236$), and control ($M = 1.61, SE = .259$).

representing a large effect size) indicated that there were significant differences between massed, spaced and control groups' means on posttest of writing after controlling for the effect of pretest.

Table 5. Levene's Test of Homogeneity of Variances for Posttest of writing by Groups with Pretest

F	df1	df2	Sig.
1.665	2	32	0.205

Table 6. Descriptive Statistics for Posttest of Writing by Group with Pretest

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Massed	2.335 ^a	0.236	1.854	2.816
Spaced	3.870 ^a	0.230	3.402	4.339
Control	1.617 ^a	0.259	1.088	2.146

a. Covariates appearing in the model are evaluated at the following values: Pretest = 1.31.

Table 7 shows the main results of One-Way ANCOVA. The results ($F(2, 31) = 22.28, p < .05$, partial $\eta^2 = .590$

The results indicated that:

A: There was not any significant difference between massed practice ($M = 2.33$) and control ($M = 1.61$) groups' means on posttest of writing after controlling for the effect of pretest ($MD = .718$, $p > .05$). Thus; the first null-hypothesis as “massed practice of English phrasal verbs and idioms by WordUp did not have any significant effect on EFL learners' writing performance” was supported.

B: The spaced practice group ($M = 2.87$) significantly outperformed the control group ($M = 1.61$) on posttest of writing after controlling for the effect of pretest ($MD = 2.25$, $p > .05$). Thus; the second null-hypothesis as

“spaced practice of English phrasal verbs and idioms by WordUp did not have any significant effect on EFL learners' writing performance” was rejected.

C: The spaced practice group ($M = 2.87$) significantly outperformed the massed practice group ($M = 2.33$) on posttest of writing after controlling for the effect of pretest ($MD = 1.53$, $p > .05$). Thus; the third null-hypothesis as “there was not any statistically significant difference between massed and spaced instruction of English phrasal verbs and idioms by WordUp builder on EFL learners' writing” was rejected.

Figure 1 shows the three groups' means on posttest of writing after controlling for the effect of pretest.

Table 7. Tests of Between-Subjects Effects for Posttest of Writing by Groups with Pretest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pretest	3.135	1	3.135	4.730	.037	.132
Groups	29.549	2	14.774	22.288	.000	.590
Error	20.550	31	.663			
Total	314.750	35				

The significant results of One-Way ANCOVA were followed by Bonferroni post-hoc comparison tests.

Table 8. Bonferroni Post-Hoc Comparison Tests for Posttest of Writing by Groups with Pretest

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Massed	Control	.718	.349	.144	-.165	1.601
Spaced	Massed	1.536*	.332	.000	.696	2.375
	Control	2.254*	.350	.000	1.368	3.140

* The mean difference is significant at the .05 level.

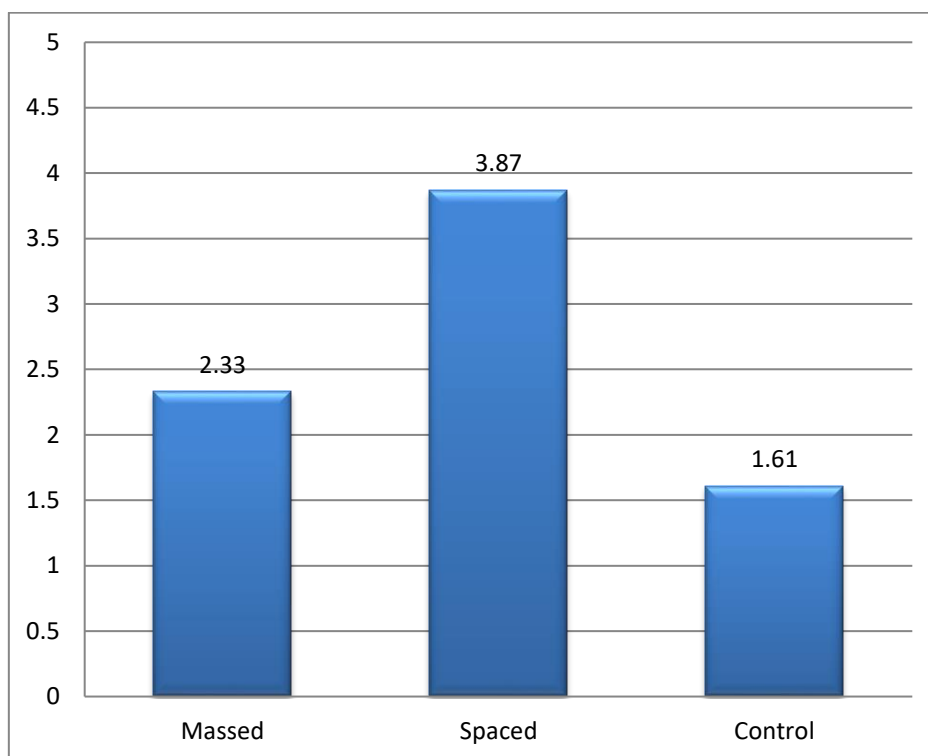


Figure 1. Means on Posttest of Writing by Groups with Pretest

4. Discussion and Conclusion

This study investigated the comparative efficacy of massed and spaced practice of English phrasal verbs and idioms, facilitated by the WordUp application, in promoting the writing proficiency of Iranian EFL learners.

The results revealed that while massed practice yielded no significant improvement in writing performance, spaced practice through WordUp had a significant positive impact on learners' writing abilities.

The findings of this study corroborate several previous studies in the field. Firstly, the results provide additional empirical support for Nakata's (2015) conclusion that a gradual increase in intervals between spaced sessions is more effective than massed or equally spaced practice for learning English vocabulary among Japanese EFL learners. Secondly, the findings align with Mashhadi et al.'s (2017) research, which demonstrated that spaced distribution instruction significantly improved EFL learners' recall and retention of grammatical structures. Similarly, the results support Namaziandost et al.'s (2020) findings that spaced practice outperforms massed practice in learning English collocations. The evidence supporting the efficacy of spaced practice further aligns with Shams-Abadi et al.'s (2015) conclusion that the online platform Edmodo can positively impact EFL learners' writing performance.

Additionally, the results provide robust empirical support for Namaziandost et al.'s (2018) study, which reported a significant positive effect of spaced instruction on reading comprehension compared to massed instruction. The outcomes of this study also corroborate those of Lotfolahi and Salehi (2017), who investigated various spacing schedules for teaching English-Persian vocabulary equivalents to young EFL learners. The results further support Mashhadi and Farvardin's (2017) findings, which indicated the superior efficacy of spaced over massed teaching of grammatical structures.

Moreover, the results confirm Miles' (2014) findings, which reported significant positive effects of spaced instruction on grammar learning.

The current findings resonate with Year's (2009) research, which underscored the efficacy of spaced practice over massed practice in enhancing learners' grammatical proficiency across both production and recognition tasks. Conversely, our results diverge from Engel's (2022) findings, which indicated no statistically significant benefits of spaced instruction for students with learning disabilities in spelling.

Our study provides compelling evidence for the superiority of spaced instruction over both massed and conventional instructional approaches. By distributing

learning sessions over time, spaced practice optimizes cognitive load, fostering deeper processing and long-term retention. This method facilitates active recall, strengthening neural connections and enhancing the durability of knowledge.

Moreover, spaced practice counteracts the effects of the forgetting curve by strategically scheduling review sessions. This approach not only solidifies learning but also potentially boosts motivation and reduces anxiety, as learners are less overwhelmed by the volume of information presented in a single session. Ultimately, spaced practice promotes a more effective and engaging learning experience.

Overall, technological tools such as WordUp AI have demonstrated significant potential in enhancing language learning outcomes (Al Fotais, 2019). The efficacy of WordUp in teaching and learning phrasal verbs and idioms can be attributed to its ability to increase student engagement and provide personalized feedback, which is invaluable for improving writing skills. WordUp AI can further identify individual strengths, weaknesses, and learning needs, enabling tailored linguistic development plans (Maenza & Gajic, 2020). By integrating technology and spaced practice, learners become more actively involved in the learning process. Additionally, studies have shown that AI tools can boost learner self-confidence (Chen et al., 2020) and enhance self-efficacy and motivation (Winkler & Söllner, 2018).

The findings of this study advocate for a shift from traditional teaching methods and massed practice towards spaced practice. The integration of technological tools like WordUp AI is recommended to optimize the teaching of phrasal verbs and idioms, ultimately leading to improved EFL learners' writing performance. This approach equips learners with the necessary tools to effectively incorporate these crucial linguistic elements into their writing.

EFL teachers play a pivotal role in elevating students' writing skills by guiding them through the writing process (Nosratinia & Zaker, 2017). By recognizing individual strengths and weaknesses, setting personalized goals, and encouraging reflective thinking, teachers can empower students to improve their writing (Nosratinia & Zaker, 2014). The utilization of technological apps like WordUp can further enhance this process by providing diverse writing topics and targeted feedback on errors, facilitating progress and saving valuable class time.

Previous research has highlighted the challenges EFL learners encounter in acquiring and utilizing English PVs and idioms in their writing (Shahidipour & Tahririan, 2018). However, the integration of AI-powered applications like WordUp, coupled with spaced

practice, can facilitate the acquisition of these linguistic elements and enhance their effective implementation in writing. Learners are encouraged to leverage such tools to refine their writing skills and to systematically learn phrasal verbs and idioms through personalized word plans and writing prompts. These tools empower learners to monitor their progress and focus on areas requiring improvement. Additionally, establishing a consistent writing routine incorporating spaced practice can significantly contribute to learning and skill development. The findings of this study have profound implications for syllabus designers. The integration of spaced practice principles and technological tools such as WordUp into syllabi can optimize the learning of phrasal verbs and idioms. WordUp's personalized word plans enable learners to select unfamiliar vocabulary, phrasal verbs, and idioms, tailoring the learning experience to individual needs. The app's writing section, equipped with writing prompts and error correction capabilities, addresses learners' specific challenges and guides their improvement. The efficacy of spaced practice of phrasal verbs and idioms through WordUp underscores the importance of creating learner-centered syllabi that foster engagement and motivation in foreign language learning. Based on the findings of this study, several recommendations for future research are proposed. Further investigation into the comparative effects of massed and spaced practice of English phrasal verbs and idioms using WordUp on writing performance is warranted. The current study involved a sample of 35 female EFL learners, and future research could expand the scope to include male learners and participants from diverse age groups (Zaker et al., 2019). A larger sample size would enhance the generalizability of the findings and increase the validity of the results. This would provide valuable insights into how factors such as gender and age influence the effectiveness of massed versus spaced practice in the context of English phrasal verb and idiom acquisition for EFL learners' writing performance (Zaker, 2024).

Authors Contribution

All authors have contributed equally to prepare the paper.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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