Research Article

The Effect of Individually-Generated, Teacher-Generated, and Cooperatively-Generated Graphic Organizers on Intermediate EFL Students' Vocabulary Knowledge

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Abstract

Although previous studies have shown the benefits of graphic organizers in improving learners' vocabulary knowledge, scant attention has been paid to the possible differences in the effect of individually-developed, cooperatively-developed, and teacher-developed graphic organizers on intermediate L2 learners' vocabulary knowledge. The present study addressed this topic by examining 80 intermediate language learners. The participants were selected based on convenience sampling procedure and studied English in four classes. The learners in the conventional group received the translation/definition of the lexical items. Those in the teacher-generated were provided with the graphic organizers prepared by their teacher, and the participants in the other two groups made the graphic organizers either individually or cooperatively. The researchers employed Vocabulary Knowledge Scale as the pre-test, immediate post-test, and delayed post-test to examine the participants' vocabulary knowledge. The findings of this study indicated that the mean scores of the control group in the immediate and delayed post-tests were significantly lower than those of all graphic organizer groups. In addition, the cooperatively-generated graphic organizer group was significantly more successful than learner and teacher-generated graphic organizer groups, but there was no difference between the learner and teacher-generated groups.

Keywords: graphic organizer, vocabulary knowledge, intentional vocabulary learning

Introduction

Vocabulary knowledge is known as one of the main factors which can facilitate a second language user's communication with other speakers (Nation, 2001). However, learning second language lexical items is not a straightforward task, and a large number of second language learners, even the advanced ones, seek for efficient ways of improving their vocabulary knowledge all the time. Thornbury (2006) signifies the importance of vocabulary knowledge by identifying it as a factor without which nothing can be conveyed. He argues that due to the incessant need of language users to communicate in different situations, both L1 and L2 use constantly have to learn new lexical items.

The literature on second language vocabulary instruction accommodates different measures to help learners expand their vocabulary knowledge. A wide range of instructional options including repetition, translating, dictionary approach, and contextualizing items in reading passages are some of the most common techniques to promote learners' vocabulary knowledge. Another technique which has been employed to improve second language learners' vocabulary knowledge is the employment of graphic organizers. Ajayi (2018) defines graphic organizer as a " non-linguistic, visual representation that students use for linking new learning to their existing knowledge and making connections between ideas" (p. 1). This technique has been welcomed widely since it benefits learners cognitively, metacognitively, and affectively (Ellis & Howard, 2007; Liu, 2016; Liu et al., 2010; Oxford, 2016).

Graphic organizers have been used extensively in second language classes to improve learners' vocabulary knowledge, and researchers have experimented different options to increase the efficiency of this vocabulary instruction technique by incorporating computer-assisted language learning and using different graphic organizer templates. However, there are still niches in the literature that can be occupied using empirical research. To the best of the researchers' knowledge, prior studies have overlooked the examination of the effect of individually-generated, teacher-generated, and cooperatively-generated graphic organizers on EFL (English as a foreign language) learners' immediate and delayed vocabulary knowledge. As an

attempt to fill this gap in the literature, the present study examines the effect of different types of graphic organizers on vocabulary knowledge.

Vocabulary Acquisition

The literature on second language vocabulary acquisition includes incidental and intentional vocabulary instruction and learning. Incidental vocabulary learning deals with the activities that involve the instruction of lexical items while learners are mainly involved in understanding a second-language learning material which does not require learners' focus on the lexical items (Ender, 2016). In other words, no conscious effort is urged by the task or teacher to acquire specific lexical items. The findings of most prior studies (Ender, 2016; González-Fernández, 2017; Hulstijn, 2013) have shown that incidental learning occurs, but the rate of vocabulary acquisition is slow.

Intentional vocabulary learning, on the other hand, includes those activities that urge learners to deliberately focus on the lexical items. In these activities, direct instruction and vocabulary learning strategies are used to facilitate the process of learning. Different activities such as fill-in-the-blank exercises, matching, synonyms, antonyms, and selecting the correcting word forms can be categorized under the intentional vocabulary learning type. The examination of the literature shows that the vast majority of studies have reported the superiority of intentional activities over incidental ones in terms of rate and depth of retention (Ender, 2016; González-Fernández, 2017; Joyce, 2018). Graphic organizer, which is the focus of this study, is an example of intentional instruction of vocabulary, which directs learners' attention to different aspects of lexical items.

Graphic Organizers

Graphic organizers are different visual representations of information which are usually formed using lines and circles/boxes and help learners organize the data and facilitate communication or understanding of information (Ellis & Howard, 2007). Graphic organizers became popular in the 1990s as they were in line with the tenets of cognitive theories of learning such as the schema theory. This theory posits that people learn based on their individual schemata, which enable them to encode, store, and retrieve learned information (Slavin, 1991); when the new data are

simplified using organizers, learners have an easier task connecting new materials with their pre-existing knowledge. Similarly, Lee et al. (2006) state that graphic organizers are of significance since the data acquired using information maps are more easily accessible.

Graphic organizers are also supported for their dual coding of information. To dual coding theory of information, both the linguistic form of knowledge (words) and the non-linguistic (visual) form of information can determine the success of acquiring, storing, and retrieving knowledge (Marzano et al., 2001). It is argued that two interconnected systems work together to code a piece of information into the existing knowledge block (Kanellopoulou, 2019). The data provided in the form of linguistic material is called "logogen", and those in the form of visuals are "imagen" (Paivio, 2014, p. 142). When these two sets of data are provided for learners, it is more probable that they learn an item faster and retain it for a longer time (Rusanganwa, 2015).

Finally, using graphic organizers is supported by the cognitive load theory which maintains that working memory can process a limited amount of information, and if the amount of information surpasses one's capability, the process of learning fails partially or completely (Buchanan, 2015). One of the pressures on learners is related to the extraneous cognitive load, which can be decreased using modified instructional methods. The visual presentation of information is reported to be one of these instructional methods which can reduce the cognitive load and improve learning (Ajayi, 2018). Other pressures are intrinsic, which refer to the difficulty of the item to be learned, and germane, which deals with learner characteristics (Shepherd & Bolliger, 2011).

These theoretical bases, accompanied by the positive findings of several studies (see the extended list of references below), have made graphic organizers a popular technique to improve learners' second language ability. The following section provides information on how graphic organizers have been employed in developing learners' vocabulary knowledge.

Graphic Organizers and Vocabulary Instruction

The examination of the history of graphic organizers in the second language learning context shows that graphic organizers are mainly used to improve learners' reading comprehension and rhetorical analysis (Katayama

& Robinson, 2000; Minaabad, 2017; Oliver, 2009) and generating and organizing ideas for writing tasks (Colliot & Jamet, 2020; Nussbaum & Schraw, 2007). However, an increasing number of practitioners are employing graphic organizers to improve their learners' vocabulary knowledge.

In an attempt to find the best activity, several types of graphic organizers have been provided by practitioners and researchers. They use various templates to include different aspects related to words. For instance, *synonym wheel* (Stamper, 2006) requires learners to provide the synonyms of the intended lexical item and sentences showing them in context. The second one is *concept circle*, which is used to help learners associate words with their related meanings. The third graphic organizer template is *Venn Diagram*, which deals with the organization of the lexical items identified in a text. However, it can also be used as a brainstorming activity. Some other graphic organizer types include more information for each lexical item and move beyond the synonym. *Word star* is another example of graphic organizers that includes a word's synonym(s), number of syllables, part of speech, antonyms, and examples in the form of sentences. These different graphic organizer formats have been employed for different purposes; however, the researchers of the present study preferred to use *Word star* model in all graphic organizer groups, which provides the learners with a wide range of information about a lexical item.

The study of the literature on graphic organizers shows that some studies have been conducted to examine the effect of using graphic organizers on second language learners' vocabulary knowledge. Several studies have found the positive effects of graphic organizers on learners' vocabulary knowledge (Alashry et al., 2019; Buchanan, 2015; Duyen, 2020; Gadallah, 2020; Karimi, 2020; Keshavarz et al., 2006; Liu, 2016; Ridho, 2020; Saeidi & Atmani, 2010; Shoari & Farrokhi, 2014; Zahedi & Abdi, 2012). Al-Hinnawi (2012) found the positive long-term effect of graphic organizer strategy on learners' vocabulary expansion. In addition, some scholars (Duyen, 2020; Feruza et al., 2020; Gadallah, 2020; Karimi, 2020) found the positive effects of using graphic organizers on learners' attitudes toward vocabulary learning.

The examination of the literature on graphic organizers shows that the vast majority of studies have demonstrated that the superiority of graphic organizer condition over the conventional vocabulary instruction strategies; however, to the best of the researchers' knowledge, no previous study has compared the effectiveness of individually-generated, teacher-generated, and cooperatively-generated graphic organizers on L2 learners' vocabulary knowledge. The investigation of this issue can inform us about the effect of instructional options in graphic organizer activities on the quality of the product (vocabulary knowledge). One of the aims of this study is to fill this gap in the literature by examining four independent groups. The findings of this research project can help materials developers and teachers find the most effective graphic organizers to improve L2 learners' vocabulary knowledge.

Furthermore, previous studies have employed mainstream vocabulary test types (mainly in the form of multiple-choice tests) to examine L2 learners' vocabulary improvement. These tests have been identified as insufficient since they do not consider the multi-dimensionality of the words; thus, researchers made an attempt to examine learners' vocabulary knowledge by analyzing their depth of knowledge (Stewart et al., 2012). One of the scales which has been used in vocabulary acquisition research is Vocabulary Knowledge Scale developed by Paribakht and Wesche (1993). This scale can assess learners' depth of vocabulary knowledge, which goes beyond the meaning of items and includes "spoken and written forms, morphological, collocational, and grammatical knowledge" (Stewart et al., 2012, p. 696). Stæhr (2009) defines depth of vocabulary knowledge as "the quality of lexical knowledge that reflects how well a learner knows individual words or how well words are organized in the learner's mental lexicon" (p. 579). The present research employed Vocabulary Knowledge Scale to examine the effect of different graphic organizer types on learners' depth of vocabulary knowledge.

To be more specific, the following research question guided this research project:

Research question: Is there any significant difference between the effects of individually-generated, teacher-generated, and cooperatively-generated

graphic organizers on EFL students' immediate and delayed vocabulary knowledge?

Method

Participants

The participants of this study included 80 intermediate students studying at a private language institute in Ardabil, Iran. Both male (N = 33, 41.25 %) and female (N = 47, 58.75 %) language learners participated in this study. All participants were native speakers of Turkish-Azari, and their ages ranged between 18 and 27 (M = 22.3, SD = 1.7). The participants were selected based on convenience sampling; however, they were randomly assigned to three experimental and one control groups. The experimental groups employed individually-generated, teacher-generated, and cooperatively-generated graphic organizers. These students were placed in four classes of 20 by the institute. Based on the charter of the institute, the participants were all at the intermediate level; however, the researcher employed an IELTS Mock test to assess the participants' English language proficiency. Based on the results, the participants were all independent users of English with scores ranging between band scores 4.5 and 6.5. This range represents level B in the CEFR. The mean score of the participants was 5.38 (SD = .61), and there was not any significant difference between the mean scores of the four groups, $M_{control}$ = 5.2, SD = .57, $M_{teacher}$ = 5.4, SD = .55, $M_{learner}$ = 5.35, SD = .60, $M_{cooperatively}$ = 5.5, SD = .7, F (3, 76) = 1.01, p = .394.

Instruments and Materials

IELTS Mock Test

In order to examine the participants' English language proficiency level, the researchers employed an IELTS Mock test to have reliable scores. With the cooperation of the host institute and a major language institute which holds IELTS Mock tests online, the researcher bought the voucher of IELTS Mock Tests for the participants. The participants had one week to take the test. All skills were examined in one sitting, and the exam took around three hours. The scores were sent to both the researcher and the participants. The

IELTS scores can range between one and nine, and those who range between 4.5 to 6.5 are labeled as independent users (Intermediate learners).

Vocabulary Knowledge Test

To examine the participants' vocabulary knowledge, the researchers benefited from vocabulary knowledge scale, which is a well-established method to examine second language learners' knowledge of vocabulary (Fitzpatrick & Clenton, 2017). In this scale, the examinees are provided with an intended set of lexical items, and they have to show their knowledge by providing information on their familiarity with the word, cognizance of meaning, synonyms or L1 equivalent, appropriate semantic use in a sentence, and grammatical use in a sentence. The details of the analysis procedure are provided in the Data Analysis section, below. In the exams, learners' knowledge of 50 items selected randomly out of a pool of 100 lexical items was assessed. The examined lexical items were verbs (eight items), nouns (nine items), and adjectives (eight items). The participants had 50 minutes to answer the questions. These words were taken from the wordlist provided by the book publisher as an appendix.

Textbook

The textbook employed in this study was Cutting Edge: Intermediate (Cunningham, 2013), which intends to improve English language learners' knowledge to move from the intermediate toward the advanced level. Each unit includes reading passages, and five units were used in this study as the material to contextualize the lexical items. The topics covered in this study were entertainment and television, social life, consumerism, current issues, and rules.

Data Collection and Analysis

The data collection started with the collection of participants' English language proficiency scores. The participants took IELTS Mock Test a week before the treatment started. The participants were then asked to take a vocabulary pre-test of 50 items in the first session. The items were selected from a pool of lexical items within the intended units of the book. The researchers used this pre-test to ensure the homogeneity of the participants in terms of their vocabulary knowledge at the beginning of the treatment.

The term lasted for 20 sessions and five units of the book were covered in these sessions. In the first session, the teacher provided the learners of the

individually-generated, teacher-generated and cooperatively-generated graphic organizer groups with a 45-minute instruction on how to use dictionaries to create graphic organizers and how to study the prepared graphic organizers. The learners in individually-generated and cooperatively-generated groups also practiced making graphic organizers under the guidance of their teacher in sessions two and three. From session four to 19, the participants in the teacher-generated graphic organizer group (TGGO) received 100 graphic organizers provided by the teacher, and worked on the items for 30 minutes individually every other session. Those in the individually-generated graphic organizer group (IGGO) spent 30 minutes every other session on creating graphic organizers for the same lexical items. In the cooperatively-generated graphic organizer group (CGGO), the participants spent the time (30 minutes) creating graphic organizers in groups of four. The groups were formed randomly and were different each session. In the control group, however, the lexical items were explained, their synonyms were provided, and their Persian equivalents were given on request; however, no graphic organizer was created by the learners. Finally, the learners sat for the immediate post-test, which was the same as the pre-test. The delayed post-test (the same as the immediate post-test) was given to the students after 60 days. The participants did not receive any formal instruction during this period.

The IELTS Mock Test was scored by the external institute, and the researchers were not involved in the scoring process. The analysis of the vocabulary pre-test and post-test had its own difficulties since it involved subjective scoring. The Vocabulary knowledge scale requires six levels (dimensions) for each lexical item:

I. I have never seen this word.

II. I have seen this word before, but I don't know what it means.

III. I have seen this word before, and I think it means _____. (synonym or translation)

IV. I know this word. It means _____. (synonym or translation)

V. I can use this word in a sentence: _____. (Paribakht & Wesche, 1993, p. 15).

The third, fourth, fifth and sixth levels were checked by the researcher. As Paribakht and Wesche (1993) have argued, minor grammatical mistakes were ignored; however, those items which were misused both structurally and semantically were scored as level II. Those items which were correct regarding the referential meaning but were not structurally exact were labeled as level V. Finally, those items which were used both grammatically and semantically correct were scored as level VI. Here are some examples from our analysis. For instance, a respondent wrote " همکا " for the word *acquaintance* at level III, but since the response was not precise, it was labeled as level II. Another respondent used the word *engaged* in the following sentence, "*He was happy about his engaged.*" On these occasions, following Paribakht and Wesche (1993), the researchers labeled the items as level V.

To avoid sneaking errors into the process of scoring, the assessment was checked by two independent scorers (out of the research team) who checked the collected data. One of these scorers was an English language teaching PhD student with 15 years of teaching experience, and the second one was an applied linguistics PhD-holder who had been teaching grammar at a state university for 13 years by the time the current research project was conducted. To improve the quality of the analysis, the researcher first examined 50 percent of the data and asked the external examiners to assess the data independently, and the inter-rater values of .86 and .89 were achieved. The researchers discussed the discrepancies with the examiners in an extended online session until they agreed on the scores. In the second round, the external examiners assessed the second half of the items, and the inter-rater values of .94 and .96 were achieved. The discrepancies (108 items) were discussed in a three-hour online video call, and the discussions continued until all items were discussed.

Results

To answer the research question of the study, the researchers analyzed the participants' pre-test, immediate post-test, and delayed post-test scores, the results of which are presented below.

Pre-test of Vocabulary

The researchers examined the participants' vocabulary pre-test scores to check their homogeneity in terms of vocabulary knowledge prior to the treatment (Table 1).

Table 1
Learners' Vocabulary Knowledge Scores in the Pre-test

	Control	Teacher	learner	Cooperatively
Mean (SD)	2.52 (.69)	2.45 (.82)	2.4 (.92)	2.55 (.82)
	df	Mean square	F	Sig.
Between groups	3	.433	.611	.6
Within groups	76	.709		
Total	79			

As Table 1 shows, the mean scores of the four participating groups were not significantly different (F = .611, p = .6), $M_{control}$ = 2.2, SD = .69, $M_{teacher}$ = 2.45, SD = .82., $M_{learner}$ = 2.4, SD = .92, $M_{cooperatively}$ = 2.55, SD = .82. These figures indicated that the participants of the different groups were not significantly different in terms of vocabulary knowledge scores. Furthermore, the mean scores, which ranged between 2.2 and 2.55, suggested that the assessed lexical items were relatively new for the participants. Thus, these vocabularies were suitable items to examine the participants' lexical retention.

Immediate Post-test of Vocabulary

The vocabulary knowledge scores of the participants were collected at the end of the treatment, and the mean scores belonging to different groups were compared (Table 2).

Table 2
Learners' Vocabulary Knowledge Scores in the Immediate Post-test

	Control	Teacher	Individual	Cooperatively
Mean (SD)	3.6 (.82)	4.45 (.6)	4.55 (.99)	5.3 (.92)
	df	Mean square	F	Sig.
Between groups	3	9.68	13.40	.001
Within groups	76	.72		
Total	79			

As presented in Table 2, the cooperatively-generated graphic organizers (CGGO) group had the highest mean score (M = 5.3, SD = .92), followed by the individually-generated graphic organizers (IGGO) group (M = 4.45, SD = .99) and the teacher-generated graphic organizers (TGGO) group (M = 4.45, SD = .6). The least mean score belonged to the control group (M = 4.45, SD = .6). The results of the One-way ANOVA indicated that the mean scores of these groups were significantly different, F (3, 76) = 13.4, p < .05. To have a better understanding of the differences, a post hoc test was run (Table 3).

Table 3
Scheffe for Learners' Vocabulary Knowledge Scores in the Immediate Post-test

	Control	TGGO	IGGO	CGGO
Control		.024*	.009*	.001*
TGGO	.024*		.97	.024*
IGGO	.009*	.97		.059
CGGO	.001*	.024*	.059	

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

The results in Table 3 show that the mean score of the control group was significantly lower than those of TGGO (.024), IGGO (.009), and CGGO (.001). The mean score of TGGO was significantly lower than that of CGGO (.024), but it was not significantly different from the mean score of IGGO. The mean score of IGGO did not significantly differ from that of CGGO (.059).

Delayed Vocabulary Post-Test

The scores of the participants in the delayed post-test were also computed and compared, and the results of which are provided in Table 4.

Table 4
Learners' Vocabulary Knowledge Scores in the Delayed Post-Test

	Control	Teacher	learner	Cooperatively
Mean (SD)	3.35 (.74)	4.05 (.60)	4.15 (.93)	4.9 (.71)
	Df	Mean square	F	Sig.
Between groups	3	8.04	13.94	.001
Within groups	76	.577		
Total	79			

As indicated in Table 4, CGGO had the highest score among the four participating groups (M = 4.9, SD = .71). The second highest score belonged to IGGO (M = 4.15, SD = .93), followed by TGGO (M = 4.05, SD = .6) and the control group (M = 3.35, SD = .74). The results of the One-way ANOVA showed that the difference between the mean scores was significant (F (3, 76) = 13.94, p < .05). To have a better understanding of the differences, a post hoc test was run (Table 5).

Table 5
Scheffe for Learners' Vocabulary Knowledge Scores in the delayed Post-test

	Control	TGGO	LGGO	CGGO
Control		.044*	.015*	.001*
TGGO	.044*		.98	.009*
IGGO	.015*	.98		.026*
CGGO	.001*	.009*	.026*	

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

The results of the Scheffe post hoc test showed that the mean score of CGGO was significantly higher than those of the control group (.001), TGGO (.009), and IGGO (.026). The mean score of TGGO was higher than that of the control group (.015), but it was not significantly different from the mean score of IGGO (.98). The mean score of the control group was significantly lower than those of TGGO (.044) and IGGO (.015).

Figure 1 summarizes the information provided in Tables 1 to 5. This figure shows how the participants' scores were different across different groups and different tests. It shows that the highest improvement belonged to the cooperative group and the lowest improvement was achieved in the control group.
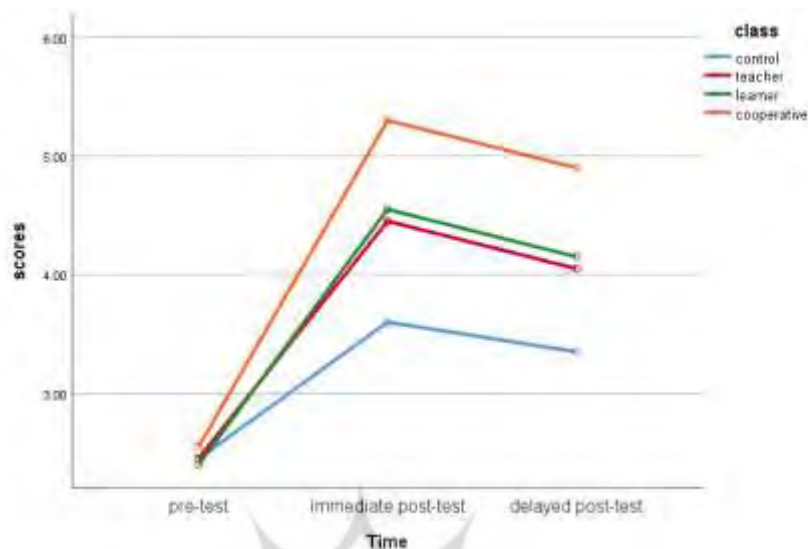
Figure 1. Learners' Vocabulary Knowledge Scores

Discussion

Learning vocabulary in an EFL context is a difficult task since learners do not have constant exposure to language and the opportunity to practice them in real situations. As a result, teachers take different measures to improve the quality of their vocabulary instruction. One of the vocabulary instruction strategies which has been employed in the last two decades is the use of graphic organizers, which has been supported theoretically and empirically. While several studies had compared the effect of graphic organizers with conventional vocabulary instruction choices, the present study examined whether individually-developed, cooperatively-developed, and teacher-developed graphic organizers could differentially improve intermediate L2 learners' vocabulary knowledge.

The findings of this study indicated that the mean scores of the control group in the immediate and delayed post-tests were significantly lower than those of all graphic organizer groups. In addition, cooperatively-generated graphic organizer group was significantly more successful than learner and teacher-generated graphic organizer groups, but there was no difference between the learner and teacher-generated groups.

The results of the present study suggesting the superiority of graphic organizers over conventional vocabulary instruction (providing translation, explanation, and definition) in developing L2 learners' vocabulary knowledge are in line with the findings of prior studies (Al-Hinnawi, 2012; Alashry et al., 2019; Buchanan, 2015; Duyen, 2020; Gadallah, 2020; Karimi, 2020; Keshavarz et al., 2006; Liu, 2016; Ridho, 2020; Saeidi & Atmani, 2010; Shoari & Farrokhi, 2014; Zahedi & Abdi, 2012). This finding supports the idea that both the linguistic form of knowledge (lexical items) and the way it is presented (visuals) can significantly affect L2 learners' vocabulary retention in the short and long run (Marzano et al., 2001). A reason which can explain the superiority of graphic organizers over the conventional vocabulary instruction strategies is the dual coding of knowledge, which can benefit learners of different learning styles. For instance, Cuevas and Dawson (2018) and Rusanganwa (2015) argued that when those learners who are of visual learning style are presented both linguistic and visual data, they are more successful than when they are provided with materials in the form of spoken/written data. It is argued that they can make connections between their preexisting knowledge and the new data more easily since the visual data are more compatible with their learning style (Caviglioli, 2019). The presence of visual data in our graphic organizer data may have benefitted those with visual learning style and reinforced the vocabulary retention of those with auditory learning style.

Another factor which could be a justification for the findings of the present study is related to cognitive issues. First, it is argued that when learners are more cognitively involved with an activity, it is more likely that they learn the intended items than when the new data are not deeply processed (Nisbet et al., 2005). In the present study, engaging learners with different aspects of a lexical item in a systematic manner (graphic organizers) could have improved the chances of uptake. While learners are given L1 equivalents, definitions, and/or explanations in the conventional vocabulary instruction, it seems that the use of graphic organizers could cognitively engage with different morphological, structural, semantic, etc. aspects of words more deeply. This deeper engagement can result in the longer retention of the lexical items.

Another related issue which can explain the superiority of graphic organizers over the conventional vocabulary instruction is the cognitive load that the activities in the former condition imposed. Graphic organizers may have reduced the intrinsic load of the activity since the data were provided in two forms (linguistic and visual) simultaneously, and they were provided in a simplified logical form. Baylor et al. (2005) and Pollock et al. (2002) have found that when information is simplified, broken into segments using visuals, it becomes easier in nature and more accessible for lower level learners, who have difficulty learning the whole item at once. This simplification can help learners retain the vocabulary more easily.

The higher scores of the cooperatively-generated GO group in comparison to those of the other graphic organizer groups can be attributed to the lower extraneous cognitive load that cooperative activities impose. The nature of cooperative activities can help learners, especially the lower level ones, have less difficulty digesting different aspects of lexical items (Elgort et al., 2008). Learners could provide feedback on their peers' definitions, explanations, sentences, etc. This may have reduced the cognitive load on the learners who were not able to extract, analyze, and uptake all this information if they worked individually. The lower depth of cognitive engagement with lexical items and the lower chances of receiving feedback from their teachers in the TGGO and IGGO conditions may have shaped the superiority of the CGGO.

To conclude, the present study contributes to a growing body of research on graphic organizers in second language vocabulary instruction. This study addressed an unexamined topic and studied how changes in the source of graphic organizer content could affect learners' vocabulary knowledge in the short and long run. In addition, this study benefited from Vocabulary Knowledge Scale, which assessed the learners' depth of vocabulary knowledge in a multidimensional manner.

Based on the findings of this study, all graphic organizer conditions were significantly more successful in improving learners' vocabulary knowledge in the short and long term. The results suggest that graphic organizer characteristics facilitated learners' retention of lexical items. This study provides further empirical evidence for the use of graphic organizers in intentional vocabulary designs to maximize the effectiveness of the

instruction. Furthermore, the findings of this study highlighted the superiority of cooperatively-generated graphic organizers over teacher-generated and individually-generated ones. The higher scores of learners in the cooperative group can be attributed to both lower intrinsic and extraneous cognitive loads, which make the content more accessible for learners, especially for the lower level ones. However, the results did not show any significant difference between the effectiveness of individually-generated and teacher-generated graphic organizers.

The implications of this study are straightforward. As the findings of this study suggest, second language instructors are invited to benefit from graphic organizers in their classes to increase their learners' engagement with intentional vocabulary activities. Teachers are encouraged to implement cooperatively-generated graphic organizers whenever possible to improve learners' L2 vocabulary retention.

A few limitations can be mentioned for the present study. The first one is the possible effect of the novelty effect on learners' performance. Some might argue that the scores might have been the result of the participants' excitement about a new activity, but it cannot be the case since they already had graphic organizers in their reading activities in the prior terms. Another limitation is the low number of participants in each group. The researchers managed to collect data from 80 learners from the same linguistic background; other researchers can conduct more comprehensive studies and examine possible differences across genders, linguistic backgrounds, and motivational orientations. Furthermore, other researchers can examine the effect of learner factors (i.e., germane cognitive load) on learners' vocabulary retention. For instance, they can investigate the effects of learners' working memory capacity on their vocabulary knowledge in the short and long run.

Declaration of interest: none

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