Asian Journal of English Language Teaching, 32(1), 29–62

Incidental Vocabulary Learning Through Word-Focused Exercises: The Association with Vocabulary Learning Strategies

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Reading is an important source of input for incidental vocabulary learning, and vocabulary learning strategies may affect incidental vocabulary learning outcomes from reading. This paper investigates incidental vocabulary learning through word-focused exercises among students learning English as a foreign language (EFL). The extent to which vocabulary learning strategies predict these impacts is also considered. Specifically, this study involved 486 Chinese university EFL students who were randomly and equally assigned to three word-focused exercise conditions: reading with marginal glosses plus comprehension questions; reading with a digital dictionary; and reading and filling in the blanks with a digital dictionary. All learners completed a survey on vocabulary learning strategies. The Vocabulary Knowledge Scale was adapted to measure vocabulary knowledge gains. Results showed that learners who read and filled in blanks with the use of a digital dictionary demonstrated significantly better vocabulary learning outcomes than the other groups. No significant differences were detected between the groups that read with marginal glosses plus comprehension questions or read with a digital dictionary. Multiple linear regression analysis revealed the roles of different vocabulary learning strategies on vocabulary learning outcomes in each group. Relevant implications are provided based on these findings.

Introduction

Learning vocabulary is of critical importance to language learning (Schmitt, 2000). Vocabulary knowledge helps learners develop skills such as reading, writing, listening, and speaking (Nation, 2013). Vocabulary learning can be learned either incidentally or intentionally. Incidental vocabulary learning refers to acquiring new words through meaningful activities, such as reading, without consciously engaging in the rote memorization of target words, while intentional vocabulary learning requires learners' deliberate efforts to learn and memorize new words (Huckin & Coady, 1999). In an attempt to enhance incidental vocabulary learning, word-focused exercises were recommended as an approach that informs pedagogical practice in vocabulary instruction (Laufer, 2001). In addition, learners' vocabulary learning strategies can influence how they develop vocabulary knowledge (Gu & Johnson, 1996). However, limited attention has been given to the role of word-focused exercises in incidental vocabulary learning while considering vocabulary learning strategies.

Vocabulary learning strategies have attracted consistent scholarly interest. O'Malley and Chamot (1990) introduced metacognitive, cognitive, and social strategies as three basic types of learning strategies. Gu and Johnson (1996) later cited metacognitive regulation and cognitive strategies as two main dimensions of vocabulary learning, covering at least five subcategories of guessing: dictionary use, note-taking, rehearsal, encoding, and activating. According to Hedge (2000), learners employ a range of cognitive strategies to learn words, such as using keywords, making associations, and learning words in groups. Cognitive strategies entail working on new words to understand, categorize, and store them in a mental lexicon (Hedge, 2000). Schmitt (1997) pointed out that learners deploy metacognitive strategies to manipulate and evaluate learning based on their perceptions of the learning process. Learners' use of metacognitive and cognitive strategies is essential to vocabulary acquisition (Mizumoto & Takeuchi, 2009). However, limited attention has been given to how vocabulary learning strategies influence incidental vocabulary learning.

The development of word-focused exercises was drawn from Hulstijn and Laufer's (2001) involvement load hypothesis (ILH) because ILH outlines the different aspects of engagement that a learner has with a new word. According to ILH, retention of new words is contingent

upon a task's involvement load (e.g., how the task imposes *need, search,* and *evaluation* for word learning). Learning conditions with higher involvement loads lead to better vocabulary learning (Keating, 2008; Kim, 2011). Nation and Webb (2011) contended that other factors, such as vocabulary learning strategies, may influence the effectiveness of vocabulary learning as well. Despite the potential of word-focused exercises for word learning (Laufer, 2001), it is important to explore how individuals' use of vocabulary learning strategies may affect incidental vocabulary learning outcomes through these exercises. The present study contributes to previous studies exploring incidental vocabulary learning from word-focused exercises while considering learners' vocabulary learning strategies.

Literature Review

Vocabulary Learning Strategies

A review of the literature reveals multiple attempts to classify language learning strategies (e.g., Rubin, 1981). For example, O'Malley and Chamot (1990) outlined metacognitive, cognitive, and social strategies as fundamental learning methods. Meanwhile, Oxford (1990) proposed a basic taxonomy that divided language learning strategies into six categories: cognitive, metacognitive, mnemonic, compensatory, affective, and social. This grouping may be one of the most common taxonomies of learning strategies. Later, Gu and Johnson (1996) compiled their Vocabulary Learning Questionnaire and identified two categories of strategies—metacognitive (planning, monitoring, and evaluating) and cognitive (attention, rehearsal, and production)—as core dimensions of vocabulary learning. These strategies also covered subcategories of guessing, including dictionary use, note-taking, rehearsal, encoding, and activating.

Hedge (2000) considered cognitive strategies as psychological operations associated with understanding, classifying, and remembering new vocabulary in a mental lexicon. Learners must master words through a series of cognitive strategies, such as using keywords, developing word associations, and learning groups of similar words. Learners generally use metacognitive strategies to manage and access learning through a sketch of the learning process (Schmitt, 1997).

Reflection can help learners reinforce their metacognitive skills, which are considered vital for thinking critically, regulating oneself, and learning throughout life. Metacognition also covers metacognitive strategies upon which learners depend to control their own cognition (Flavell, 1979). Metacognitive knowledge and metacognitive experiences play roles in learning (Flavell, 1979). For instance, students who apply metacognitive strategies have been shown to remain occupied with task completion. Strategy-based research has also focused on teaching less successful learners with reference to high-achieving students' distinguishing features and abilities (Plonsky, 2011). Skilled English learners tend to be keenly aware of what they can learn about unknown words, to focus more on form and spelling, and to learn more efficiently from context.

Previous studies have attempted to explore vocabulary learning strategies and vocabulary learning. In one experiment, Fan (2003) found that students preferred to use strategies they considered effective and valuable. Fan (2003) specifically considered a taxonomy of how students manage word learning, how they access a dictionary and use guessing strategies to understand word meaning, and how they strengthen newly learned vocabulary. Participants with a higher proficiency level in English vocabulary tended to exploit strategies more frequently than lower-level students. Webb and Kagimoto (2009) investigated collocation acquisition in a traditional classroom setting. Their results indicated that task difficulty and some mnemonic learning strategies (e.g., using cards to list, classify, and revise idiomatic expressions) may yield varying results for L2 students at different levels. Gu and Johnson (1996) performed a cluster analysis to profile active and passive strategy users; active strategy users were more eager to use new strategies and could adopt a wider spectrum of strategies than passive users. Tseng and Schmitt (2008) remarked that involvement in learners' vocabulary learning behavior could reveal strategic options and effective learning tactics. The authors devised a structural model clarifying the importance of motivation in vocabulary acquisition along with two categories of strategic behavior: frequency-based use of metacognitive skills and attention to individual-level strategies. Mizumoto and Takeuchi (2009) conducted a 10-week training on vocabulary learning strategies with EFL students in Japan. The results revealed three main findings: (1) strategy training was effective in changing the repertoire of strategies

and enhancing learners' vocabulary test scores; (2) rather than learners with high levels of strategy use, less frequent strategy users and moderate strategy users benefitted more from the training; and (3) training vocabulary learning strategies can make learners more motivated. Moreover, Nassaji and Hu (2012) confirmed an association between one's task involvement load and manipulation of lexical referencing strategies. A higher involvement load promoted better mastery of word-focused strategies. Learners in Nassaji and Hu's (2012) study were required to develop an array of independent vocabulary learning strategies, such as note-taking, which is a cognitive technique. Note-taking strategies enabled learners to make internal connections to the knowledge they had acquired. This active engagement seemed to greatly enhance their long-term retention of new vocabulary. Teng and Zhang (2021) associated one's task involvement load with metacognitive strategies. The results showed that EFL learners' use of metacognitive strategies could influence their vocabulary learning outcomes.

Upon reviewing the literature, it is unsurprising to find that vocabulary learning strategies represent a cornerstone of vocabulary research. These strategies may predict vocabulary learning performance because students' performance could be strongly associated with how often they use such strategies. Nevertheless, few studies have sought to unravel the relationship between vocabulary learning strategies (i.e., cognitive strategies and metacognitive strategies) and incidental vocabulary learning from word-focused exercises.

Involvement Load Hypothesis (ILH) and Vocabulary Learning

The ILH can be traced back to the levels of processing theory (Craik & Lockhart, 1972). According to this theory, the chance of a new word being stored in long-term memory is determined by the depth at which that word is processed. Hulstijn and Laufer (2001) pointed out the difficulties in operationalizing levels of processing. Laufer and Hulstijn (2001) formulated the ILH to contextualize task involvement-oriented vocabulary learning. In particular, the retention of unfamiliar words is conditional upon the amount of learner involvement while processing the meaning of those new words in a task. The motivational-cognitive construct of involvement varies in the degree of *need*, *search*, and *evaluation* and can be present or absent while processing vocabulary in a

naturally or artificially designed task (Table 1). *Need* belongs to the motivational dimension of involvement, while *search* and *evaluation* are cognitive dimensions. *Need* is moderate when vocabulary learning is task-imposed and strong when learner-imposed. The index of a moderate need is 1, while the index of a strong need is 2. *Search* indicates that learners endeavor to make sense of new words or identify the appropriate L2 form using available resources in a task. Two indices are involved in *search*: 1 is granted if *search* is present, and 0 is awarded if *search* is absent. An example of *search* is to find the meaning of a new word using a dictionary while finishing a task. *Evaluation* is the process of comparing a given word with other words to assess whether that word suits the context or to compare a specific meaning with another meaning. *Evaluation* is moderate with an index of 1 when learners are required to finish a task examining differences between words in context, such as filling in the blanks with correct words. An index of 2 is assigned to strong evaluation (e.g., when learners use unknown words in a writing task). These three dimensions—*need*, *search*, and *evaluation*—determine the weight of task involvement. The assumption of the ILH is that, all other factors being equal, words that are processed under a higher involvement load are learned better than words processed under a lower load (Laufer & Hulstijn, 2001).

Table 1. ILH Components

Component	Need	Search	Evaluation
Feature	Motivational, noncognitive dimension of involvement	Cognitive dimension of involvement	Cognitive dimension of involvement
Operationalization	Need for knowing words for the task	Attempting to find the meaning of unknown words; attempting to identify the appropriate L2 form for a particular concept	Comparing a given word with other words (to assess whether a word fits its context); comparing the specific meaning of a word with its other meanings
Categories	Absent (0) vs. present: moderate (1) or strong (2)	Absent (0) vs. present (1)	Absent (0) vs. present: moderate (1) or strong (2)

Empirical studies have explored word-focused exercises based on the ILH. Some fully support this hypothesis. For example, Laufer (2003) compared word learning performance between reading and writing exercises under the ILH. Writing exercises with a higher involvement load contributed to higher scores versus encountering target words during reading. Nassaji and Hu (2012) showed that exercises with a higher involvement load resulted in superior vocabulary retention. Other studies partially support the ILH: Webb (2005) found that when reading and writing exercises both took learners the same amount of time to complete, the reading exercises led to more pronounced vocabulary learning outcomes. Conversely, when the time was allotted based on learners' willingness or need, the writing exercise (which required more involvement) produced better outcomes. Folse (2006) observed that vocabulary retention from an original sentence-writing exercise was lower than that of three fill-in-the-blank exercises, given the equal time spent on each exercise. In other words, exercises with different task-induced involvement loads could be equally effective when the same time was provided for learning. Kim (2011) also partially supported the ILH by claiming that exercises with higher involvement indices were not more effective in all instances. For example, balanced degrees of the components in an exercise might not contribute equally to vocabulary learning; strong evaluation could be more important than other components. This degree of evaluation may lead to more focused attention when manipulating information for unknown words. In a recent meta-analysis, Yanagisawa and Webb (2021a) analyzed research on the predictive ability of the ILH and the relative effectiveness of its three components (i.e., *need*, *search*, and *evaluation*). Overall, vocabulary learning increased along with the involvement load. The authors concluded that the *evaluation* component contributed the most to vocabulary learning, followed by *need*. In contrast, *search* did not contribute to incidental vocabulary learning. The total variance explained by vocabulary learning gains on immediate posttests was 15.4% compared with 5.5% on delayed posttests. Yanagisawa and Webb (2021b) further proposed an extended ILH (the ILH plus) based on accumulated data. Their modified ILH component model, in which *evaluation* included four levels (absent, moderate evaluation, sentence-level varied use, and composition-level varied use), was optimal. They nonetheless stressed the need to assess the predictive accuracy of the ILH plus with learning conditions employing more combinations of factors.

Hazrat and Read (2022) reviewed articles on the ILH and identified several remaining critical issues: components' relative weights remained unclear; conflicting evidence exists about the degree of prominence given to sentence writing and composition writing; the impact of component distribution is ambiguous; and the range of scores on tasks is limited. They also recognized that the ILH is based on the assumption that all factors are equal—yet some aspects, including time on task, learners' level of proficiency, and learners' frequency of exposure to target words, may influence this supposition. Relatedly, Teng's (2022) findings support ILH, but learners' proficiency level and working memory were found to be significant predictors of vocabulary learning. Teng and Zhang (2021) also discovered that metacognitive strategies could affect vocabulary learning. Variation in learners' use of metacognitive strategies may predict the effects of word-focused exercises on learners' vocabulary acquisition. In this vein, Nassaji and Hu (2012) identified a significant relationship between learners' degree of task-induced involvement load and the use of lexical inferencing strategies.

Relevant work has conveyed sustained academic interest in *need*, *search*, and *evaluation*. Other factors, such as task type, learner proficiency, strategies, and task completion time, may influence word learning and retention. However, there has been little research on vocabulary learning strategies in the context of incidental vocabulary learning through word-focused exercises. Studies have suggested the roles of such strategies in vocabulary learning (Gu, 2013; Mizumoto & Takeuchi, 2009). A more in-depth explanation of their correlations with word-focused exercises is still needed: When learners engage in different involvement-load exercises, their use of distinct vocabulary learning strategies may shape vocabulary learning outcomes.

Rationale and Research Questions

The rationale for this research is based on the findings of earlier work on learners' understanding and use of vocabulary learning strategies (e.g., Gu & Johnson, 1996; Hulstijn, 1997; Mizumoto & Takeuchi, 2009; Schmitt, 1997). A common point in these studies is that vocabulary learning strategies can help learners plan, control, and evaluate their vocabulary learning effectively. Learners who deploy vocabulary

learning strategies more frequently, such as metacognitive tactics, achieve better vocabulary learning performance (e.g., Teng & Zhang, 2021). Efforts have also been made to explicate the correlation between lexical inferencing strategies and vocabulary learning through the ILH (Nassaji & Hu, 2012). This hypothesis presumes a lack of individual differences among learners. It is nevertheless important to understand how certain types of vocabulary learning strategies may guide vocabulary learning outcomes from word-focused exercises. The following questions are addressed in this paper:

1. To what extent do varying degrees of word-focused exercises affect incidental vocabulary learning?
2. To what extent do learners' vocabulary learning strategies predict incidental vocabulary learning in several word-focused exercise conditions?

Methodology

Participants

This study was carried out at a university in southern China. The initial participant pool contained 530 EFL learners who were non-English majors and were between 18 and 20 years old. Twenty learners with intimate knowledge of the 13 target words during their pretest were eliminated; prior knowledge of the target words would compromise the reliability of the results. Ten participants who expressed concern about being involved in an intervention trial were also excluded from the pool. Fourteen participants failed to complete the exercises; as such, they were excluded as well. The final sample consisted of 486 students (251 women and 235 men). The participants were randomly assigned to three word-focused exercise conditions (n = 162 per condition). All participants were in their first year of college and had studied English for at least nine years.

Target Words

The target words were 13 low-frequency words with which participants were unfamiliar. Target words were selected from the fifth frequency

band in the COBUILD dictionary, spanning from the 6,601st to the 14,700th most frequent word. As high-frequency words were common in the selected reading materials, we substituted several words with low-frequency target words and re-edited the text. Each target word occurred once in the reading passage. The Vocabulary Knowledge Scale (VKS) (see the "Vocabulary Knowledge Test" section) was administered prior to the experiment to ensure that participants had no knowledge of any of the target words (Table 2).

Table 2. Thirteen Target Words

altercation	ferocious	nugatory	impugn	veracity
camouflage	fetid	gulp	disgruntled	astute
waft	feign	reticent		

Materials and Word-Focused Exercises

In choosing reading materials, we considered the reading genres as well as the participants' vocabulary size, reading comprehension ability, and interest in reading. The reading material was a fable extracted from Aesop, a work of fiction. The text included 440 tokens (i.e., individual words). This story is about a proud lion who, after the lioness informs him that his breath smells bad, sets out to ask his advisors if this is true. The reading materials were selected based on suitable content and an entertaining topic. Approximately 95% of words in the text were at the 2,000-word level (Heatley et al., 2002). All participants mastered the 2,000- and 3,000-word levels, based on a cut-off criteria of 26/30 (Schmitt et al., 2011). Learners need at least 95% lexical coverage of a text to have adequate comprehension (e.g., Hirsh & Nation, 1992; Laufer & Ravenhorst-Kalovski, 2010). Therefore, the sample of learners in this study was expected to understand the text well.

We considered three word-focused exercises with different involvement loads (Laufer & Hulstijn, 2001). Each participant had an equal chance of being assigned to one of the following conditions: reading comprehension with marginal glosses and comprehension questions (reading + comprehension questions); reading comprehension with available use of a digital dictionary to search for word meanings (reading + dictionary); and reading and filling in blanks in the text with available use of a digital dictionary to search for word meanings (reading + fill-in-the-blank +

dictionary). The three exercises contained the same reading passage. The fill-in-the-blank test included 13 target words and two distractor words. Only two distractor words were chosen given the workload required to finish the exercise. As Table 3 shows, all exercises involved a moderate need because students' learning process and motivation can be attributed to task demands. Exercises 2–3 contained a search process; participants could complete the task while using an electronic dictionary. Evaluation was moderate in Exercise 3 because learners had to read the text and fill in the 13 blanks while distinguishing 15 words (see the appendix for the three exercises).

Table 3. Involvement Load Index in Word-Focused Exercises

Involvement load	Reading + comprehension questions	Reading + dictionary	Reading + fill-in-the-blank + dictionary
Need	Moderate (1)	Moderate (1)	Moderate (1)
Search	Absent (0)	Present (1)	Present (1)
Evaluation	Absent (0)	Absent (0)	Moderate (1)
Involvement load index	1	2	3

Measurement Instruments

Vocabulary Learning Strategies

A vocabulary learning strategies questionnaire (Gu, 2018) was applied to assess participants' use of vocabulary learning strategies when learning English in general. This questionnaire included two main categories: metacognitive strategies (17 items) and cognitive strategies (45 items). The metacognitive strategies addressed beliefs about words being memorized and beliefs about words being learned through use, selective attention, and self-initiation. The cognitive strategies included contextual guessing strategies, dictionary strategies, note-taking strategies, rehearsal strategies, encoding strategies, and activation. Table 4 presents the categories of vocabulary learning strategies. Items were scored on a 5-point Likert scale: 1 = *Certainly, always false*; 2 = *Generally false*; 3 = *Somewhat false, but with exceptions*; 4 = *Generally true*; 5 = *Certainly, always true*. Item scores were summed to capture participants' use of metacognitive and cognitive strategies.

Table 4. Categories of Vocabulary Learning Strategies

	Categories	Strategies
Metacognitive	Beliefs about vocabulary	Words should be memorized
		Words should be learned through use
	Metacognitive strategies	Selective attention
		Self-initiation
Cognitive	Inferencing	Guessing strategies
	Using dictionary	Dictionary strategies
	Taking notes	Choosing which word to put into notebook
		Deciding what information goes into notes
	Rehearsal	Use of word lists
		Oral repetition
		Visual repetition
	Encoding	Visual encoding
		Auditory encoding
		Use word structure
		Contextual encoding
	Activation	Activation strategies

Vocabulary Knowledge Test

We adapted Wesche and Paribakht's (1996) VKS to determine participants' vocabulary learning performance. The VKS in this study consisted of four items covering three points (Table 5); it served as a pretest and a posttest. The pretest was administered four weeks before the experiment was conducted to minimize learners' rote memorization of target words during the pretest.

Table 5. Vocabulary Knowledge Test

Word: Anxious	
0	I do not think I have ever seen this word. Tick (√) if true: (do not proceed)
1	I have seen this word before and I think it means (give a synonym or definition in English/Chinese):
2	I can use this word (anxious) in a sentence (write your sentence in English):
3	Translate your sentence into Chinese:

Participants who provided either no answer or a wrong answer were given 0 points. One point was granted for every correct answer. No partial scores were given. The maximum score was 39 points for the 13 target words.

Research Procedure

All exercises, as well as the tests included in this study, were completed in participants' regular classrooms. The survey was distributed and completed online. The reading and vocabulary tests were in paper-and-pencil form. Two days prior to the experiment announcement, researchers received informed consent from participants with the help of their English teachers. Participants were told that this research concerned vocabulary learning strategies and would involve different exercises. The vocabulary test was administered to participants without notice, but they were informed of the purpose of incidental vocabulary learning after the experiment.

The three exercises were randomly assigned to three groups, each with 162 participants. Participants completed the 30-minute VKS pretest online four weeks before the experiment to measure their previous knowledge of target words. Each of the three exercises was then completed in Week 5. Participants filled out the vocabulary learning strategies questionnaire to demonstrate their use of vocabulary learning strategies after the intervention. Each exercise took 20 minutes to complete. The time allocated was consistent in each group to minimize the time-upon-task effect on learning performance (Huang et al., 2012). Each reading passage included 13 target words. Participants completed a 20-minute posttest immediately after completing the strategy questionnaire; they could not use a dictionary or the reading materials on the posttest.

Data Analysis

The data were analyzed using SPSS. A one-way independent analysis of variance (ANOVA) was employed to compare group performance on each task. The effects of the three word-focused exercises on participants' incidental vocabulary learning outcomes were examined via post hoc comparisons. Multiple linear regression analyses were used to evaluate the extent to which vocabulary learning strategies predicted participants' vocabulary learning scores in each exercise condition.

Results

Vocabulary Learning Outcomes

The first research question concerned the extent to which word-focused exercises led to vocabulary learning. Participants did not exhibit prior knowledge of the target words based on the pretest. The descriptive statistics in Table 6 summarize the characteristics and distribution of posttest vocabulary knowledge in the three conditions. Conditions with a higher involvement index yielded better vocabulary knowledge learning outcomes than conditions with a lower index conditions. The group of reading + fill-in-the-blank + dictionary yielded the best scores (14.86), followed by reading + comprehension questions (11.23) and reading + dictionary (10.65). The Cronbach's alpha value for the vocabulary test was .71; alpha values for the components of vocabulary learning strategies ranged from .57 to .85. These values reflected the reliability of the test and survey.

Table 6. Descriptive Statistics for Vocabulary Learning in Three Conditions

	N	Mean	Std. deviation	95% confidence interval for mean	
				Lower bound	Upper bound
Reading + comprehension questions	162	11.23	8.52	9.29	13.18
Reading + dictionary	162	10.65	8.71	8.84	12.47
Reading + fill-in-the-blank + dictionary	162	14.86	8.92	13.01	16.72
Total	486	12.25	8.67	11.17	13.34

A one-way ANOVA was used to compare group performance (Table 7).

Table 7. Results of one-way independent ANOVA

	Sum of squares	*df*	Mean square	*F*	Sig.
Between groups	1686.634	2	843.317	5.802	.003
Within groups	70206.741	483	145.356		
Total	71893.374	485			

A significant difference was observed between the three groups' scores, $F(2, 485) = 5.802$, $p < .01$, $\eta^2 = .155$. We used a post hoc Tukey's HSD (honestly significant difference) test (Table 8) for multiple comparisons. The mean scores of the group of reading + fill-in-the-blank + dictionary differed significantly from those of reading + comprehension questions and reading + dictionary ($p < .05$); the latter two groups did not vary significantly ($p = .90$).

Table 8. Post Hoc Comparisons of Posttests Across Three Groups

Dependent variable		Mean difference (I-J)	Std. error	*p*	95% confidence interval	
					Lower bound	Upper bound
1	2	0.58	1.34	.902	–2.57	3.73
	3	–3.630*	1.34	.019	–6.78	–0.48
2	1	–0.58	1.34	.902	–3.73	2.57
	3	–4.210*	1.34	.005	–7.36	–1.06
3	1	3.630*	1.34	.019	0.48	6.78
	2	4.210*	1.34	.005	1.06	7.36

Note. 1 = Reading + comprehension questions; 2 = Reading + dictionary; 3 = Reading + fill-in-the-blank + dictionary.

Predictive Effects of Vocabulary Learning Strategies

The second question revolved around the extent to which participants' vocabulary learning strategies predicted vocabulary learning outcomes in each exercise condition. First, confirmatory factor analysis was adopted for 16 factors and 58 items. Gu's (2018) Vocabulary Learning Questionnaire originally contained 62 items, but 4 items (items 1, 25, 26, and 27) with low factor loadings (.255, .264, .299, and .346, respectively) were eliminated for the purposes of the present study.

Next, we conducted multiple linear regressions. Our data did not show multicollinearity (i.e., the independent variables were not highly associated with each other), which meant that our data did not violate this assumption. Multiple regressions could therefore generate a valid result (Field, 2013). All potential predictors (beliefs about vocabulary, metacognitive strategies, guessing strategies, dictionary strategies, note-taking strategies, rehearsal strategies, encoding strategies, and activation) were entered into a linear regression model using stepwise entry. The regression coefficient (β) had standard deviations as its unit,

facilitating variable comparisons. The adjusted R^2 measured the proportion of variance in the dependent variables that was explained by the independent variables.

Table 9. Results of Multiple Regression Analysis for the Group of Reading + Comprehension Questions

Predictors	Unstandardized coefficients		Standardized coefficients			
	B	Std. error	Beta	*p*	R^2	*F*
Words should be memorized	1.620	1.752	.088	.357	.115	*F* (16, 145) = 1.177, *p* = .29
Words should be learned through use	5.329	2.326	.239	.023*		
Selective attention	–1.555	2.036	–.082	.446		
Self-initiation	–1.761	1.902	–.087	.356		
Guessing strategies	–2.105	2.834	–.085	.459		
Dictionary strategies	1.349	2.4	.064	.575		
Choosing which word to put into notebook	–2.246	1.975	–.116	.257		
Deciding what information goes into notes	–0.706	1.874	–.042	.707		
Use of word lists	0.274	1.757	.016	.877		
Oral repetition	0.923	1.693	.05	.586		
Visual repetition	0.222	1.543	.013	.886		
Visual encoding	–0.024	1.388	–.002	.986		
Auditory encoding	0.653	1.498	.043	.664		
Use word structure	4.024	1.716	.234	.02*		
Contextual encoding	–3.345	1.75	–.209	.058		
Activation strategies	1.889	2.039	0.112	.356		

As indicated in Table 9, the *p* values for the belief that words should be learned through use and encoding strategies of using word structure were statistically significant at the .05 level for the group of reading + comprehension questions. However, the *F* test ($F = 1.177$, $p = .29$) showed that these vocabulary learning strategies did not significantly predict posttest outcomes. The R^2 value was .115; that is, 11.5% of the posttest scores could be explained by vocabulary learning strategies in the reading + comprehension questions group.

Table 10. Results of Multiple Regression Analysis for the Group of Reading + Dictionary

Predictors	Unstandardized coefficients		Standardized coefficients			
	B	Std. error	Beta	*p*	R^2	*F*
Words should be memorized	–0.396	1.483	–.022	.790	.184	*F* (16, 145) = 2.041, *p* = .01
Words should be learned through use	–3.655	2.382	–.193	.127		
Selective attention	0.158	2.044	.009	.938		
Self-initiation	1.56	1.755	.074	.376		
Guessing strategies	4.966	2.336	.233	.035*		
Dictionary strategies	3.735	1.868	.206	.047*		
Choosing which word to put into notebook	3.882	1.781	.226	.031*		
Deciding what information goes into notes	0.002	1.585	0	.999		
Use of word lists	0.746	1.491	.054	.618		
Oral repetition	–1.834	1.475	–.114	.216		
Visual repetition	–0.867	1.371	–.059	.528		
Visual encoding	–0.03	1.213	–.002	.98		
Auditory encoding	–0.654	1.448	–.044	.652		
Use word structure	3.564	1.479	.237	.017*		
Contextual encoding	–3.451	1.779	–.255	.054		
Activation strategies	–3.043	1.738	–.204	.082		

The *p* values in the reading + dictionary group ($F = 2.041$, $p = .01$) were less than .05. Some strategies thus had predictive effects. As listed in Table 10, the guessing strategies, dictionary strategies, note-taking strategies, strategies of choosing which word to put into a notebook, and encoding strategies of using word structure significantly predicted the posttest scores in the group of reading + dictionary ($p < .05$). The R^2 value was .184. In other words, the independent variables explained 18.4% of this group's posttest outcomes.

The *p* values in the reading + fill-in-the-blank + dictionary group ($F = 2.094$, $p = .01$) were also less than .05. Some strategies thus had predictive effects. The R^2 value was .188 (see Table 11). The results also revealed that the posttest scores were most significantly positively predicted by oral repetition, a type of rehearsal strategy ($p < .01$). Other independent variables (e.g., metacognitive strategies of selective attention, dictionary strategies, and encoding strategies of using word structure) also had predictive effects on posttest values ($p < .05$). Overall, dictionary

strategies and encoding strategies for using word structure were each significantly predictive among participants in the groups of reading + dictionary and reading + fill-in-the-blank + dictionary.

Table 11. Results of Multiple Regression Analysis for the Group of Reading + Fill-in-the-Blank + Dictionary

Predictors	Unstandardized coefficients		Standardized coefficients			
	B	Std. error	Beta	*p*	R^2	*F*
Words should be memorized	–1.467	1.481	–.084	.324	.188	$F(16, 145) = 2.094$, $p = .01$
Words should be learned through use	–2.889	2.062	–.135	.163		
Selective attention	3.57	1.658	.2	.033*		
Self-initiation	–0.528	1.885	–.025	.78		
Guessing strategies	–2.525	2.149	–.112	.242		
Dictionary strategies	3.495	1.744	.206	.047*		
Choosing which word to put into notebook	–0.878	1.597	–.058	.583		
Deciding what information goes into notes	–2.521	1.529	–.187	.101		
Use of word lists	–2.37	1.447	–.149	.104		
Oral repetition	4.886	1.423	.297	.001*		
Visual repetition	–2.364	1.342	–.17	.08		
Visual encoding	–0.301	1.311	–.022	.819		
Auditory encoding	–0.523	1.236	–.04	.673		
Use word structure	3.13	1.428	.21	.03*		
Contextual encoding	–0.303	1.557	–.021	.846		
Activation strategies	–0.937	1.724	–.062	.588		

Discussion

Effects of Word-Focused Exercises on Incidental Vocabulary Learning

In accordance with previous studies (e.g., Hulstijn & Laufer, 2001; Nassaji & Hu, 2012; Teng, 2022; Teng & Zhang, 2021), participants' learning of unknown words was contingent on the exercise's involvement load. The involvement load could determine vocabulary learning outcomes through incidental means, such as exposure to target words through marginal glosses or a dictionary. Participants in the reading + fill-in-the-blank + dictionary group faced a higher involvement load and

scored better on the posttest than the reading + comprehension questions and reading + dictionary groups. This pattern lends support to the ILH (e.g., Keating, 2008; Laufer, 2003). However, no significant differences emerged between the two groups of reading + comprehension questions and reading + dictionary. These findings were inconsistent with the ILH.

Three main issues should be considered based on our results. First, the use of a digital dictionary may not benefit vocabulary acquisition; no significant differences manifested between the two groups of reading + comprehension questions and reading + dictionary. These findings accord with Yanagisawa and Webb's (2021a) determination that the *search* component did not contribute to incidental vocabulary learning from word-focused exercises. Second, *evaluation* (in the form of fill-in-the-blank exercises) was an important aspect of vocabulary learning outcomes (Folse, 2006). The group of reading + fill-in-the-blank + dictionary also demonstrated greater advantages over the condition of reading + dictionary or reading + comprehension questions. These results draw attention to the *evaluation* component. As Yanagisawa and Webb (2021b) argued, this component's predictive influence is especially important: *evaluation* contributes the most to incidental vocabulary learning outcomes. Cognitive involvement may hence be beneficial for evaluating the use of target words rather than the predictive effects of the *search* component. The ILH could be reconsidered in light of this partial support. Hazrat and Read (2022) noted that the effectiveness of word-focused exercises on incidental vocabulary learning can vary across *evaluation* types (e.g., combining a *search* with different forms of *evaluation* or focusing on the target aspect of vocabulary knowledge rather than the involvement load).

Predictive Effects of Vocabulary Learning Strategies on Incidental Vocabulary Learning

Among all cognitive strategies, the encoding strategies of using word structure most significantly predicted participants' posttest scores. This tactic also forecasted the three groups' vocabulary learning outcomes. Put simply, top-scoring participants often used word structures such as prefixes, roots, suffixes, or other word-formation rules. Using word structures helped learners link new and known words, so unfamiliar vocabulary could be more easily stored in long-term memory (Pressley & Hilden, 2006). Guessing strategies also played a role in vocabulary learning outcomes. Gu (2018) suggested that these strategies (i.e.,

guessing in a wider context or in the immediate context) significantly correlated with vocabulary learning outcomes. Robust and effective guessing strategies required participants to contemplate contextual logic (e.g., cause and effect) while referring to their personal backgrounds and grammatical knowledge. Guessing strategies thus helped participants engage more fruitfully with word-focused exercises. Being able to clarify what they were reading, and to better understand the text, could generate better vocabulary learning outcomes (Nassaji & Hu, 2012). These findings substantiate the impacts of vocabulary learning strategies on vocabulary acquisition (Mizumoto & Takeuchi, 2009).

Meanwhile, participants were less likely to use other encoding strategies such as visual encoding (e.g., trying to act out, create a picture of, or visualize new words to remember them better), auditory encoding (e.g., trying to link words to a similarly sounding known word to remember them together), and contextual encoding (e.g., remembering a new word in context). Not all vocabulary-learning strategies predicted related outcomes. Participants' use of these strategies varied: Learners were more likely to adopt strategies that they considered successful (Fan, 2003). Neither the belief that words should be learned through use nor the encoding strategies of using word structure predicted the posttest outcomes in the group of reading + comprehension questions. However, dictionary strategies and encoding strategies for using word structure were both significantly predictive of posttest vocabulary learning achievement for the group that read with a digital dictionary and the group that read and filled in the blanks with a digital dictionary. Compared with the group that read with the digital dictionary, the rehearsal strategy of oral repetition most positively and significantly predicted the vocabulary learning outcomes in the group of reading + fill-in-the-blank + dictionary. Gu (2018) found that oral repetition requires learners to repeat the pronunciation of words aloud or mentally. In our case, test-takers who outperformed other participants were more willing to use oral repetition. Vocabulary learning was not instantaneous; it called for intentional, constant repetition. The metacognitive strategies of selective attention were also positively and significantly predictive of vocabulary learning outcomes in the reading + fill-in-the-blank + dictionary group. Participants using this strategy clearly knew which words were important to learn to understand a passage. This result echoes that of Gu (1994), who showed that selective attention to word learning distinguished unsuccessful and successful learners. Teng and

Zhang (2021) pointed out that learners who adopted metacognitive strategies were more eagerly engaged in tasks. However, participants in the two groups (reading + dictionary and reading + fill-in-the-blank + dictionary) in the present study were required to consult a dictionary to learn the meanings of target words. Participants in the reading + fill-in-the-blank + dictionary group were further required to complete fill-in-the-blank exercises. These demands may elicit different uses of vocabulary learning strategies. Overall, although word-focused exercises can lead to vocabulary learning outcomes, certain strategies may influence vocabulary learning outcomes differently.

Concluding Remarks, Limitations, and Implications

This research was intended to identify the effects of word-focused exercises on incidental vocabulary learning while considering the use of vocabulary learning strategies. The *search* component was far from adequate for learning target words compared with the *need* and *evaluation* components. *Evaluation* should particularly be considered when designing word-focused exercises. Contributing to previous studies in this line, EFL learners' use of vocabulary learning strategies may influence incidental vocabulary learning under each exercise condition.

Its contributions notwithstanding, some limitations of this research should be noted for future study. First, our sample consisted of undergraduate students in China, which may limit the generalizability of the results to other cultural contexts or populations. Second, we intended to adapt the VKS from Wesche and Paribakht (1996) using a multidimensional design, but we did not investigate the longitudinal development of participants' vocabulary learning. Third, the strategies questionnaire included 58 items. Raising the sample size to the recommended value of 10 times larger than the number of items would increase the statistical power of our findings. Fourth, repeated exposure to target words is an important determinant of vocabulary acquisition through reading (Teng, 2020). Scholars could continue investigating the interaction between word-focused exercises and word encounters and how this interaction shapes incidental vocabulary learning. Finally, equal time was allotted for all word-focused exercises; we did not consider time-on-task effects (Huang et al., 2012).

Despite these limitations, our work innovatively explored incidental vocabulary learning outcomes through word-focused exercises while

considering vocabulary learning strategies. Several theoretical implications arise from the results described above. We have discussed the relationship between vocabulary learning strategies, word-focused exercises, and incidental vocabulary learning. The ILH is a useful framework but predicts only part of the variance in incidental vocabulary learning. The effectiveness of fill-in-the-blank exercises highlights the role of word retrieval. Although we did not include retrieval as a separate involvement component, it may be worth considering more closely. The retrieval component of sentence writing and composition writing may boost the accuracy of this hypothesis for predicting the effectiveness of word-focused exercises (Hazrat & Read, 2022). Regarding pedagogical implications, learners' strategy awareness should be cultivated to help them monitor, regulate, and facilitate vocabulary learning. Students' time could then be better spent on exercises with a high involvement load. Teachers may also pay attention to which strategies should be taught and how vocabulary learning strategies may shape the outcome of vocabulary learning. Moreover, students may find themselves having various abilities and motivations when asked to accomplish word-focused exercises with different involvement loads. Teachers must be cognizant of task demands and enhance students' motivation to become involved in word learning exercises. It is also important for instructors to teach students how to employ strategies, such as guessing strategies, dictionary strategies, note-taking strategies, strategies of choosing which word to put into a notebook, and encoding strategies of using word structures, to build vocabulary knowledge and to seek opportunities to develop vocabulary learning strategies under different exercise conditions.

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Appendix

Exercise 1

Dear students,
Please do not use electronic dictionaries when completing the following reading comprehension. The difficult words have been marked. We promise to keep your answers confidential, and the test results are only used for this experimental research.

Student ID:_____

The Lion and His Advisor

One night, the Lion and the Lioness got into an **altercation**. All through the night, they roared at each other, and their **ferocious** roaring could be heard a mile away.

"You are **nugatory**!" roared the Lioness. "You never do anything! My sisters and I do most of the hunting. All you do is sleep and lie around the den all day! On top of it all, your breath smells bad!"

"It does not!" roared the king of the jungle in his loudest voice. But, as soon as he said this, the Lion began to **impugn** it. Did his breath really smell bad? He had never smelled his own breath. Was it even possible to smell your own breath? How could he find out if his breath was horrible?

In the morning, the Lion decided to send for three of his advisors, the Sheep, the Wolf, and the Fox.

He summoned the Sheep into his den first.

"Sheep," the Lion said, "tell me and tell me truly. Does my breath smell bad?" The Sheep thought the Lion wanted to know the **veracity**.

"Your Majesty," the Sheep said, "since you have asked me for the truth, I will not **camouflage** it from you.

Your breath does smell bad. In fact, it smells **fetid**."

That was not what the Lion wanted to hear. He roared and **gulped** down the Sheep. Next, the Lion summoned the Wolf.

"Wolf," he said, "tell me and tell me truly. Does my breath smell bad?"

The Wolf thought the Lion would be **disgruntled** to learn the truth. He decided this was a situation in which it would be **astute** to lie.

"Your Majesty!" said the Wolf, "I can't imagine where you got such an idea. Your breath most certainly does not smell bad. On the contrary, it smells wonderful

Why, your breath is as fresh as **wafts** of fragrant herbs and blooming flowers!"

"You lie!" said the Lion. He roared and **gulped** down the Wolf. Then, the Lion summoned the Fox.

"Fox," he said, "tell me, and tell me truly. Does my breath smell bad?"

"Ah-choo!" said the Fox, **feigning** sneeze. He wiped his nose and said, "Excuse me, Your Majesty. I have a terrible cold today. My nose is all stopped up. I'm afraid I can't smell a thing."

Moral: A wise man knows when to remain **reticent**.

批注：

1. altercation 爭吵; 2. ferocious 兇猛的; 3. nugatory 無價值的; 4. impugn 懷疑; 5. veracity 真相; 6. camouflage 隱瞞; 7. fetid 惡臭的; 8. gulp 狼吞虎咽; 9. disgruntled 不高興; 10. astute 精明的; 11. waft 一股 (味道) ; 12. feign 假裝; 13. reticent 沉默的

1. Which of the following sentence is NOT correct according to the Lion and the Lioness?

A. The Lion and the Lioness got into an argument because the Lion was nugatory.

B. The Lioness thought the Lion was worthless, because he never do anything of the hunting.

C. The ferocious Lion began to impugn his own words as soon as he denied the Lioness.

D. The Lion and the Lioness had a long altercation on food sharing.

2. Why did the Fox feign illness when the Lion asked if his breath smelled bad?

A. Because the Fox was not astute enough to camouflage the veracity of the Lion's breath.

B. Because the Fox was not astute enough to answer the Lion's question.

C. Because the Fox had to remain reticent for fear of being gulped down by the disgruntled Lion.

D. Because the Fox had a bad cold and he couldn't stop sniffing and sneezing.

3. Which of the following is NOT correct according to the passage?
A. The Sheep told the Lion his breath had a fetid smell.
B. The Lioness told the Lion his breath smelled fetid.
C. The Wolf told the Lion his breath was like wafts of fragrant herbs and the Lion impugned it.
D. The Fox told the Lion his breath was like wafts of perfume and the Lion impugned it.

4. What do you think most likely happened to each of the Lion's advisors?
A. The Sheep was gulped down for camouflaging the veracity from the Lion.
B. The Wolf was not gulped down because he was smarter to lie.
C. The king Lion gulped down the fox's because of his feigning illness.
D. The king Lion spared the fox's life because he remained silent.

5. Why did the author write this selection?
A. to describe what disgruntled lions usually gulp down.
B. to entertain and enlighten people when to keep reticent with a story.
C. to inform people about ferocious, fetid and disgruntled animals in the jungle.
D. to scare people with information about ferocious lions.

Exercise 2

Dear students,
While completing the following reading comprehension, you can use the mobile phone dictionary to look up words. We promise to keep your answers confidential, and the test results are only used for this experimental research.

Student ID:_____

The Lion and His Advisor

One night, the Lion and the Lioness got into an **altercation**. All through the night, they roared at each other, and their **ferocious** roaring could be heard a mile away.

"You are **nugatory**!" roared the Lioness. "You never do anything! My sisters and I do most of the hunting. All you do is sleep and lie around the den all day! On top of it all, your breath smells bad!"

"It does not!" roared the king of the jungle in his loudest voice. But, as soon as he said this, the Lion began to **impugn** it. Did his breath really smell bad? He had never smelled his own breath. Was it even possible to smell your own breath? How could he find out if his breath was horrible?

In the morning, the Lion decided to send for three of his advisors, the Sheep, the Wolf, and the Fox.

He summoned the Sheep into his den first.

"Sheep," the Lion said, "tell me and tell me truly. Does my breath smell bad?" The Sheep thought the Lion wanted to know the **veracity**.

"Your Majesty," the Sheep said, "since you have asked me for the truth, I will not **camouflage** it from you. Your breath does smell bad. In fact, it smells **fetid**."

That was not what the Lion wanted to hear. He roared and **gulp**ed down the Sheep. Next, the Lion summoned the Wolf.

"Wolf," he said, "tell me and tell me truly. Does my breath smell bad?"

The Wolf thought the Lion would be **disgruntled** to learn the truth. He decided this was a situation in which it would be **astute** to lie.

"Your Majesty!" said the Wolf, "I can't imagine where you got such an idea. Your breath most certainly does not smell bad. On the contrary, it smells wonderful! Why, your breath is as fresh as **wafts** of fragrant herbs and blooming flowers!"

"You lie!" said the Lion. He roared and **gulped** down the Wolf. Then, the Lion summoned the Fox.

"Fox," he said, "tell me, and tell me truly. Does my breath smell bad?"

"Ah-choo!" said the Fox, **feigning** sneeze. He wiped his nose and said, "Excuse me, Your Majesty. I have a terrible cold today. My nose is all stopped up. I'm afraid I can't smell a thing."

Moral: A wise man knows when to remain **reticent**.

1. Which of the following sentence is NOT correct according to the Lion and the Lioness?

A. The Lion and the Lioness got into an argument because the Lion was nugatory.
B. The Lioness thought the Lion was worthless, because he never do anything of the hunting.
C. The ferocious Lion began to impugn his own words as soon as he denied the Lioness.
D. The Lion and the Lioness had a long altercation on food sharing.

2. Why did the Fox feign illness when the Lion asked if his breath smelled bad?

A. Because the Fox was not astute enough to camouflage the veracity of the Lion's breath.
B. Because the Fox was not astute enough to answer the Lion's question.
C. Because the Fox had to remain reticent for fear of being gulped down by the disgruntled Lion.
D. Because the Fox had a bad cold and he couldn't stop sniffing and sneezing.

3. Which of the following is NOT correct according to the passage?

A. The Sheep told the Lion his breath had a fetid smell.
B. The Lioness told the Lion his breath smelled fetid.
C. The Wolf told the Lion his breath was like wafts of fragrant herbs and the Lion impugned it.

D. The Fox told the Lion his breath was like wafts of perfume and the Lion impugned it.

4. What do you think most likely happened to each of the Lion's advisors?

A. The Sheep was gulped down for camouflaging the veracity from the Lion.

B. The Wolf was not gulped down because he was smarter to lie.

C. The king Lion gulped down the fox's because of his feigning illness.

D. The king Lion spared the fox's life because he remained silent.

5. Why did the author write this selection?

A. to describe what disgruntled lions usually gulp down.

B. to entertain and enlighten people when to keep reticent with a story.

C. to inform people about ferocious, fetid and disgruntled animals in the jungle.

D. to scare people with information about ferocious lions.

Exercise 3

Dear students,
While completing the following reading comprehension questions, you can use the mobile phone dictionary to look up words. We promise to keep your answers confidential, and the test results are only used for this experimental research.

Student ID:_____

The Lion and His Advisor

One night, the Lion and the Lioness got into an __1__. All through the night, they roared at each other, and their __2__ roaring could be heard a mile away.

"You are __3__!" roared the Lioness. "You never do anything! My sisters and I do most of the hunting. All you do is sleep and lie around the den all day! On top of it all, your breath smells bad!"

"It does not!" roared the king of the jungle in his loudest voice. But, as soon as he said this, the Lion began to __4__ it. Did his breath really smell bad? He had never smelled his own breath. Was it even possible to smell your own breath? How could he find out if his breath was horrible?

In the morning, the Lion decided to send for three of his advisors, the Sheep, the Wolf, and the Fox.

He summoned the Sheep into his den first.

"Sheep," the Lion said, "tell me and tell me truly. Does my breath smell bad?" The Sheep thought the Lion wanted to know the __5__.

"Your Majesty," the Sheep said, "since you have asked me for the truth, I will not __6__ it from you. Your breath does smell bad. In fact, it smells __7__."

That was not what the Lion wanted to hear. He roared and __8__ down the Sheep. Next, the Lion summoned the Wolf.

"Wolf," he said, "tell me and tell me truly. Does my breath smell bad?"

The Wolf thought the Lion would be __9__ to learn the truth. He decided this was a situation in which it would be __10__ to lie.

"Your Majesty!" said the Wolf, "I can't imagine where you got such an idea. Your breath most certainly does not smell bad. On the contrary,

it smells wonderful! Why, your breath is as fresh as __11__ of fragrant herbs and blooming flowers!"

"You lie!" said the Lion. He roared and gulped down the Wolf. Then, the Lion summoned the Fox.

"Fox," he said, "tell me, and tell me truly. Does my breath smell bad?"

"Ah-choo!" said the Fox, __12__ sneeze. He wiped his nose and said, "Excuse me, Your Majesty. I have a terrible cold today. My nose is all stopped up. I'm afraid I can't smell a thing."

Moral: A wise man knows when to remain __13__.

(A) altercation	(B) astute	(C) camouflage	(D) diligent	(E) disgruntled
(F) feigning	(G) ferocious	(H) fetid	(I) fragrant	(J) gulped
(K) impugn	(L) nugatory	(M) reticent	(N) veracity	(O) wafts