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The effects of lexical densities and task types on Chinese students' incidental vocabulary acquisition

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Abstract

This study examines the effects arose by different lexical densities (2%, 5%) and task types (mind map, continuation task) on Chinese senior high students. Four classes of intermediate-level Chinese EFL learners were randomly assigned to four groups, where the treatment condition for each group includes two variables (group1: 2%+mind map, group2: 5%+mind map, group3: 5%+continuation task, group4: 2%+continuation task). It was found that (1) lexical density (2%, 5%) would not result in a significant difference on incidental vocabulary acquisition; (2) Both tasks would lead to a significant difference on incidental vocabulary acquisition and (3) mind map showed superiority in enhancing receptive vocabulary, productive vocabulary and word retention under the text of 5% of lexical density; (4) 2% of lexical density more facilitated output vocabulary when the continuation task was administered. Pedagogical implications of these results for EFL vocabulary acquisition are discussed.

Keywords incidental vocabulary acquisition, lexical densities, task types, Chinese senior high students

1. Introduction

Vocabulary is of paramount importance to learners, especially for those who develop greater fluency and expression (Alqghtani, 2015). Reading, as a crucial way of incidental vocabulary acquisition, involves various variables, in which lexical densities (e.g., Hue & Nation, 2000; Nation, 2006) and task types (e.g., Schmitt, 2008; Laufer, 2020) have great impact on vocabulary gains. It has become well-established that vocabulary growth usually occurs incidentally when learners involve themselves in cognitive tasks that are not originally geared toward vocabulary (Gass, 1999). A wide array of studies prove that reading is an important source of incidental vocabulary acquisition, some of which affirm the appropriate range of lexical densities (from 2% to 5%) optimally promotes vocabulary acquisition (Nation, 2001; Laufer & Ravenhorst, 2010). Nevertheless, proximal lexical densities for Chinese intermediate EFL learners remain questionable owing to distinct context and input materials. In reference to task types, continuation task seems to play a promising role for it has the tendency to induce more alignment (e.g., Atkinson et al., 2007; Zhang, 2023). However, the majority of these studies (e.g., Ye & Ren, 2019; Shi et al., 2020; Peng et al., 2020; Ye et al., 2021; Zhong, 2021; Dai,2022) did not concern themselves with vocabulary acquisition specifically but pointed to the potential positive effect jhat continuation might have in sentence-production.

Meanwhile, another body of studies pertaining to task types highlights the potential benefits of mind map as informed by the knowledge visualization theory (Eppler & Burkard, 2004) and involvement load hypothesis (Kıvrak, 2019), notwithstanding major studies largely focus on reading comprehension. While mind map and continuation task have been so far favored by some researchers, there has been no empirical study as of yet that explores which type of task more contributes to vocabulary acquisition. On the theoretical front, since different mechanisms are applied to interpret their respective learning potential (i.e., alignment for the continuation tasks vs. knowledge visualization theory and involvement load hypothesis for the mind map), a comparative study designed as a 2 x 2 matrix could shed light on task designs in texts with different lexical densities.

2. Literature Review

2.1. Theoretical underpinning for and empirical studies on lexical densities and incidental vocabulary acquisition

Lexical densities refer to the proportion of the words that a learner could identify in a text (Hue & Nation, 2000). While a text covering a small percentage of unknown words signifies the limited acquisition rate, a large portion of new words would cut off the original textual clues and hinder word inferential accuracy. Accordingly, exploring an appropriate range of lexical density is beneficial to improve the efficacy of vocabulary gains. Although available research, either on a corpus-driven approach or pseudo word approach, has arrived at conclusions about

the vocabulary threshold required in certain types of texts (e.g., Hue & Nation, 2000; Adolphs & Schmitt, 2004; Nation, 2006; Zhang & Graham, 2020), such conclusions remain inconsistent in that lexical densities vary in different genres and contexts. According to Nation (2001), "the probabilistic threshold is 98%". With this coverage almost all learners have a chance of gaining adequate comprehension. If, instead of adequate comprehension, a standard of minimally acceptable comprehension is applied, then 95% coverage is likely to be the probabilistic threshold" (p. 147). This conclusion was echoed with the study of Laufer and Ravenhorst-Kalovski (2010) but negated by Song & Reynolds (2022) who concluded that 2% of lexical densities could more contribute to vocabulary retention in the long run.

In order to interpret the process of incidental vocabulary acquisition, Rieder (2002) defines the degree of focus and enrichment from a comprehensive view. Focus means the amount of effort a learner will make in examining a word. This effort depends on word-based factors (i.e., word saliency, the centrality of a word for textual comprehension, word recurrence) as well as learner-based factors such as personal interest and reading strategies. Enrichment refers to the extent to which a learner can identify the unknown conceptual structure. Learner-based variables (i.e., learners' strategies, knowledge resources) coupled with textual variables (i.e., contextual clues) will determine the degree of enrichment.

Thus far, following a traditional path to compare the vocabulary gains in the immediate and delayed test, most related studies failed to further explore the characteristics of learners' receptive and productive vocabulary. That being said, a bulk of initial studies centralized on the optimum lexical density but did not zoom in on the acquired vocabulary. Additionally, whereas Laufer's (2016) "3i" principle (input, instruction, improvement) verifies the importance of instruction in facilitating vocabulary development, the aforementioned studies are conducted in the setting of independent reading without any instruction, which are not in line with the Chinese senior students' teaching context where teachers' instruction is dominant.

2.2. Theoretical underpinning for and empirical studies on task types and incidental vocabulary acquisition

Given that the number of words acquired from independent reading is quite limited (Schmitt, 2008), output-oriented tasks administered after reading improve the pick-up rate of vocabulary. Continuation task, as one of the output tasks, has recently gained serious research attention. This task requires learners to continue an incomplete text both logically and coherently, by which the productive vocabulary knowledge of learners could be consolidated. These studies adduced evidence that continuation is a task boasted great language learning potential and uniquely induce alignment between a given sample text and learners. Alignment, first proposed by Garrod & Pickering (2004), is evident in dialogue or conversation. It refers to the tendency to repeat linguistic patterns from the one with higher proficiency. Such linguistic coordination occurs at the level of lexicon, grammar, and pronunciation. In terms of vocabulary

acquisition, priming mechanism occurs in the course of linguistic coordination, during which lexical and syntactic mechanism are involved in. Lexical mechanism refers to the phenomenon where an output word is related to the lexical category of the input one. Syntactic priming echoes structural priming and it depicts the situation where one's output structure is influenced by the input he or she is exposed to (Pickering & Branigan, 1999).

It is noteworthy that the intensity of alignment is determined by the degree of interaction. Previous research made vigorous efforts to reveal that more peer interaction during the course of continuation better contributes to vocabulary learning outcomes. Like the continuation task, mind map, as a tool for language learning, play an important role in activating learners' reading motivation. The theoretical justification of mind map deals with knowledge visualization theory (Eppler & Burkard, 2004), of which the defining feature is to transfer knowledge through some visualized formats based on the superiority of visual representations. Related research on mind map seems to overemphasize its effect on reading comprehension and writing performance rather than vocabulary acquisition. Empirical studies demonstrated that mind map enhanced reading skills and played an important role in activating learners' reading motivation (Chang,2016; Lin & Mubarok,2021). These studies showed that mind map enabled learners to establish connections among key words and information, which deepened the level of processing.

Specifically, as tools that make the learners more concentrated, both continuation and mind map could induce more involvement load of tasks. Involvement load in this case is conceptualized as a process in which learners' higher level of processing for new information would bring more traces left in long-term memory.

In empirical studies, involvement load hypothesis (ILH) is operational for it contains three core components: need, search, and evaluation. According to the hypothesis, "the need component is the motivational, noncognitive dimension of involvement" (Hulstjin & Laufer, 2001, p. 543). "Search" refers to the process where a learner tries to guess meanings and translate certain words while using strategies and tools (Martinez-Fernandez, 2008). "Evaluation" concerns assessing the accuracy of guessed meanings in a certain context. The validity of this hypothesis on vocabulary learning lies in the discrimination of three degrees of involvement load, which marked by specific indexes.

In sum, previous conclusions about vocabulary threshold remain questionable due to the diversified variables in reading texts. In addition, the output-driven task types adopted in the post-reading procedure are insufficient.

3. Methodology

3.1. Design and participants

The present study adopted 2 x 2 matrix design with a pilot study, treatment, immediate post-tests and delayed post-tests. The subjects that involved in the main study were from four classes only, exclusive of the pilot one. All

of the students had taken part in the English academic test before the experiment.

Based on their performance on reading comprehension, 126 second-year Chinese students at a senior high school were finally assigned to 4 conditions:

group1: 98% word coverage + mind map
group2: 95% word coverage + mind map
group3: 95% word coverage + continuation task
group4: 98% word coverage + continuation task

Three research questions are presented:

1. What effect does different word coverage have on eleventh grade students' incidental vocabulary acquisition?

2. What effect do different task types have on eleventh grade students' incidental vocabulary acquisition?

3. What effects do the combinations of word coverage and task types have on eleventh grade students' incidental vocabulary acquisition?

3.2. Target words

Six words, encompassing three adjectives, two verbs, and one noun, were chosen based on participants' performance from a pilot study. On account of the difference in participants' vocabulary size, pseudowords were used to assure that all the target words were unknown to them. All the pseudowords were adopted from art and science non-word database, among which six target words to be tested. This database is established based on various properties deemed to be of theoretical significance for the analysis of reading (Rastle et al., 2002). Following Zhao and Macaro's (2016) modified VKS test, the present study echoed the measuring word knowledge at both receptive and productive knowledge by subsuming five dimensions to gauge the written form, meaning and syntactic functions of target words.

3.3. Treatment

Short stories are good materials for extensive reading due to more concise and coherent plots. However, the fact is that quite a few students are not exposed to story reading as part of their English lessons. Following Hue and Nation's (2000) experiment, this study adopts the reading material that talks about trick-playing. There are about 600 words in the original version of this story. Because of the current level of participants, the adapted version contains 520 words. Accordingly, the version of 98% word coverage should subsume 10 pseudowords (520 words x 2%) and the version of 95% should subsume 26 pseudowords (520 words x 5%) (see Appendix A). The whole experiment spanned three weeks. Figure 1 is the arrangement of the whole experiment:
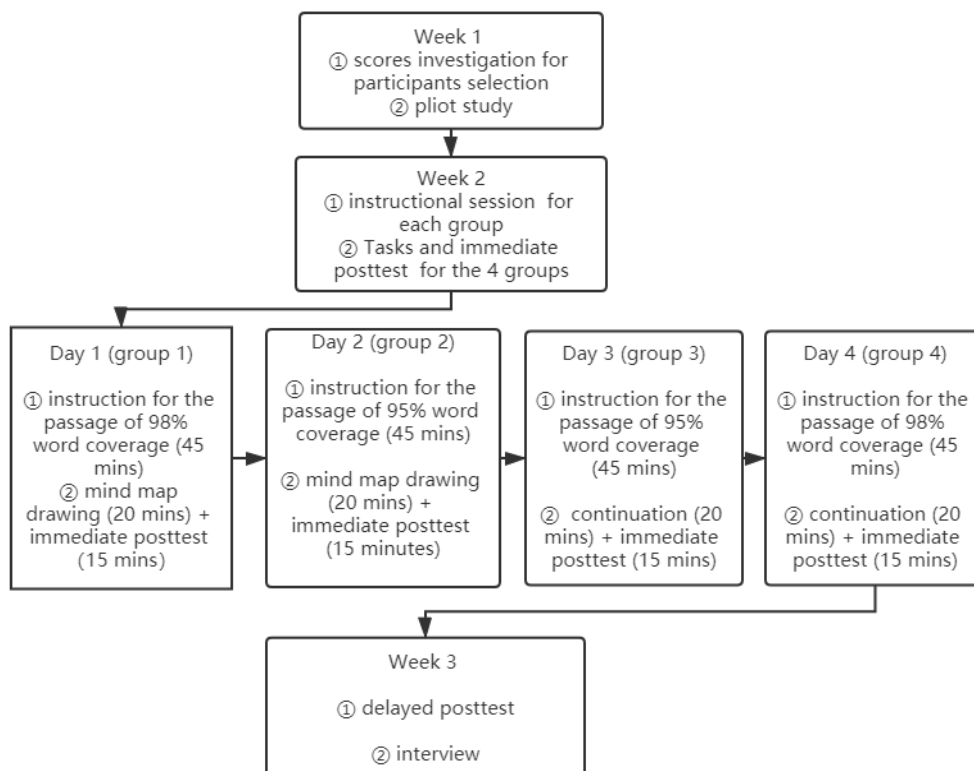

Figure 1. The outline of all procedures

At the beginning of week 1, an investigation for participants' reading comprehension scores from the latest academic proficiency examination for the ordinary high school students was firstly conducted. This examination is one of the criteria for the admission to college, which has a significant impact on students' future development. After selecting participants, the pilot class was required to read the version of 95% of word coverage and finish a VKS immediate posttest composed of 6 target words. The 6 target words presented in an additional glossary were intermingled with other pseudowords to avert intentional memorization of the target words.

Week 2 was about the main study. The four classes in the main study comprised a 2 x 2 study design, where both

word coverage and task types contained two levels of factors. The instruction of the four groups lasted 40 minutes, which was followed by task session (mind map or continuation task) and immediate posttests. According to the pilot study, the time for the two tasks was controlled within 20 minutes and the posttest was controlled within 15 minutes.

As was mentioned above, the instruction was followed by another class where a mind map or continuation task was conducted (see appendix B). According to the experimental conditions, group 1 and group 2 had to finish a mind map within 20 minutes. Before drawing the mind map, the teacher would show them a sample of mind map and inform them the elements of narrative. Thus, students' mind map should contain the information about time, place, character, process, etc. Likewise, after the instructional session, group 3 and group 4 had to complete continuation task within the given time.

Week 3 was for the delayed posttest and interview. The difference between the two posttests was the order of target words. The time limit set for the test was 15 minutes. In addition, eight students (two students for each group) were invited to the interview complementary for the data analysis.

3.4. Testing instruments and scoring

Following Zhao and Macaro's (2016) modified VKS test, the present study echoed the measuring word knowledge at both receptive and productive knowledge by subsuming five dimensions to gauge the written form, meaning and syntactic functions of target words. The order that the target words appeared was the only difference for the two tests. The revised VKS (RVKS) is demonstrated in appendix C. There are five questions for each target word. Specifically, the first question valued one score, the second question valued two scores, and the third valued three scores. The fourth question that required a synonym or corresponding translation valued four scores. The fifth question that valued five points was a productive one, which required students to write down a sentence with the tested words. There was no half point in the study. Students who misspelled the synonym could still gain four scores since the misspelling would not impede understanding. But for an incorrect translation given by the students, they could only gain two points. The fifth item valued five scores and misspellings could be tolerated in light of the usage of pseudowords.

4. Results

In light of the two variables in the present study, it firstly identified whether there was an interactive effect triggered by the factors. Then, it further investigated how different word coverage and task types compared to each other in incidental vocabulary acquisition.

Before the data analysis, the assumptions for adopting the parametric test of ANOVA were supposed to be checked. In Table 1, the K-S Sigs of the four groups were all larger than .05, which indicated that the scores of the four classes in immediate posttest were in accordance with the normal distribution. Furthermore, the statistics of Levene's test conformed to the equality of variance ($p > .05$).

Table 1. Descriptive statistics for the participants

	class	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
score	1	.153	31	.062	.946	31	.124
	2	.150	32	.067	.953	32	.174
	3	.147	32	.077	.947	32	.115
	4	.153	31	.064	.954	31	.203

The results in Figure 2 demonstrate that the significant value of the between-subjects effect for the two factors was .704, larger than .05, which indicated that word coverage and task types induced no interactive effect. Importantly, the significant values for word coverage and task types were respectively .109 and .000. Overall, with the exclusion of task types, 95% and 98% of word coverage would not lead to a statistic difference in the immediate posttest. Comparably, with the exclusion of word coverage, task types could result in a significant difference in performances. Accordingly, the word coverage, from 95% to 98%, was a suitable range for the participants.

As shown in Table 2, word coverage (98%, 95%) would not bring a significant difference in immediate posttest, though participants under 98% would gain more scores. Namely, word coverage was not a decisive factor affecting the quality of vocabulary acquisition.

In Table 2, while mind map and continuation task had similar promoting effects under the coverage of 98%, the former did significantly outperform the latter once the coverage was reduced to 95%. Thus, for a text with low coverage, adequate collaboration might improve learners' quality of vocabulary acquisition.
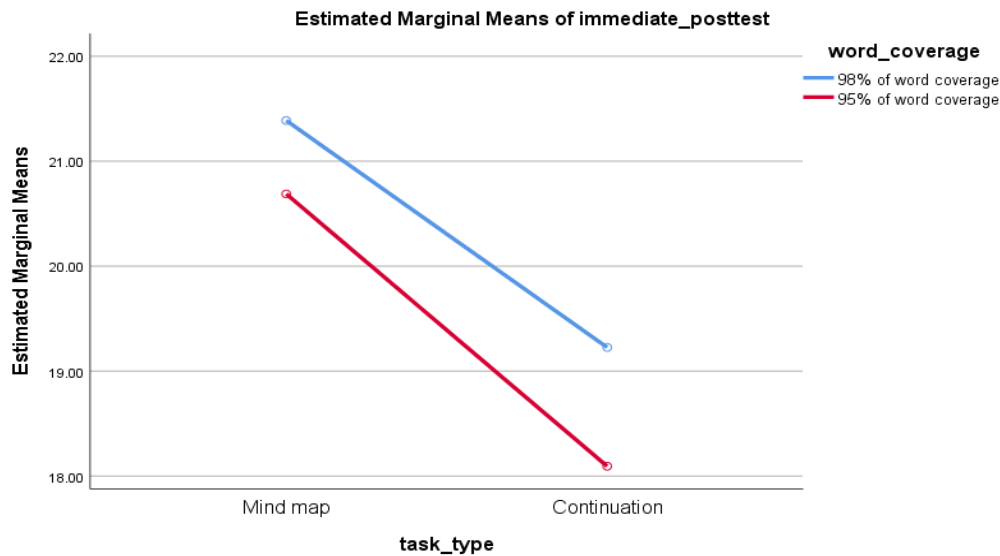
Figure 2. Profile plot (task types in x axis)

Table 2. Pairwise comparisons on word coverage (dependent variable: immediate posttest)

Word Coverage	Word Coverage	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
98% of word coverage	95% of word coverage	.916	.568	.109	-.208	2.040
95% of word coverage	98% of word coverage	-.916	.568	.109	-2.040	.208

Table 3. Pairwise comparisons on task types (dependent variable: immediate posttest)

Task Types	Task Types	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Mind map	Continuation	2.378*	.568	.000	1.254	3.501
Continuation	Mind map	-2.378*	.568	.000	-3.501	-1.254

Table 4. Test statistics on receptive vocabulary (dependent variable: immediate posttest)

Task Types	Task Types	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Mind map	Continuation	2.378*	.568	.000	1.254	3.501
Continuation	Mind map	-2.378*	.568	.000	-3.501	-1.254

Table 5. Test statistics on productive vocabulary

	G1 - G2	G1 - G4	G2 - G3	G3 - G4
Mann Whitney U	453.000	425.000	278.000	327.500
Wilcoxon W	949.000	921.000	806.000	855.500
Z	-.598	-.797	-3.194	-2.372
Asymp. Sig.	.550	.426	.001	.018

Table 6. Test statistics on vocabulary retention

	G1 - G2	G1 - G4	G2 - G3	G3 - G4
Mann Whitney U	453.000	425.000	278.000	327.500
Wilcoxon W	949.000	921.000	806.000	855.500
Z	-.598	-.797	-3.194	-2.372
Asymp. Sig.	.550	.426	.001	.018

Table 7. Test statistics on vocabulary retention

	G1 - G2	G1 - G4	G2 - G3	G3 - G4
Mann Whitney U	457.500	402.500	322.500	460.000
Wilcoxon W	953.500	898.500	860.500	988.000
Z	-.533	-.1.104	-2.434	-.500
Asymp. Sig.	.594	.269	.015	.617

When it comes to the vocabulary development, group 2 (95%+mind map) significantly outperformed group 3 (95%+continuation task), which made the only statistic difference on receptive vocabulary. Group 3 (95%+continuation task) was statistically overshadowed by group 2 (95%+mind map) and group 4 (98%+continuation task), which indicated that continuation task was much more effective under the text with fewer new words. With regard to word retention, there was an edge for mind map to retrieve words.

5. Discussion

5.1. RQ1: What effect does different word coverage have on eleventh grade students' incidental vocabulary acquisition?

When task types were excluded, there was no significant difference between 95% of word coverage and 98% of word coverage. Namely, word coverage was not a decisive factor affecting the quality of vocabulary acquisition. This finding was corroborated by some researchers who sought to identify the least requirement for a vocabulary threshold: Nation (2006) found that 95% to 98% was a probably optimal range. Different as the participants involved were, 95% to 98% of word coverage was still suitable for eleventh grade students under the context of foreign language learning.

This finding could be explained by degree of focus and enrichment (Rieder, 2002), which assumed that there are two steps for constructing the lexical knowledge. First, the precondition for identifying the meaning of a new word should be textual comprehension. Second, the comprehension of context brings the possibility to shift textual meaning to word meaning, that is, denotative meaning. The participants in this study had to understand the idea of the passage firstly. Then, based on their own comprehension, they were likely to construct the concept structure in their mind and refer the meaning of a new word.

From the perspective of this theory, the little difference between 98% and 95% of word coverage became explainable. Rieder (2004) integrated various influential factors from textual and learners' aspects, which could be summarized as "focus condition" and "enrichment condition". Because "focus" represents the amount of attention that a learner pays to examine a new word, "focus condition" thereby includes the factors such as word salience, word distribution, etc. Comparably, "enrichment" means the degree that a learner achieves in identifying the conceptual structure of a word.

As for "focus condition", the placement of target words was relatively fixed despite the inconsistent number of new words in the two versions of texts. Besides, without

highlighted devices in the texts (i.e., bold, italics, underlines), the attention paid to a certain word would be lessened. More importantly, all the participants were selected based on their reading scores. With similar reading proficiency, the amount of effort or attention they needed to examine the meaning of a word made little difference. Besides, the two versions of texts were narrative, the type of genre that the students were familiar with. Consequently, such a sense of familiarity more or less eased the difficulty for comprehension. Therefore, when the word coverage was down to 95%, the elements of a narrative text (i.e., time, place, character, etc) still made them get a main idea for the text.

"Enrichment condition" determined whether the meaning guessed in context was close to the denotative meaning. Undoubtedly, "enrichment condition" is influenced by word coverage. This is because the more words a learner recognizes, the more textual clues he or she finds out. In this study, though there were more new words under the version of 95%, some contextual clues could be still found in context. For instance, there were two pseudowords in the sentence "I heard heavy crangs and a stuide sound". However, it was not difficult for the participants to connect the form "crangs" to related concepts like noise, voice, etc. For the latter word, the meaning of "stuide" was also easy for them to guess because the word "heavy" was an important clue. Then, with the clues provided in the sentence, the students would naturally relate the form to the referred meaning. That is to say, the increased number of pseudowords in the text of 95% would not necessarily cut off the clues for word guessing.

Besides word coverage, other factors such as sight vocabulary and lexical strategies would influence "the degree of enrichment". In this study, the use of pseudowords made the pretest for the participants' vocabulary size unnecessary. Despite the fact that the students' reading strategies and word-guessing abilities were not investigated, the results in turn proved that the learners had little difference in the two aspects. Consequently, when only considering the effect of word coverage, the similarity in "focus condition" and "enrichment condition" for the groups greatly narrowed the difference on the effects.

5.2. RQ2: What effect do different task types have on eleventh grade students' incidental vocabulary acquisition?

According to the last two parts mentioned above, it would be summarized that the factor leading to a significant difference would not be word coverage (95%, 98%) but task types (mind map, continuation task). This part concerns how the two variables jointly affect incidental vocabulary acquisition. Instead of just

comparing the performances of the four groups on the whole, this part will further discuss which treatment conditions could cause the superiority on receptive vocabulary, productive vocabulary, and retention.

As the results indicated, task types would be the factor leading to a significant difference. Despite the benefits of the two tasks designed in the post-reading procedure, mind map still had a comparative advantage over continuation task.

Knowledge Visualization Theory proposed by Eppler and Burkard (2004) could be applied to explain the superiority of mind map. This theory was based on dual coding theory (Paivio & Sadoski, 2011), which proposes two significant concepts: First, "imagen" refer to the mental representations in learners' mind, which was meaningful in essence. Second, "logogen" refer to linguistic entities, which are intrinsically meaningless. With related task or contextual stimuli, "imagen" would be activated, which thereby made the linguistic entities meaningful. That is to say, this activation serves as the bridge between "imagen" and "logogen" (linguistic entities).

Based on the interpretation above, mind map was not merely a post-reading task, but a stimulus for the activation of "imagen". Mind map requires the participants to present the storyline on their own way. To finish drawing, they had to review the story repeatedly to find out useful information. The more connections the students found out in the story, the more contextual stimuli they would be exposed to. Thus, in vocabulary acquisition, these stimuli enabled the two groups to establish more connections between their mental representations and the form of certain words. The assumption of "imagen" and "logogen" somewhat echoes with the opinion of Rieder (2002), who holds that the shift from textual meaning to word meaning made the acquisition possible.

As the name suggests, knowledge visualization theory converts the original knowledge type to visual representation. According to Eppler and Burkard (2004: 9), mind map, as one of the formats of knowledge visualization, incorporates some merits such as coordination, recall, motivation, etc. In this study, instead of just reviewing several isolated episodes of this story, those with mind map bore more details in mind by depicting the storyline.

Moreover, mind map was useful in recalling the story for it was characterized by images. According to Pavio (1991), pictures have the advantage to be remembered than words because the former could trigger two specific codes: pictorial and verbal. After printing out the storyline, the text became more vivid and visualized for them. Thus, it was no wonder that those who with mind map performed better in the immediate posttest.

However, compared with continuation task, it failed to convert the plots to concrete visualized formats that deepened the impression on the text. Besides, for the grasp of the whole story, continuation task was somewhat overshadowed by mind map. As what the students mentioned in the interview, they hold that continuation task enabled them to attach more importance on the ending parts and the cause of the story. Namely, continuation task made the students select the related

paragraphs important for their writing. This suggested that such a selection in passage reviewing made them ignore some expressions or even paragraphs. Consequently, they might fail to recall some words occurred somewhere.

Interactive alignment theory (Pickering & Garrod, 2004) also served to explain the distinct results brought by the two tasks. Alignment originally refers to the phenomenon where an interlocutor uses each other's linguistic patterns in a dialogue. Then, more empirical studies provide evidences that alignment also occurs in language learning (Zhou & Wang, 2024). Typically, continuation task that integrates writing with reading is a typical task triggering alignment (Cui et al, 2022). Since alignment would occur in multiple aspects of language learning such as lexicon and syntax, the students under continuation task were required to anticipate what would happen and they also tend to notice the writing style of some particular paragraphs. That is to say, their attention on the whole story was distracted and dissipated.

The reduction of cognitive efforts that a learner devoted to identify the word meaning actually reflected the lower level of engagement. In spite of the same amount of time for task-completion in the study, mind map enabled the students to get more involved, which thereby induced higher loads of involvement than continuation task. It is thus understandable why the better vocabulary acquisition would be brought by mind map.

5.3. RQ3: What effects do the combinations of word coverage and task types have on eleventh grade students' incidental vocabulary acquisition?

Though the word coverage, from 95% to 98%, had previously proved to be an appropriate range, the two different word coverage would make a difference when another factor (task types) was taken into account. This could be ascribed to the intervention of mind map and continuation task leading to different quality of acquisition. Under 95% of word coverage, mind map had a sharp edge over continuation task on receptive vocabulary, productive vocabulary and word retention. Because receptive vocabulary was a dimension in relation to word recognition, the lower level for vocabulary acquisition, the difference brought by the two pairs was not significant. Moreover, since the participants with continuation task tended to select some paragraphs to review, their involvement load for other parts of the story might be reduced. The high involvement induced by mind map indicated that it served as a scaffold to learn about the context. Then, the context deepened their impressions on some words. On the other hand, interactive alignment (Pickering & Garrod, 2004) also served to explain the difference of the two groups. Alignment is generally regarded as the phenomenon where the interlocutors tend to use the other's linguistic patterns. Some researchers like Wang (2015) accentuate that alignment also occurs in L2 learning besides dialogue. Since linguistic coordination could occur in various linguistic aspects such as syntax, grammar, word, etc., the students with continuation task might more focus on the syntax and grammar in order to output corrective sentences. Therefore, when the word

coverage was reduced to 95%, the efficacy of continuation task was not as satisfying as mind map.

Therefore, in spite of the merits of mind map such as motivation and coordination (Eppler & Burkard, 2004), 98% of word coverage eased the difficulty of task-completion for the latter group, which thereby narrowed the difference between group 4 (98%+continuation task) and group 3 (95%+continuation task).

In a similar vein, the pairs with the same word coverage would be discussed: Based on the results from table 3, group 2 (98%+mind map) significantly outperformed group 3 (98%+continuation task). This result conformed to involvement load hypothesis, where three indexes (index 0, index 1, and index 2) are used to distinguish the prominence of each component (Hulstijn & Laufer, 2001). Index 0 is the lowest degree, index 1 represents the moderate degree, and index 2 is the strongest degree. When it comes to vocabulary, the three components and their degrees of prominence have great impact on the quality of acquisition. According to the hypothesis, group 2 (95%+mind map) yielded the involvement load of 3, in which the "need", "search" and "evaluation" were moderate. More specifically, in this group, the task, mind map, was set externally by the teacher, the focus was on word meaning, and some of new words were compared against others for the students tend to substitute some new words with their synonyms when drawing the storyline. However, the task in group 3 (95% + continuation task) generated the involvement load of 2, in which the continuation task was also designed by the teacher, students' focus was mainly on the word meaning, and the participants failed to compare new words against others. That is, the participants under mind map were more involved in the story itself, and they were more creative in word substitution. The little difference between group 3 (95%+continuation task) and group 4 (98%+continuation task) could be partly boiled down to the lack of exposure to the target words. Since the delayed posttest was conducted on the third week, retrieving the words one week later was a little challenging. To some extent, the spelling of pseudowords was unfamiliar to the participants. One week later, most students still remained on the level of vocabulary recognition. It thus conceivable that continuation task coupled with 98% of word coverage did not have comparative advantage on vocabulary retention.

6. Pedagogical implications

This study yields some implications grounded in the above-mentioned findings. In the first place, teachers should come to believe that the selection of appropriate reading materials, from 95% to 98% of word coverage, is crucial to the eleventh-grade students' incidental vocabulary acquisition.

More importantly, mind map would elicit higher involvement load in the post-reading procedure and could better motivate the learners to find out the connections of plots, which helps them acquire new words incidentally. Therefore, similar tasks that make the participants more involved should be conducted in a reading class. In this

study, while mind map and continuation task had similar promoting effects under the coverage of 98%, the former did significantly outperform the latter once the coverage was reduced to 95%. Thus, for a text with low coverage, adequate collaboration might improve learners' quality of vocabulary acquisition.

Additionally, teachers also need to offer students more chances of extensive reading. When it comes to Chinese teaching context, students have inadequate time for reading, and most of them fail to acquire words with the support of contexts. Hence, the time for extensive reading should be assured.

7. Conclusion

Given that there were two factors involved in this study, the research purpose was to explore the efficacy of word coverage and task types as well as their joint effect on incidental vocabulary acquisition.

The major findings were as follows:

Firstly, the word coverage, from 95% to 98%, was a suitable range for the participants. Secondly, the superiority of mind map in productive vocabulary occurred under the coverage of 95%. Moreover, 98% better facilitated vocabulary retention when the tasks were continuation.

Thirdly, for the effectiveness of task types, both mind map and continuation task contributed to reading comprehension. Needless to say, continuation task was an effective task that combined reading with writing. But in this study, there were more syntax alignment rather than lexical alignment on students' writing. This task, with no request to use target words creatively, enabled the participants to invest more effort on some certain parts, especially the cause and the ending part of the story. That is to say, under the coverage of 95%, mind map was superior in relation to vocabulary acquisition for the participants with mind map got more involved in the story itself. Hence, some key words that appeared on other parts became confused to those with continuation task. Furthermore, peer interaction was significant for post-reading tasks. The suggestions of the students also suggested that it was necessary for the learners to conduct the tasks collaboratively especially when there were more new words involved.

While this study sheds some light on pedagogical practices, it is by no means without limitations. The limitations and suggestions will be presented as follows:

Firstly, one potential limitation concerns the selection of participants. Although it is acknowledged that learner-based variables such as vocabulary strategies were hard to control, the scores investigation before this study was undertaken to minimize the gap of students' reading ability. Future research is suggested to conduct a questionnaire for more detailed information (i.e., strategies for word guessing).

Secondly, this study only lasts for three weeks. Though the instruction as well as the post-reading tasks was all completed within the time for two classes, this short-term experiment could better exclude interfering factors, and thereby ensured the reliability of the study. In

future research, the instructor could spend more time on instruction, provide immediate feedback for the participants, and give them time to devise their drawing or writing.

Moreover, in regard to task types, this study mainly compared the promoting effect of two tasks. Needless to say, it was impossible to compare various tasks at one time. Thus, other tasks that might contribute to incidental vocabulary acquisition could be compared and investigated in future research. Besides, the majority of the students from the interview supposed that they would perform better if they completed the tasks collaboratively. Such an opinion is supported by the "interaction-alignment-learning" route. Hence, the communication and collaboration among participants should be considered in future research.

Lastly, another limitation concerns the selection of target words. According to Rieder (2002), learners' concept structure of a vocabulary depends on how important it is for developing the mental model of textual meaning. Undauntedly, judging how important a word is for textual comprehension is subjective for the mental model a learner develops may differ from each other. Though it was acknowledged that subjective factors inevitably exist, the pilot study designed before the experiment would effectively help the instructor to spot the target words. For the future research, it is advisable to select the target words with the help of another experienced instructor.

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