Research Paper

Effect of Individually-Generated, Teacher-Generated, and Cooperatively-Generated Graphic Organizer Activities on EFL Learners' Collocation Knowledge and Retention

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Abstract
Graphic organizers have been employed to facilitate second language learners' vocabulary knowledge development; however, the examination of the effects of these graphic organizer options on learners' collocation knowledge development has remained unexplored. This research investigated the effects of using teacher-generated, individually-generated, and cooperatively generated graphic organizers on Iranian English language learners' collocation knowledge. The present study examined these effects by studying 80 intermediate second language learners who were selected based on convenience sampling. The participants were assigned to four groups randomly. The collocations were provided on the board in the control group, and explanations were provided orally. In the teacher graphic organizer group, the teacher provided the learners with pre-filled graphic organizers with collocations. In the individually-generated group, the teacher provided the learners with a list of words in groups, and they had some minutes to generate their graphic organizers. In the cooperatively-generated group, the participants had some minutes to generate their graphic organizers cooperatively with their peers. Using a pre-test, immediate post-test, and delayed post-test, the researchers examined the effects of these conditions on learners' collocation knowledge. The findings showed that all graphic organizer groups were more successful than the control group in developing learners' collocation knowledge. In addition, the mean value of the participants' scores in the cooperative group was significantly more than that of the teacher-generated and individually-generated groups, and there was no significant difference between the mean scores of the teacher and individual-generated graphic organizer groups.

Keywords: *Collocation, Cooperatively-generated, Explicit vocabulary instruction, Graphic organizer, Teacher-generated, Individually-generated*

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تأثیر فعالیت‌های سازمان‌دهنده گرافیکی معلم و مشارکتی بر دانش واژگان هم مکان فراگیران زبان انگلیسی

سازمان‌دهندگان گرافیکی گرافیکی برای تسهیل توسعه دانش واژگان زبان‌آموزان زبان دوم به کار گرفته شده‌اند. با این حال، بررسی اثرات گزینه‌های سازمان‌دهنده گرافیکی بر توسعه دانش واژگان هم مکان یادگیرندگان ناشناخته باقی مانده است. این پژوهش به بررسی تأثیر استفاده از سازمان‌دهنده‌های گرافیکی معلم‌تولید، فردی و مشارکتی بر دانش هممکانی زبان‌آموزان ایرانی انگلیسی پرداخت. مطالعه حاضر این اثرات را با مطالعه 80 زبان آموز متوسطه زبان دوم که بر اساس نمونه گیری در دسترس انتخاب شدند، بررسی کرد. شرکت کنندگان به طور تصادفی در چهار گروه قرار گرفتند. در گروه کنترل، هم‌آهنگی‌ها روی تابلو ارائه شد و به صورت شفاهی توضیحات ارائه شد. در گروه سازمان‌دهنده گرافیک معلم، معلم سازمان‌دهنده‌های گرافیکی از پیش پر شده با هم‌مجموعه‌ها را در اختیار زبان‌آموز قرار می‌دهد. در گروهی که به صورت انفرادی ایجاد شد، معلم فهرستی از کلمات را به صورت گروهی در اختیار زبان آموزان قرار داد و آنها چند دقیقه فرصت داشتند تا سازمان دهنده های گرافیکی خود را ایجاد کنند. در گروه ایجاد شده توسط تعاونی، شرکت کنندگان چند دقیقه فرصت داشتند تا سازمان دهندگان گرافیکی خود را با همکاری همتایان خود تولید کنند. محققان با استفاده از یک پیش آزمون، پس آزمون فوری و پس آزمون تأخیری، تأثیر این شرایط را بر دانش جمعی فراگیران بررسی کردند. یافته‌ها نشان داد که همه گروه‌های سازمان‌دهنده گرافیکی موفق‌تر از گروه کنترل در توسعه دانش همکانی یادگیرندگان بودند. همچنین میانگین نمرات شرکت‌کنندگان در گروه تعاونی به‌طور معنی‌داری بیشتر از گروه‌های معلم‌تولید و انفرادی بود و بین میانگین نمرات معلم و سازمان‌دهنده گرافیکی فردی تفاوت معناداری وجود نداشت. گروه ها.

واژگان کلیدی: سازماندهی گرافیکی، آموزش واژگان صریح، فردی و مشارکتی

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Introduction

Vocabulary has always been a significant component of second/foreign language teaching programs. In the last two decades, a growing number of researchers have emphasized the significant role of collocations in learners' second language learning and use (El-Dakhs et al., 2018; Kang, 2019; Rezaee et al., 2019). A collocation is a string of words that co-occurs naturally and habitually, and its meaning is inferable from literal concepts (Chan & Liou, 2005). However, due to their arbitrary nature, it is difficult for learners to use them practically. Although the importance of collocations has been well-established in the literature, prior studies have shown that learners have difficulty learning them since they are not usually instructed explicitly in second language classes (Arifani, 2019). As a solution to this problem, explicit instruction has been proposed by a large number of scholars to improve learners' collocation knowledge (Tsai, 2020).

One of the instructional options for teaching lexical items is the use of graphic organizers. The examination of the literature shows that a graphic organizer, which is defined as a "non-linguistic, visual representation that students use for linking new learning to their existing knowledge and making connections between ideas" (Ajayi, 2018, p. 1), has been found to be an efficient measure to improve learners' lexical knowledge. This instructional technique has become popular with both researchers and teachers since it can benefit learners cognitively, metacognitively, and affectively (Liu, 2016; Oxford, 2013).

Although both collocations and graphic organizers have been researched extensively in the last three decades, there are still niches in the literature that require empirical studies to be occupied. One of these gaps, which has remained unexplored, is the examination of the effects of different graphic organizer types (individually-generated, teacher-generated, and cooperatively-generated) on Iranian intermediate English language learners' collocation knowledge. Considering the significance of the role of collocations in learning and using a foreign/second language, the improvement in their instruction can benefit learners considerably since they have been reported to affect learners' general proficiency in previous studies. In addition, this study can contribute to the literature by showing whether different graphic organizer options (individually-generated, teacher-generated, and cooperatively-generated) could affect learners' immediate and delayed collocation knowledge.

Cooperative learning has proved to be a significant approach to second language learning; however, the integration of graphic organizers into a cooperative learning condition can lead to a better learning condition in which learners can work together to share knowledge, solve problems, ask for help, and improve their social skills (Dzemidzic Kristiansen et al., 2019). The present study included the cooperative learning approach to examine the synergetic effect of learners' cooperation and graphic organizers on their collocation knowledge and retention. The examination of the literature on second language vocabulary learning shows that little is known about this innovative combination. The present study can help us fill this gap in the literature and contribute to the literature by showing whether different graphic organizer options (individually-generated, teacher-generated, and cooperatively-generated) could affect learners' immediate and delayed collocation knowledge. To be more specific, the present study was guided by the following 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 collocation knowledge?

Literature Review

Collocation

Collocation has been identified as a significant part of one's lexical knowledge in the last three decades (El-Dakhs et al., 2018; Kang, 2019). The examination of the literature shows that there is no single definition for collocation that all scholars find acceptable, but a few definitions have recurred in the literature. For instance, Durrant (2008) defines collocation as a "psychological association between words which is merely evidenced by their occurrence together in corpora more often than random distribution" (p. 10), and Lewis (1997, p. 8) defines collocation as "the readily observable phenomenon whereby certain words co-occur in natural texts with greater than random frequency."

Collocations have been reported to be of two main types oexical and grammatical ones (Bahn, 1993). In their oft-cited model, lexical collocation refers to items comprised of at least two content words, such as adjectives, verbs, nouns, and adverbs. Some examples of this category are *make the bed*, *take a risk*, *do homework*, etc. Grammatical collocations from the second category are formed using a content word and a function word. *Insist on*, *on purpose*, *interested in* are a few examples of this category.

Collocations are known as essential components of the use of words. In the realm of second language learning, Nation (2013) argues that learners' knowledge of collocation is significant since it gives information on how to use a lexical item in sentences. Lewis (2008) proposed a teaching approach called the "lexical approach" and found that the instruction of lexical phrases (collocations) resulted in considerable improvements in learners' both lexical and grammatical accuracy scores. Some (e.g., Schmidt, 2000) argue that the superiority of teaching collocations is due to the nature of mind processing. Schmidt (2000) states that when learners are provided with conscious input in this regard, the whole phrase is processed as a single item, and the mind acts significantly faster in acquiring, retrieving, and using one single item rather than different ones at a single point. The instruction of collocations has also been practiced in communicative language teaching (CLT), where the functions were accompanied by linguistic forms, which were in the form of collocations. For instance, van Ek and Alexander (1980) provided some collocations such as *How nice + verb-ing*, *What a surprise!*, and *How nice to +verb* as the relevant language structures to be used to show surprise in a conversation.

However, the acquisition of collocations is reported to be a difficult task for second language learners. Lewis (2008) has argued that, unlike first language acquisition, those who are involved in second language acquisition are less likely to learn collocations without explicit instruction. Similarly, Benson (1990) found that the arbitrary nature of the words collocating together has made it unpredictable and difficult to acquire; however, collocation instruction has been found to positively affect second language learners' fluency in speaking (McCarthy & O'Dell (2005) and writing (Asaei & Rezvani, 2015; Colliot & Jamet, 2020; Nussbaum & Schraw, 2007), reading and listening (Hill, 2000), and general English language proficiency (Bahramdoust & Moeini, 2012; Rahimi & Momeni, 2012).

Jafarpour and Koosha (2006), too, found the collocation knowledge of second language learners was one of the most significant discriminating factors between successful and unsuccessful English language learners. Similarly, in recent studies, scholars (e.g., Chan & Cheuk, 2020; El-Dakhs et al., 2018; Kamarudin et al., 2020; Shen et al., 2021) have found that collocation instruction can have significant effects on second language learners' general proficiency.

These studies have been informative sources for understanding the significance of collocations and the effect of collocation instruction on learners' second language skills or general proficiency; however, there are a plethora of niches in the literature to be filled. One of the areas

which hhaveremained unexplored is the comparative examination of the effects of different graphic organizer instruction types on learners' collocation knowledge.

Graphic Organizers

Graphic organizers are "visual representations of information that highlight the key structural relationships between core concepts and help students create mental representations of knowledge" (Sandoval, 2020, p. 16). Hao et al. (2021) also define them as an array of visual representations of data that are shaped employing lines and squares. They argue that graphic organizers can play a facilitative role in learners' communication and understanding.

Although graphic organizers have long been employed to organize knowledge, the examination of the literature shows that researchers and practitioners started focusing on graphic organizers in the 1990s when cognitive theorists were the most favorable educational authorities worldwide. As cognitive theorists (Hao et al., 2021; Lee et al., 2006) argue, what a person learns is formed upon his/her individual schemata that make it possible for encoding, storing, and retrieving acquired information, and graphic organizers can help learners encode the data more efficiently, store them in their short-term and long-term memories more efficiently, and retrieve them more successfully (Lee et al., 2006; Slavin, 1991).

Graphic organizers can provide learners with templates to turn implicit structures and relationships between items into explicit, more comprehensible structures (Sandoval, 2020). Graphic organizers can also function as facilitative devices for higher levels of cognitive processing (McCrudden & Rapp, 2017). They can also benefit learners as they can direct learners' attention to the educational items that might remain unnoticed if not provided in a graphic format (Sandoval, 2020). McCrudden and Rapp (2017) call it a signaling principle and believe that learners' attention to the most significant issues can promote learning and retaining items more successfully.

In addition, those who believe in the cognitive load theory have argued that graphic organizers are beneficial as our working memory is capable of processing a limited amount of data, and if the data to be processed surpasses the learner's capacity, the process of learning will be disrupted partially or completely (Buchanan, 2015). Among many others, extraneous cognitive load is of significance and can be reduced to a lower level by modifying instructional options (Castro-Alonso et al., 2021). Lee et al. (2006) argue that the provision of visual forms to convey meaning can decrease learners' cognitive load and increase the chances of learning. Other main pressures are intrinsic, which refer to the difficulty of the item to be learned, and germane, which deals with learner characteristics (Shepherd & Bolliger, 2011). Buchanan (2015) states that when extraneous pressure is reduced, learners are more cognitively capable of dealing with intrinsic and germane pressures; as a result, the chances of learning the intended items are higher.

The last advantage of graphic organizers provided here is their dual coding of information. Based on the dual coding theory of information, the presentation of both words (a linguistic form of knowledge) and visuals can shape our acquisition, storage, and retrieval of knowledge (Marzano et al., 2001). These two intertwined systems function together to encode an item into the pre-existing knowledge structure (Kanellopoulou et al., 2019). When the linguistic data ("logogen") and visual data ("imagen") are combined, learners are more likely to learn the provided items and retrieve them for a longer time (Paivio, 2014, p.142; Rusanganwa, 2015).

Different graphic organizer types are present for different purposes. The *concept circle* is one of the most common graphic organizers that is employed to assist learners in making an association between words and their meanings. The second type is the *synonym wheel*, which is used to provide learners with a collection of lexical items' synonyms. *Venn Diagram* is another popular graphic organizer type in the realm of second language learning. This template is mainly

used to organize the lexical items in passages. *Word star* is the last type examined here, providing learners with an array of information on each lexical item. For instance, it can accommodate the lexical items' synonyms, meanings, number of syllables, antonyms, and examples. In the present study, a modified version of it was used in which the chunk (collocation), synonym(s), meaning(s), possible antonyms, and examples were included in the template.

Graphic Organizers and Vocabulary Instruction

The review of empirical studies on graphic organizers in L2 learning contexts indicates that graphic organizers have been a popular research area, and researchers have examined itheireffects on different language skills and components. Graphic organizers have been mainly employed and researched in reading comprehension, and rhetorical analysis studies (Alvermann, 1981; Minaabad, 2017; Fisher & Frey, 2018; Kim et al., 2004; Oliver, 2009), and some others have employed graphic organizers to help learners organize their ideas for writing passages (Colliot & Jamet, 2019; Lee & Tan, 2010; Regan et al., 2018). However, a growing number of scholars have focused on learners' vocabulary development through the employment of graphic organizers.

The study of the literature on graphic organizers and vocabulary instruction reveals that a noticeable number of studies have been carried out to examine the extent to which the use of graphic organizers was successful in improving second language learners' vocabulary knowledge and attitudes toward vocabulary learning. For instance, several studies have found second language learners' positive perceptions of using graphic organizers to develop their vocabulary knowledge (Albufalasa, 2019; Duyen, 2020; Gadallah, 2020; Karimi et al., 2020; Kılıçkaya, 2020; Zahedi & Abdi, 2012). In addition, a large number of studies have demonstrated the positive effects of using graphic organizers on learners' vocabulary knowledge in the short term (Alashry et al., 2018; Gallagher et al., 2019; Karimi et al., 2020; Reed et al., 2019; Keshavarz et al., 2006; Vander Woude, 2016; Zhang & Yang, 2016) and long term (Al-Hinnawi, 2012; Colliot & Jamet, 2020; Kim, 2018; Ponce et al., 2020).

Cooperative Learning and Cooperative Vocabulary Learning

Cooperative learning is a popular approach to learning which encourages the active participation of learners in activities that are conventionally done by teachers (Abramczyk & Jurkowski, 2020; Kimmelmann & Lang, 2019; Liebech-Lien, 2021). Cooperative learning has been lauded for its positive effects on second language students' learning, psychological condition, and social abilities (Dzemidzic Kristiansen et al., 2019). The shared goal can motivate learners to work together to accomplish the tasks successfully. This can also result in providing and seeking help from teammates (Onwuegbuzie, 2001). In addition, cooperative learning is in line with the tenets of the sociocultural theory, which emphasizes the roots of learning in social interactions. According to this theory, learning occurs at two interpersonal and intrapersonal planes (Hoomanfard & Rahimi, 2020), and the interactions between more knowledgeable and less knowledgeable learners can mediate and usually facilitate their learning.

The cooperative learning approach has also been employed in vocabulary instruction in second/foreign language instruction settings. The examination of the literature on vocabulary instruction reveals that several prior studies have investigated the effects of cooperative versus individual vocabulary instruction and have reported the superiority of the cooperative condition over the individual learning option (e.g., Bagherian Poor & Serati, 2021; Hao et al., 2019; McGuire, 2016; Namaziandost et al., 2019; Vakilifard et al., 2020; Yavuz & Arslan, 2018). Similarly, some studies have studied the effect of cooperative learning on learners' collocation knowledge. The results are unanimously in favor of cooperative learning against individual learning conditions (e.g., Kang, 2019; Khonamri et al., 2020; Kulsitthiboon & Pongpairoj, 2018; Vahdat & Mazareian, 2018).

Method

Participants

Eighty intermediate students studying at an English language institute in Ardabil, Iran, took part in this study. Both male (Number = 47, 41.25 %) and female (Number = 47, 58.75 %) language learners whose ages ranged between 19 and 26 years constituted the participants of this study. All participants were native speakers of Azari. The selection of these participants was made based on convenience sampling. The learners were randomly assigned to control, teacher, individual, and cooperative groups. To ensure their English language ability, the participants took an IELTS (International English Language Testing System) Mock test. The results of this test administration showed that all participants were intermediate language learners (B in CEFR, Council of Europe, 2001), and their scores were not significantly different across different classes ($M_{control}$ = 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

IELTS Test (Mock Test)

To examine the participants' English language ability, the researchers of this study used an online IELTS test at the beginning of the study. This test was suggested by the institute and was welcomed by the researchers since it could provide them with valid and reliable scores of learners in four skills. The language institute and researchers bought test vouchers for each learner, and they took this test over a period of seven days. All skills were assessed in a day, and the researchers tried to minimize the chance of cheating by asking learners to activate their cameras and screen sharing software called AnyDesk so that the researchers could observe their screens and faces. The test included the four main language skills (speaking, reading, writing, and listening). The test scores can be between one and nine, and those whose scores ranged between 4.5 and 6.5 were regarded as intermediate learners.

Collocation Test

The test included 30 items chosen from the book Cutting Edge: Intermediate. These items were taken from the first six units of this book which were on different topics (everyday activities, memory, describing a place, life events, work, and narration). The test items were in the multiple-choice format. The validity and reliability of the test were examined in this study. First, the content validity of the test was examined by the researchers. Then, a TEFL (Teaching English as a Foreign Language) assistant professor, who was familiar with the book's content, confirmed the content validity and face validity of the test. Then, the reliability of the test scores was assessed through internal consistency (i.e., Cronbach's alpha). As the results showed, the value of .87 was obtained for the reliability of this test, which is representative of the desired correlation coefficient for the reliability of the test scores.

Data Collection and Analysis

The course that accommodated our research lasted for 18 sessions. The participants were taught 163 collocations related to the covered themes. The collocations revolved around 23 verbs. The instructor of the four classes, who was one of the authors of this research, moderated all classes. The graphic organizers had some sections, including chunk (collocation), synonym(s), meaning(s), possible antonyms, and examples. The teacher provided the same data to those in the control group in the form of lists (no graphic formation).

In the control group, based on the content of each unit, the teacher provided 10-15 collocations on the board in the form of a list. In the teacher graphic organizer group, the teacher provided the learners with pre-filled graphic organizers with collocations. Figure 1 is an example of graphic organizers the teacher provided in the teacher graphic organizer group and provided in other experimental groups to provide the participants with examples.
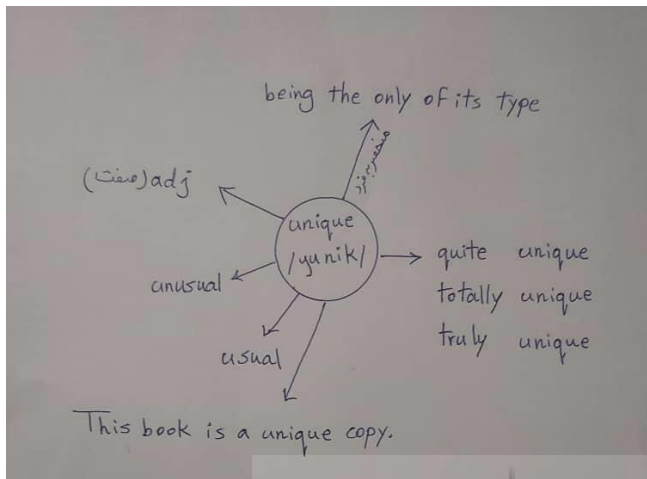
Figure 1
A Sample of teacher-generated Graphic Organizers

In the individually-generated group, the teacher provided learners with a list of words in groups, and students had 10-15 minutes to generate their graphic organizers. The members of each group wrote their ideas on a single piece of paper and modified the graphic organizer until they reached the final model. The instructor then checked the responses and provided them with the correct intended collocations. In the cooperatively-generated group, the teacher put learners in groups of four and provided them with a list of words in groups, and students had 10-15 minutes to generate their graphic organizers. They prepared their graphic organizers in groups, and the instructor checked the responses and provided them with the correct intended collocations. Direct error correction plus explanation strategy was used in this study to help the participants learn how to create graphic organizers. These error treatment activities were done during class time, and all learners could see the graphic organizers and the instructor's explanations using the screen sharing feature of the virtual learning system.

The data of this study were collected in 13 weeks. The data collection started with collecting learners' general English language ability, which was done through an IELTS Mock Test. The learners took the collocation test three times. First, the participants took the test at the beginning of the study. Second, they took the test at the end of the term, and they sat for the test once more after two months. The test was in the multiple-choice item format, and the participants had 40 minutes to answer the questions.

The data collected were analyzed descriptively, and the means and standard deviations were computed. Then, the researchers used Mixed ANOVA to examine both within-subjects and between-subjects variations. The Bonferroni post hoc tests were also employed to study pairwise differences.

Results

The results of the data analysis of this study are provided in this section. This section starts with the descriptive statistics, and the results of a Mixed ANOVA test, which was run to examine both between groups and within-group variations, are then provided.

Table 1

Descriptive Statistics for Collocation Scores in Pre-Test, Immediate Post-Test, and Delayed Post-Test

	Group	Mean	Std. Deviation	N
Pre-test	control	13.20	1.47	20
	teacher	12.38	.87	20
	individual	13.01	1.25	20
	cooperatively	13.35	1.78	20
	Total	12.97	1.41	80
Posttest	control	17.40	1.66	20
	teacher	20.50	3.20	20
	individual	21.25	3.32	20
	cooperatively	24.25	2.35	20
	Total	20.85	3.62	80
Delayed	control	15.45	1.60	20
	teacher	18.50	3.28	20
	individual	20.20	3.39	20
	cooperatively	23.10	2.07	20
	Total	19.31	3.84	80

As provided in Table 1, the participants' collocation scores were collected three times. First, the participants' scores were gleaned at the beginning of the study ($M_{individual}$ = 13.00, SD = 1.25; $M_{control}$ = 13.20, SD = 1.47; $M_{teacher}$ = 12.38, SD = .87; $M_{cooperative}$ = 13.25, SD = 1.78). The participants' mean scores in the immediate post-test were also collected ($M_{individual}$ = 21.25, SD = 3.32; $M_{control}$ = 17.4, SD = 1.66; $M_{teacher}$ = 20.5, SD = 3.20; $M_{cooperative}$ = 24.25, SD = 2.35). To examine the retention of collocation knowledge, the learners' collocation knowledge was also assessed in a delayed test, and the results showed that their scores decreased with varying degrees ($M_{individual}$ = 20.20, SD = 3.39; $M_{control}$ = 15.45, SD = 1.60; $M_{teacher}$ = 18.50, SD = .3.28; $M_{cooperative}$ = 23.10, SD = 2.07).

To examine the homogeneity of the participating groups with regard to their collocation scores, the researchers ran One-Way ANOVA.

Table 2

One-way ANOVA for Collocation Pre-Test Scores

	Control	Teacher	Individual	Cooperative
Mean (SD)	13.2 (1.47)	12.38 (.87)	13.01 (1.25)	13.35 (1.78)
	df	Mean square	F	Sig.
Between groups	3	3.88	2.01	.12
Within groups	76	1.92		
Total	79			

As shown in Table 2, the result showed that there was no significant difference between the mean scores of the four groups, F (3) = 2.01, *p* = .12. In other words, the participants started the semester with more or less the same level of knowledge of intended collocations.

In order to answer the research question, the researchers employed a Mixed ANOVA. This test was used to examine both within-subjects and between-subjects variances during the treatment.

Table 3
Mixed ANOVA for Collocation Scores

			df	MS	F	Sig.	η^2
Collocation	Within-group	Time	1	1606.55	472.1	.001	.86
		Time*Group	3	97.10	28.53	.001	.53
	Between-groups	Group	3	249.64	21.24	.001	.456

As provided in Table 3, there were significant effects of time, F (1, 76) = 472.1, p <.01, η^2 = .86, and the interaction of time and group, F (3, 76) = 28.53, p <.01, η^2 = .53. It was also found that the collocation mean scores of the participating groups were significantly different across the groups, F (3, 76) = 21.24, p < .01, η^2 = .456. These scores showed that the participants' collocation scores changed significantly during the study and across the groups. To have a deeper understanding of the results, first independent samples t-tests with Bonferroni correction were run to identify possible significant differences between temporal pairs (Table 4).

Table 4
Post hoc for Time

Time		Mean Difference	Sig.
Pre-test	Post-test	-7.875*	.001
	Delayed	-6.337*	.001
Post-test	Pre-test	7.875*	.001
	Delayed	1.538*	.001
Delayed	Pre-test	6.337*	.001
	Post-test	-1.538*	.001

*. The mean difference is significant at the .01 level.

The results provided in Table 4 show that the pre-test mean scores were significantly lower than those of the immediate post-test (Mean difference = -7.875, p <.01) and delayed post-test (Mean difference = -6.337, p <.01), and the delayed mean scores were significantly lower than immediate mean scores (Mean difference = -1.538, p <.01).

Moreover, the participants' mean scores across different groups were also examined pairwise. Table 5 provides the results of these comparisons.

Table 5 reveals that the control group's mean score was significantly lower than that of the teacher group (Mean difference = -1.76, p < .01), individual group (Mean difference = -2.80, p < .01), and cooperative group (Mean difference = -4.88, p < .01). The mean score of learners in the teacher group was not significantly different from that of learners in the individual group (Mean difference = -1.03, p = .617); however, the mean score of the cooperative group was significantly more than that of the teacher group (Mean difference = -3.11, p < .01). Finally, the mean score of the individual group was significantly lower than that of the cooperative group (Mean difference = -2.08, p < .01).

Table 5
Post hoc for Group

(I) Group	(J) Group	Mean Difference (I-J)	Sig.
control	teacher	-1.767*	.036
	individual	-2.800*	.001

	cooperative	-4.883*	.001
teacher	control	1.767*	.036
	individual	-1.033	.617
	cooperative	-3.117*	.001
individual	control	2.800*	.001
	teacher	1.033	.617
	cooperative	-2.083*	.008
cooperative	control	4.883*	.001
	teacher	3.117*	.001
	individual	2.083*	.008
*. The mean difference is significant at the .01 level.			
b. Adjustment for multiple comparisons: Bonferroni.			

Discussion

The examination of the literature indicates that second language learners have difficulty learning collocations and require assistance to extract the rules forming the collocations in a second/foreign language. The difficulty of acquiring collocations and other lexis-related issues has motivated researchers and teachers to employ different measures to boost learners' second language development. The present study examined a set of graphic organizer options (teacher-generated, individually-generated, and cooperatively-generated) to examine their effects on learners' collocation knowledge in the short and long run.

The findings of this study showed that the participants in the four groups improved significantly by receiving explicit instruction on collocations. Although the study did not include any implicit learning group (because of the results of the prior studies in literature), the present study provided further empirical evidence for the efficiency of the explicit instruction of collocations. Prior studies have also found that the explicit instruction of lexical items can benefit learners significantly (Ender, 2016; Joyce, 2018; Khonamri et al., 2020).

Another part of the findings demonstrated that the mean scores of the three graphic organizer groups were significantly higher than that of the control group, in which the collocations were taught using explanations and sentence-making activities. The superiority of the graphic organizer option over the conventional vocabulary instruction types was also observed in previous studies in the literature (Alashry et al., 2018; Al-Hinnawi, 2012; Colliot & Jamet, 2020; Gallagher et al., 2019; Karimi et al., 2020; Kim, 2018; Ponce et al., 2020; Reed et al., 2019; Keshavarz et al., 2006; Vander Woude, 2016; Zhang & Yang, 2016).

Several reasons might have contributed to this result, but the multimodal encoding of information in graphic organizer conditions might have helped learners acquire and retain collocations better and for a longer period of time. Graphic organizers have been lauded for the provision of both linguistic and visual information at the same time since this dual presentation of knowledge can facilitate the integration of new information into the pre-existing structure (Paivio, 2014; Kanellopoulou et al., 2019). Prior studies also emphasize that the multimodal encoding of knowledge in the form of graphic organizers both improves students' learning and retention of knowledge in the short and long run since the connections between the pertinent neurons in the brain are established more strongly (Hellermann, 2018; Rusanganwa, 2015).

Graphic organizers could have also been superior since they can benefit those learners whose learning style is mainly visual. Due to the nature of the graphic organizers, the visual presentation of the data can be compatible with the learning style of those who are more probable to learn visually (Cuevas & Dawson, 2018). Caviglioli (2019) asserts that the multimodal presentation of

knowledge should not be an option, and teachers should provide data in different modes and, thereby, equal chance for learners of different learning styles to learn the educational materials.

Another part of the findings showed that the cooperatively-generated graphic organizer group was significantly more successful than the teacher-generated and individually-generated groups. One of the reasons for this finding can be the co-construction of knowledge in the cooperative condition, which can result in learners' deeper engagement with the task (Kwon et al., 2018). In cooperative tasks, learners are usually encouraged by their peers (through asking questions or providing feedback) to think deeply about the task under examination. These interactions, which might function as language-related episodes (Swain & Lapkin, 1998), might have led to the superiority of the cooperative condition over the other non-cooperative graphic organizer conditions.

The interactions in the cooperative condition could have also lowered the cognitive load of the task. While in the teacher-generated graphic organizer condition, learners are responsible for understanding the provided information, and in the individually-generated graphic organizer group, both the completion and comprehension of the items are done by individual learners, those in the cooperative condition had the chance to benefit from questions and peer comments to have a better understanding of the lexical items. Elgort et al. (2008) argue that these interactional resources can especially benefit lower-level learners who usually have more difficulty learning the challenging items in a program.

Conclusion

The present study provided empirical evidence for the positive effect of graphic organizers on intermediate learners' collocation development. This study also contributed to the literature on graphic organizers by showing the effects of different varieties of graphic organizers (teacher-generated, individually-generated, and cooperatively-generated) on learners' collocation knowledge development.

According to the findings of this study, graphic organizer conditions were superior to the conventional collocation instruction alternative. Learners in the graphic organizer groups were of higher scores in both immediate and delayed post-tests. In addition, based on the findings of this study, the cooperative graphic organizer condition is more successful in developing learners' collocation knowledge than the teacher-generated and individually-generated graphic organizer conditions. Different reasons such as the lower cognitive load, facilitative role of interactions, and deeper engagement with the task were proposed in this study.

The findings of this study suggest that second language teachers benefit from the multimodal instruction of collocations since they can benefit a wider range of learners in each class. Materials developers can also consider including graphic organizers and other multimodal activities in textbooks to facilitate learners' second language development. Furthermore, the results of this study encourage teachers to use cooperative graphic organizer tasks whenever possible to maximize the benefits of graphic organizers.

This study had a few limitations which can be avoided in further studies. First, this study employed multiple-choice items to examine the participants' collocation knowledge for feasibility reasons. Other studies, however, can benefit from productive tests such as writing and speaking to examine the extent to which learners can use these collocations in communicative tasks. In addition, this study was focused on intermediate English language learners, but other studies can examine lower or higher groups to find possible similarities or differences. Further studies can also be carried out to investigate the quantity and quality of language-related episodes employed by learners in the cooperative graphic organizer group to identify the affordances and limitations of each interactional move.

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