



Which Vocabulary Learning Strategies are Important and Useful for Japanese University Students? A Text-Mining Approach

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Abstract

A growing body of vocabulary learning strategies (VLSs) studies focuses on accumulating empirical evidence on the relationship between frequency of VLS use and vocabulary acquisition by using the frequency-based measures of VLSs. Our study by contrast, examined which VLSs are perceived as important and useful, and how they are employed by Japanese university students learning English as a foreign language ($N = 40$). Further, we investigated whether university students' perceptions and use of strategies vary between higher- ($n = 16$) and lower-proficiency groups ($n = 24$). To this end, we used the KH Coder software and produced co-occurrence networks to categorize the words extracted from the results of an open-ended questionnaire. The results revealed that Japanese university students perceived cognitive strategies related to word form, sound, association learning, and metacognitive strategies as important and useful, and employed them frequently. Results from the two proficiency groups showed that while the higher-proficiency group perceived the importance of metacognitive strategies, these tendencies were not observed in the lower-proficiency group. Given the possibility that learners' proficiency influences the use of VLSs in the vocabulary learning process, considerations and suggestions for future VLSs studies and teaching are discussed.

Keywords: Vocabulary learning, vocabulary learning strategies, text-mining approach

Background

Learning vocabulary in a second or foreign language (henceforth L2) is a demanding task that requires considerable time and effort (Gu, 2020). L2 learners start by learning and being taught high frequency words that frequently appear in texts (Schmitt & Schmitt, 2012) as these words “cover a very large proportion of the running words in spoken and written texts” (Nation, 2013, p. 22). As there are an infinite number of words that further entail various aspects to be learned, such as form, sound, and meaning (Nation, 2013), learners never stop developing their vocabulary, even at the higher vocabulary proficiency level. This demanding nature of the task necessitates strategic learning in the sense that appropriate choice and development of strategies substantially influence the efficiency of vocabulary learning and sustaining motivation (Gu, 2018). Numerous studies on L2 vocabulary learning strategies (VLSs) in the field of L2 acquisition (e.g., Chou, 2022; Gu, 2012; Wang, 2015) have demonstrated an association between VLS use and L2 vocabulary acquisition (e.g., Mizumoto, 2013; Tseng & Schmitt, 2008; Ueno & Takeuchi, 2022) and L2 achievement (e.g., Gu & Johnson, 1996; Mizumoto, 2010).

According to prior studies (Gu, 2013; Mizumoto, 2010), VLSs refer to learners’ intentional actions to manage vocabulary learning and acquire vocabulary knowledge. These VLSs are further categorized into sub-strategies, such as cognitive, memory, social, and metacognitive (e.g., Fan, 2003; Gu, 2018; Gu & Johnson, 1996; Schmitt, 1997). Numerous cognitive, metacognitive, and social strategies are considered important for efficient vocabulary learning and development (Uchihara et al., 2022). Cognitive strategies are “those that deal directly with incoming information and process it” (Mizumoto, 2010, p. 8), such as learning words by taking notes (Jin & Webb, 2021), associating them with other words (Zhang & Lu, 2015), glossing (Ramezanali et al., 2021), and analyzing word parts (Wei, 2015). Metacognitive strategies comprise higher-order cognitive skills, such as planning for learning and monitoring, as well as evaluating whether learning is carried out successfully (Mizumoto, 2010; O’Malley & Chamot, 1990). Furthermore, social strategies involve learning target languages by interacting with others (Mizumoto, 2010), such as learning vocabulary by verbally interacting with capable others (Wang, 2015). Besides the effectiveness of these VLSs, research has suggested that L2 learners who use VLSs more frequently are more likely to have better L2 vocabulary acquisition (Gu, 2003; Gu & Johnson, 1996; Fan, 2003) and L2 achievement (Mizumoto, 2010). These findings consequently led to a great number of VLSs investigations on the relationships between L2 vocabulary knowledge and the frequency of the VLSs use in varying learning contexts (e.g., Fan, 2020; Nassaji, 2006; Zhang & Lu, 2015). Moreover, studies have identified moderators that affect the use of VLSs such as proficiency (Fan, 2003), gender (Catalán, 2003; Gu, 2002), motivation (Choi et al., 2018; Mizumoto, 2010), and self-regulation (Tseng & Schmitt, 2008; Ueno & Takeuchi, 2022).

Although most existing VLSs studies use a questionnaire with frequency descriptor to measure the use of VLSs, some researchers criticize the use of such measurement (e.g., Dörnyei, 2005; Tseng et al., 2006). Dörnyei and Ryan (2015) stated that “the usefulness of specific learning strategies is not absolute but depends on how they suit the individual agent who employs them: a certain learning technique/procedure can be

‘strategic’ for one learner and ‘non-strategic’ for another” (p. 164). This indicates that a higher frequency of strategies used does not guarantee successful L2 learning (Mizumoto, 2018; Takeuchi, 2019). In effect, Gardner et al. (1997) demonstrated a negative effect of frequent use of strategies on L2 achievement ($\beta = -.29$). This finding raises a question about the legitimacy of frequency-based questionnaires (Tseng & Schmitt, 2008). Thus, the research on L2 learning strategies has emphasized the necessity of considering how to measure learners’ strategy use (i.e., consideration of descriptor measuring L2 strategy use in questionnaires) or employing qualitative research methods, such as open-ended questionnaires, narratives, interviews, diaries, and journals (Takeuchi, 2019).

Considering the limitation in measuring VLSs, the current study used the qualitative data collection procedure (i.e., an open-ended questionnaire) and asked participants to write their own answers to questions regarding important and useful VLSs and how they utilize them. Unlike traditional measurement of VLSs use (i.e., VLSs use frequency), we explored how learners perceive the importance and usefulness of VLSs in their vocabulary learning process. In addition, literature has reported the possibility that learners’ factors, especially proficiency, influence VLSs use (e.g., Gu, 2003; Fan, 2003; Schmitt, 1997; Mizumoto, 2012). Therefore, our study included learners with various proficiency levels, ranging from A1 to C1 according to the Common European Framework of Reference for Languages (CEFR: ETS, 2023a, 2023b) benchmark and considered these effects of learners’ proficiency. The research questions (RQs) addressed in this study are listed below:

RQ1: Which VLSs are perceived as important and useful, and how are these strategies employed by Japanese university students?

RQ2: What are the differences in characteristics and perceptions of VLSs between higher- and lower-proficiency groups of Japanese university students?

Methods

Participants

The participants were 40 first- to fourth-year Japanese university students (most of whom were male) at three private universities in western Japan. They were selected using convenience sampling. All of them were English majors, who had learned English as a foreign language (EFL) for at least six years from grade 7. Their general English proficiency varied according to their scores on the Test of English for International Communication (TOEIC) and the Test of English as a Foreign Language Institutional Testing Program (TOEFL ITP), both including only listening and reading sections. Based on the CEFR benchmark, the target participants’ proficiency ranged from A1 to C1. To examine RQ2, regarding the difference in characteristics and perceptions of VLSs use between higher- and lower-proficiency student groups, we divided the total participants into two clusters according to their English qualifications: the higher-proficiency group ($n = 16$) had CEFR proficiency levels ranging from B2 to C1; and the lower-proficiency group ($n = 24$) had CEFR proficiency levels ranging from A2 to B1.

Measures

With informed consent of the participants, the current study was conducted outside the classroom in 2015–2016. To measure learners' use of VLSs, we used an open-ended questionnaire¹ asking the participants to write their individual answers to the following question: Which VLSs are important and useful in your vocabulary learning, and how do you employ these strategies? In addition, we included question items on individual learners' information regarding age, first language, study abroad experience, and English qualifications.

Data Analyses

All data² were analyzed using KH Coder software (<https://khcoder.net/en/>). This free text-mining software enables researchers to extract frequent and relevant words from language text data with a graphical representation (Higuchi et al., 2020). Compared to traditional quantitative questionnaire analyses, such as factor analyses and structural equation modeling that use a fixed set of hypotheses of questionnaire items that researchers select before research, KH Coder allows research participants' responses to be used to explore and construct hypotheses and conclusions in detail. In other words, KH Coder can take various answers from target participants to categorize them into common groups. Therefore, using KH Coder adds to the novelty of our study and distinguishes it from previous studies employing traditional questionnaire analyses. Although KH Coder offers various analyses, such as correspondence and hierarchical cluster analyses, following our RQs, we used co-occurrence network analyses that examine and provide a graphic visualization of potential relationships between the words in language text data. To further clarify the details of keywords extracted from the co-occurrence analyses (i.e., how each keyword is used and what they refer to), we used keyword in context analyses (KWIC concordance). Our study examined (a) VLSs use among all the target learners ($N = 40$); and (b) VLSs use between the higher- ($n = 16$) and lower-proficiency groups ($n = 24$). We carried out three co-occurrence analyses for this purpose. Following this, 96 Japanese sentences were used in analyses for all the students: 64 sentences from the higher-proficiency group and 32 sentences from the lower-proficiency group.

Results

Strategies Perceived as Important and Useful Among Japanese University Students

Figure 1 presents results of co-occurrence network analyses, which reveal the important and useful VLSs that Japanese university students use frequently. Words extracted from the analyses were classified into six categorical groups (all the categories are highlighted with different colors) and we interpreted the results of each keyword using KWIC concordance.

Results of the category highlighted in green indicate that the target students seemed to perceive the importance of learning vocabulary by writing and looking at words, and they often used these strategies in vocabulary learning. Additionally, they understood the importance of the actual use of vocabulary in writing as well

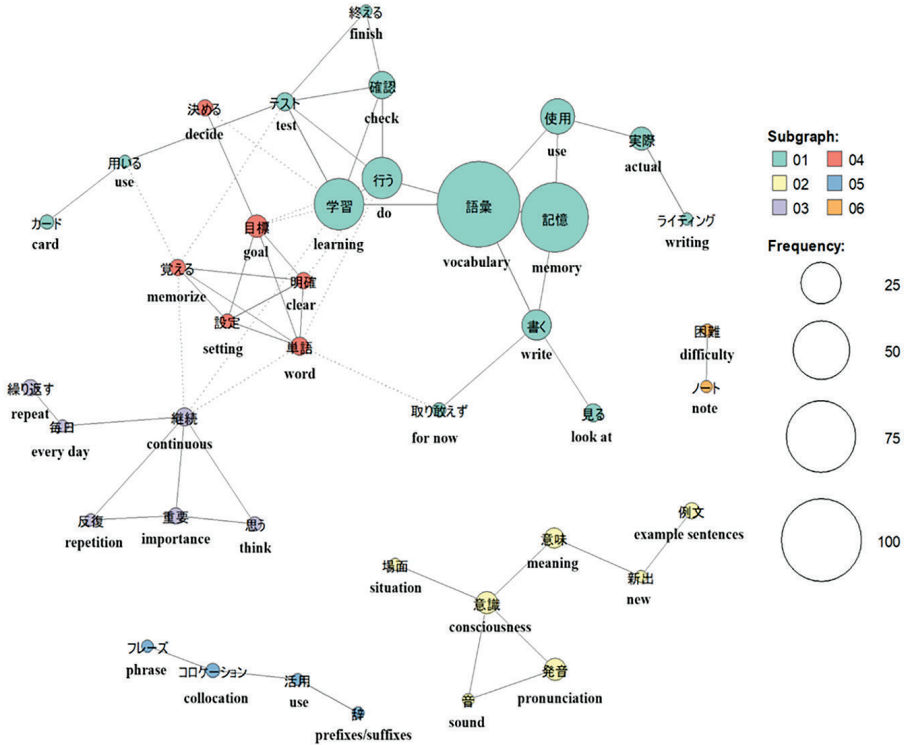


Figure 1 Results of Co-Occurrence Network Analyses Among University Students.

Note. $N = 24$. All the categorizations for VLSs are highlighted with different colors.

as reflection on vocabulary learning through vocabulary tests. These are cognitive strategies related to lexical form learning (e.g., Fan, 2020; Mizumoto, 2010).

Results of the category highlighted in red and purple also indicate that the students perceived the importance of having a clear goal for vocabulary learning and continuing to learn vocabulary every day. These are typical metacognitive strategies (e.g., Gu & Johnson, 1996; Schmitt, 1997) and learners' self-regulation (e.g., Dörnyei, 2005; Tseng et al., 2006).

Results from the category highlighted in yellow further reveal that students discerned the importance of learning the pronunciation or sound of each word, as well as learning vocabulary together with example sentences or situations in which the target vocabulary is used. These are cognitive strategies related to lexical sound learning (e.g., Catalán, 2003; Zhang & Lu, 2015) and understanding how to use the words (e.g., Nation, 2013).

Finally, results of the category in blue established that students perceived the importance of learning vocabulary with phrases or collocations and by using prefixes and suffixes. These are related to word association learning (e.g., Gu & Johnson, 1996;

Mizumoto, 2010; Schmitt, 1997). In sum, the analyses detected that the VLSs these Japanese university students used and perceived as important can be classified as (a) cognitive strategies related to lexical form, sound, and word association learning, and (b) metacognitive cognitive strategies.

Strategies Perceived as Important and Useful by the Two Proficiency Groups

To further investigate the difference in characteristics and perceptions regarding important and useful VLSs between the higher- and lower-proficiency groups of Japanese university students, we conducted co-occurrence network analyses for the two groups. Figure 2 presents the results of the higher-proficiency group. Words extracted from the analyses for this group can be classified into eight categories and keywords that we further interpreted using KWIC concordance.

Results of the categories highlighted in red, orange, and yellow indicate that higher- proficiency students recognized the importance of setting clear goals for vocabulary learning (i.e., how much vocabulary they should learn), checked vocabulary learning with tests (i.e., how many words they could memorize), and continued to

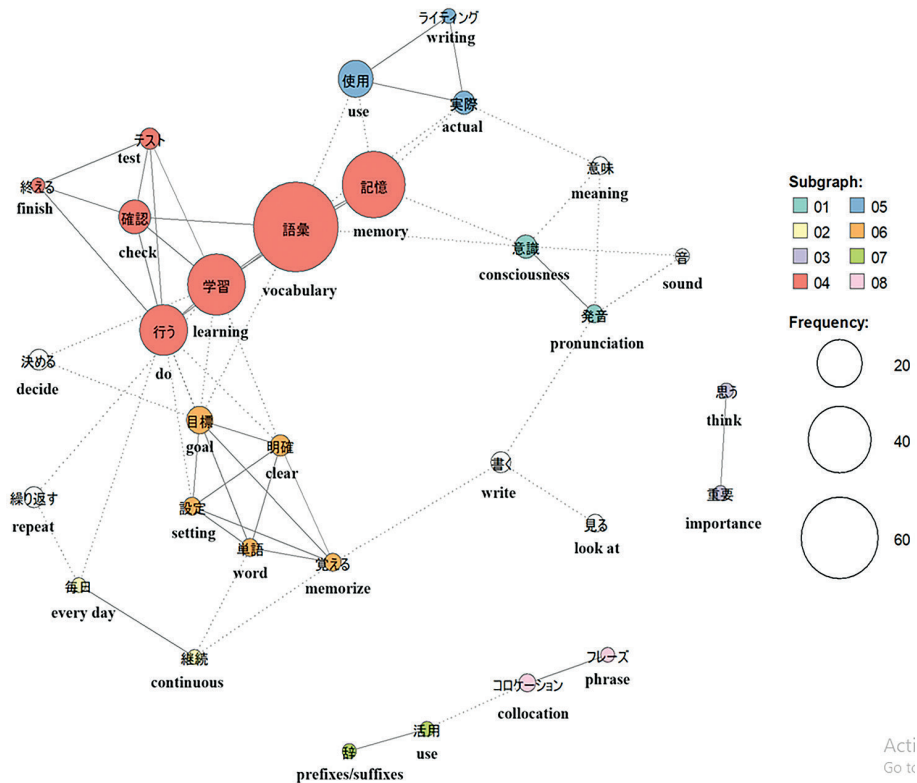


Figure 2 Results of Co-Occurrence Network Analyses in Higher-Proficiency Group. Note. n = 16. All the categorizations for VLSs are highlighted with different colors.

learn vocabulary every day. These involve metacognitive strategies (e.g., Gu & Johnson, 1996; Schmitt, 1997) and self-regulation (e.g., Dörnyei, 2005; Tseng et al., 2006).

Next, results of the categories highlighted in green and blue indicate that the higher-proficiency students perceived the importance of not merely memorizing words' meanings, sounds, and pronunciation by writing or looking at them but also using these words in writing. These strategies are cognitive strategies (e.g., Mizumoto, 2010); however, in contrast to mere mechanical learning, these are more practical for using the words in actual contexts.

Results of the categories highlighted in yellow-green and pink further show that the higher- proficiency students grasped the importance of learning vocabulary with collocations or phrases and, prefixes and suffixes of words. These are cognitive strategies related to word association learning (e.g., Gu & Johnson, 1996; Mizumoto, 2010; Schmitt, 1997), enabling learners to understand how to use their target words.

Figure 3 presents results of the lower-proficiency group. The analyses reveal that words extracted from the lower-proficiency group are classified into five categories. We also interpreted the results of each keyword using KWIC concordance.

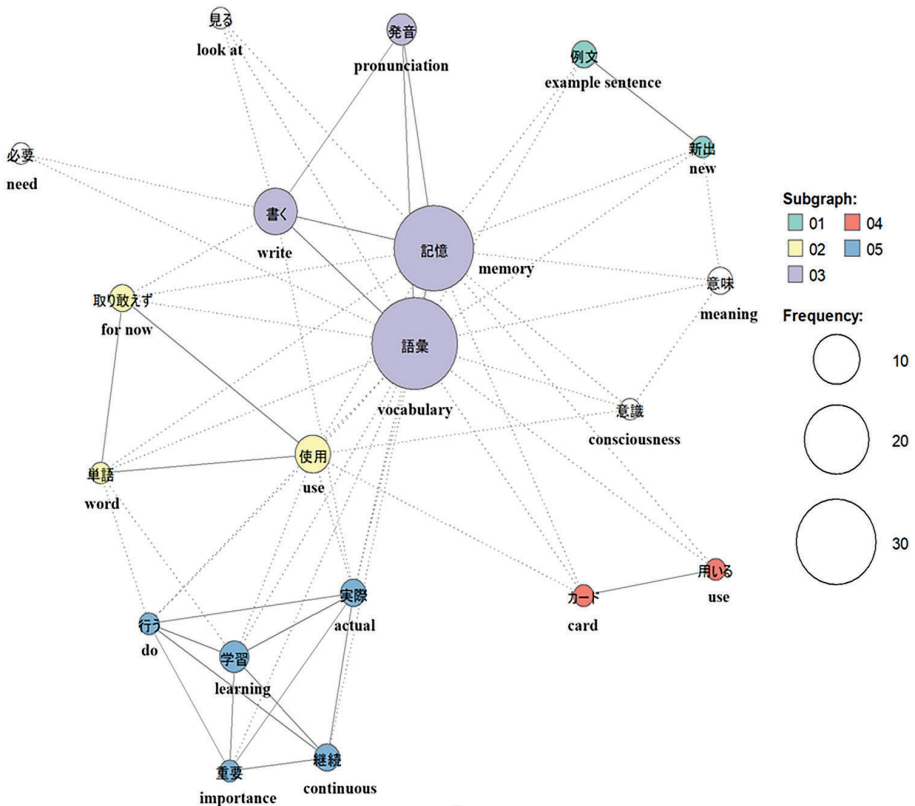


Figure 3 Results of Co-Occurrence Network Analyses in Lower-Proficiency Group.

Note. $N = 24$. All the categorizations for VLSs are highlighted with different colors.

Results of the category highlighted in purple indicate that lower-proficiency students perceived the importance of learning vocabulary by writing, looking at, and pronouncing words. These are cognitive strategies related to word form and sound learning (e.g., Fan, 2020; Zhang & Lu, 2015).

Results of the categories highlighted in yellow, red, and blue also imply that the lower-proficiency students discerned the importance of using word cards and the words they have learned so far. These are cognitive strategies related to the words to use (e.g., Gu & Johnson, 1996; Nation, 2013).

Finally, results of the category highlighted in green denoted that the lower-proficiency learners understood the importance of learning new vocabulary with their example sentences. These are discovery strategies (e.g., Fan, 2020; Schmitt, 1997).

To summarize, compared with the lower-proficiency group, the higher-proficiency group perceived the importance and usefulness of metacognitive strategies and self-regulation in their vocabulary learning. In addition, both groups of students realized the importance of cognitive strategies such as writing, looking at, and pronouncing words when learning vocabulary. They also perceived the importance of using the vocabulary they had learned. However, while students in the higher-proficiency group checked how to use target words in each context, students in the lower-proficiency group did not seem to consider this, but rather used the words they have learned so far. Finally, both groups of students perceived the importance of learning vocabulary together with example sentences, collocations, and phrases of target words.

Discussion

Strategies Perceived as Important and Useful by Japanese University Students

The results indicate that this group of students perceived the importance and usefulness of writing words and pronouncing them in vocabulary learning, which are cognitive strategies related to lexical form and sound learning (e.g., Catalán, 2003; Mizumoto, 2010; Zhang & Lu, 2015). Additionally, the results highlight the importance and usefulness of learning vocabulary together with phrases or collocations and using prefixes and suffixes, as part of cognitive strategies related to association learning (e.g., Gu & Johnson, 1996; Mizumoto, 2010; Schmitt, 1997). These results are in line with those of previous studies on Japanese EFL students (e.g., Mizumoto, 2010; Ueno & Takeuchi, 2022) and students in contexts other than the Japanese EFL environment (e.g., Fan, 2020; Gu & Johnson, 1996). Based on our English teaching experience at Japanese secondary schools and observations, Japanese culture appears to emphasize the importance of learning vocabulary by repeatedly writing, pronouncing, and learning target words through phrases and collocations. Specifically, English classes in Japanese secondary schools dedicate time to practicing pronunciation, teaching students how to use dictionaries, and assigning writing new words as homework. These traditional teaching approaches might be reflected in the students' use of VLSs and their perception of strategy importance or usefulness. Therefore, social factors such as teachers' instructions and learning environments are likely to be associated with VLSs use.

Moreover, metacognitive strategies, such as setting clear goals and continuing to learn vocabulary every day, are perceived as important and useful by Japanese university

students. Our study targeted students with a wide range of English proficiency according to the CEFR benchmark. Of these targeted students ($N = 40$), our study included a certain number of students with higher proficiency ($n = 16$). They gave numerous answers regarding metacognitive strategies in the open-ended questionnaire. Accordingly, words relevant to metacognitive strategies (e.g., making, goal, continue, every day) were extracted from the results of co-occurrence network analyses. This tendency has also been confirmed by Mizumoto (2012), who showed that Japanese EFL learners with larger vocabulary sizes had higher self-efficacy and meta-cognitively engaged in vocabulary learning by using deeper VLSs than those with smaller vocabulary size knowledge. Thus, as with Mizumoto (2012), our study concludes that individual differences, such as L2 proficiency, may be a powerful predictor for determining VLSs choices and perception of VLSs importance and usefulness.

Strategies Perceived as Important and Useful by Two Different Proficiency Groups

Results of the higher- and lower-proficiency groups indicate that both perceived the importance and usefulness of cognitive strategies such as writing, looking at, and pronouncing words when learning vocabulary. In addition, both groups understood the importance and usefulness of using words they have learned in writing and speaking. However, while the higher-proficiency group of students considered contexts wherein their target words are used, the lower-proficiency group students did not, but merely used the words they have learned. This result suggests that higher-proficiency students are more likely to focus on understanding how to use the words they have learned in context, not only acquiring receptive vocabulary (i.e., vocabulary for listening and reading skills) but also learning productive vocabulary (i.e., vocabulary for speaking and writing). This result coincides with Mizumoto's (2012) findings that learners with higher proficiency used deeper strategies than those with lower proficiency. In our study, the higher-proficiency group recognized the importance and usefulness of metacognitive strategies and self-regulation more often than the lower-proficiency group, which further supports Mizumoto (2012). In the EFL learning environment, learners have little chance to use vocabulary in the normal course of their lives, and there is a seemingly insurmountable number of words they must learn; therefore, learners must follow their own strategies, motivate themselves, and create vocabulary learning opportunities outside of classrooms (Ueno & Takeuchi, 2022). In this regard, metacognitive strategies and learner's self-regulation have been regarded as important strategies or skills to sustain motivation (Ueno & Takeuchi, 2022; Ziegler, 2014), increase learning times (Mizumoto, 2010), and ensure the use of VLSs (Tseng & Schmitt, 2008). This suggests that L2 learners who can use metacognitive strategies and possess self-regulating skills are more likely to become autonomous learners; accordingly, they are able to gain better results in L2 vocabulary learning. Thus, student proficiency is a powerful predictor of successful vocabulary learning.

Conclusion

Considering the limitations in measuring VLSs use in previous studies, our study examined VLSs that are considered important and useful by Japanese university

students and the ways they use them. For this purpose, we employed the text-mining approach and analyzed language data using co-occurrence network analyses. We further investigated whether these perceptions and use of VLSs varied according to students' proficiency. While our study obtained important results, we targeted students who were English majors only. Considering that English and non-English major students may differ in their time spent and motivation to study English, the use of VLSs in vocabulary learning may also be dissimilar. Thus, future studies targeting non-English major students could reveal a more detailed picture of the general tendency of VLSs use among Japanese university students.

Despite this limitation, our study obtained some critical findings. The results indicated that Japanese university students perceive the importance of cognitive strategies, such as repeatedly writing, looking at, and pronouncing words when learning vocabulary. They also realize the importance of learning vocabulary together with phrases, collocations, and prefixes and affixes. Further, metacognitive strategies and self-regulation are perceived as important and useful strategies or skills by the students. The results of different proficiency groups suggested that while the higher-proficiency learners tend to understand the importance of metacognitive strategies and self-regulation, it might not be the case for lower-proficiency learners. In addition, higher-proficiency learners are more likely to focus on using vocabulary in context than lower-proficiency learners. Accordingly, student proficiency may be a critical variable in determining efficient vocabulary learning.

This study has four main implications for future studies and teaching. The first implication is how we measure and describe VLSs use. Unlike traditional VLSs measurement (i.e., frequency of VLSs use), our study used an open-ended questionnaire through which we examined the perception of importance and usefulness of VLSs among Japanese university students. This measurement not only provided us with details of VLSs use among students but also suggested that perceived VLSs usefulness may affect the students' English proficiency. In this regard, development of VLSs questionnaires using importance or usefulness descriptors might overcome previous issues in measurement of VLSs use and help us gain a clearer picture of vocabulary learning processes among EFL learners.

Secondly, students' VLSs use may be affected by social factors such as teachers' instructions. For instance, teachers' instructions might enable students to use critical VLSs in their vocabulary learning. Mizumoto and Takeuchi (2009) reported that VLSs instructions allow EFL learners to use target VLSs effectively and frequently in vocabulary learning. Although existing studies have established the importance of metacognitive strategies and self-regulation in effective vocabulary learning (e.g., Gu & Johnson, 1996; Mizumoto, 2010; Ueno & Takeuchi, 2022), these tendencies were not confirmed in the lower-proficiency groups of our study. Thus, teaching these strategies and skills to lower-proficiency students may allow for more effective vocabulary learning.

Another implication is the effect of students' proficiency on VLS use. Our study found that VLS use differs according to students' proficiency. As lower-proficiency students may not understand how to study vocabulary using VLSs, appropriate scaffolding based on students' proficiency would help students study vocabulary more effectively with VLSs.

Finally, qualitative data collection can provide detailed information regarding the use of VLSs. Our study demonstrated that although students in both proficiency groups used similar cognitive strategies, their ways of using them were different. While the higher-proficiency group students used cognitive strategies by considering the contexts in which the target vocabulary was deployed, the lower-proficiency group did not. This result indicates that qualitative data collection provides detailed information, which makes it possible to distinguish different characteristics of the VLS use among students. Thus, continuing to use qualitative approaches in future studies could potentially result in crucial contributions to the field.

Notes

1. The questionnaire used to measure VLSs in this study is available upon request.
2. Owing to a request by the participants involved in this study, the data utilized cannot be provided for open use.

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