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SHORT ARTICLE

A Review of Studies on Graphic Organizers and Language Learner Performance

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It is not easy for readers to recall information and vocabulary, especially from longer texts, and transform information into meaningful clusters, which is also a convenient way for the brain to process information presented in written forms of any text (Kılıçkaya, 2019a). According to the theory of cognitive learning (Sweller, Ayres, & Kalyuga, 2011), the brain performs the complex process of dealing with the information provided: assimilating information through sensory registers, processing it through short-term and then long-term memory to store the new information in networks of information. When learners receive and process the information, they actively use and transfer it to their long-term memory in networks of connected and organized facts (Dye, 2000).

However, only a limited amount of information can be handled, as the capacity of working memory is limited. In order to assist working memory, several strategies or tools can be utilized, such as graphic organizers. Graphic organizers are visual elements with which readers indicate clusters of ideas or concepts in the form of words, phrases or sentences (McKnight, 2010; McLaughlin & Overturf, 2013; Tarquin & Walker, 1997). In its basic form of a graphic organizer, readers draw a concept or word in the middle of a piece of paper or a screen and add related information and words to this concept, leading to a graphical representation of knowledge (see Figures 1 and 2). Table 1 presents a list of online graphic organizers.

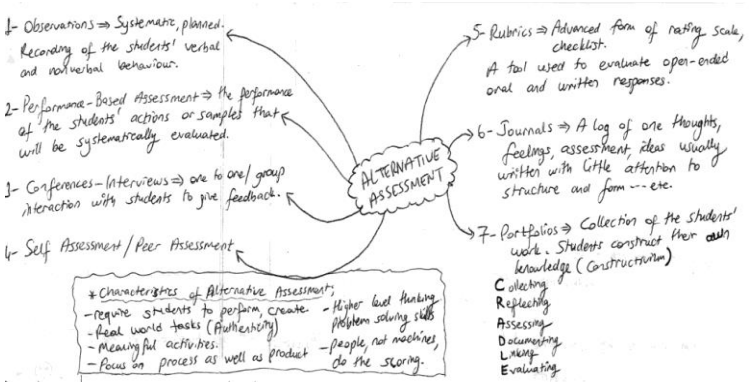

Figure 1. Graphic organizer based on alternative assessment created by a student.

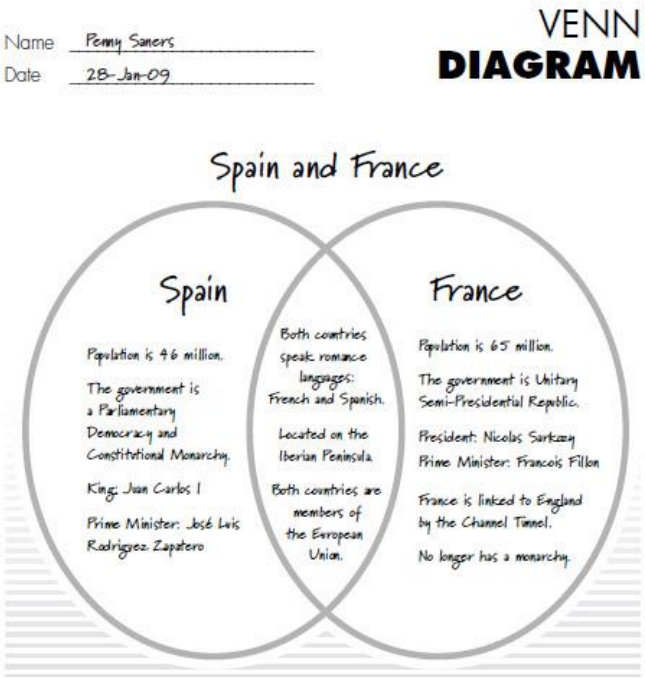

Figure 2. Venn diagram as a graphic organizer (McKnight, 2010, p. 12).

Table 1
Websites/Tools for Digital/Online Graphic Organizers

Tool/website	Brief description	Link
Canva	Creating graphical designs	https://www.canva.com/
Coggle	creating and sharing mindmaps and flow charts	https://coggle.it/
Creately	A basic diagram maker to create concept maps and flow charts	https://creately.com/
Graphic Organizer Maker	One of the free websites to create customized graphic organizers and worksheets	https://graphicorganizer.net/
Mind42	Creating a variety of maps starting from mind maps to brainstorming ideas	https://mind42.com/
Mindmeister	Completely web-based and allows users to work on visuals / maps collaboratively	https://www.mindmeister.com/
Wisemapping	Another website for creating mind maps	http://www.wisemapping.com/

Graphic organizers are widely used in teaching vocabulary and reading in both L1 and L2 classrooms in addition to glossing. It has been indicated by several studies (e.g., Lie, 2016) that students using a mobile-assisted concept-mapping vocabulary learning strategy do better and retain what they have learned longer than students who limit themselves to text-only strategies. Moreover, it was also indicated that reading

comprehension and vocabulary hypertext glosses, especially in-text glosses, have played a crucial role in improving reading comprehension and attaining vocabulary in the target language (Chen, 2016).

A number of studies investigated the use of graphic organizers and their effects on learner performance in several contexts. The results of most studies have voiced the positive effects of graphic organizers in mainly reading and writing, in addition to remembering course content. For example, Robinson et al. (2006) investigated how graphic organizers affected learners' performance in an educational psychology course. The participants in the study included 114 students in two sections of the course. They were requested to complete graphic organizers by themselves or study the ones that had been created or completed before based on the course content in three quasi experiments. The findings of the study disclosed that partial tasks led the students to score higher on the examination and that, in all experimental conditions, the participants' note taking increased.

Another study conducted by Casteleyn, Mottart, and Valcke (2013) aimed to determine how the use of concept maps as graphic organizers affects learning outcomes and several variables which included cognitive load and appreciation of e-materials prepared by the lecturer and cognitive theory of multimedia learning. One group was exposed to audio-recorded lectures, while the experimental one received lectures based on graphic organizers. The results of the study showed that, although the participants preferred the lectures based on graphic organizers, the two groups were not different from each other in terms of cognitive load, knowledge gain, and self-efficacy. Similarly, Khoii and Sharififar (2013) investigated whether rote memorization and graphic organizers as semantic mapping affect L2 vocabulary acquisition. Their study included 38 intermediate EFL learners, who were placed in two experimental groups, with each practicing a different cognitive technique. Based on a post-test which included multiple-choice vocabulary questions, the results of the study indicate that both experimental groups improved their vocabulary knowledge; however, there was no significant difference between memorization and graphic organizer groups.

In a study designed as a cross-case analysis of two classroom teachers, Mercuri (2010) examined instructional activities in classrooms where activities focused on students' academic language development during science instruction. The findings of the study revealed positive effects of print graphic organizers, helping the students summarize and show relationships between the ideas derived from texts. Servati (2012) sought to investigate how pre-writing activities based on graphic organizers such as webs, and beginning, middle and end charts affect the overall quality of student writing. Participants in the study included 2 students from a Sunnydale tutoring program and 10 teachers. To collect data, the study employed questionnaires, sample student words, interviews conducted with the participants, and field notes. The results of the study indicate that using appropriate prewriting strategies based on graphic organizers and giving enough time for the students could lead to better quality writing.

Ponce, Mayer, and Lopez (2013), on the other hand, investigated the use of computer-based spatial learning strategy in reading and writing classes. 2,468 students from 12 schools participated in the study. These participants, utilizing the specific strategy, visualized the content and ideas represented in a page in the reading class, while they completed graphic organizers in the writing. Based on the test results obtained in the study, it was stated that the participants in the computer-based instruction group, who

benefited from computer applications, performed better in reading and writing tasks than those in the traditional instruction group.

Lusk (2014) investigated the effects of utilizing graphic organizers to teach scientific concepts in a special education classroom and compared the effects of graphic organizers and lecture style teaching on participants' performance in learning scientific concepts. The participants included two classrooms of tenth-grade students and were divided into two groups: special education classroom and general education classroom. The students in the special education classroom served as the experimental group, who were exposed to graphic organizes, while the students in the general classroom were the control group, who were exposed to lecture style. Based on the assessment with 25 questions, which included a variety of item formats such as matching and multiple-choice questions, it was found that, while both groups statistically improved their performance, the experimental group participants who were exposed to graphic organizers performed better in a statistically significant way, leaded to the conclusion that graphic organizers was more useful and effective for the students in the special education.

Mann's study (2014), on the other hand, aimed at whether the use of concept maps and sequence chains affects learner performance when they were used as graphic organizers. Participants in the study were 92 students in eight-grade social studies classes and used the concept maps and sequence chains during classroom discussions and assignments on social studies. Data were collected from pre-and post-tests and used to determine learner performance and improvement in comprehension of the content covered in three chapters in a cookbook. The results of the study demonstrated that (1) both groups of students with disabilities and without disabilities increased their scores in the tests and (2) graphic organizers contributed positively to the comprehension of reading content. Evmenova et al. (2016), on the other hand, investigated the effects of computer-supported graphic organizers prepared using Microsoft Word on participants' essays and their content. The participants were 10 students enrolled in the seven and eight grades, with several disabilities, among which are emotional and attention deficits. The participants were given persuasive writing prompts, and several analyses were performed on their work such as checking the number of words and sentences, planning, and quality. The results of the study revealed in their visual analysis that all the participants in the study improved their performances in writing, leading to improvements in quantity and quality of their essays. Similarly, in a recent study, Kılıçkaya (2019b) investigated learners' perceptions towards digital graphic writing using a computer program (Comic Life, http://plasq.com/) at a university context. The study also investigated whether digital graphic writing contributes positively to learner recall of content covered during the classes. Participants in the study were senior students in a program of teaching English as a foreign language at a state university and made digital graphic organizers based on readings and lectures in a course on testing. Findings from the study suggest that, based on the participants' perceptions and views, graphic organizers supported the participants' learning of course content in addition to other benefits such as benefiting from group members' views and suggestions.

Almost all of the above studies have considered the effects of the use of graphic organizers on learners' performance as indicated by the scores or the improvements in reading and writing skills. As for the studies outlined briefly above, it can be stated that there is a general consensus that, when classes and learners are provided the opportunity to integrate graphic organizers into their learning, learning seems to be facilitated as it is

enhanced with visual representations. Moreover, the use of graphic organizers, in most cases, leads learners' comprehension of course content and performance. However, there appears to be a lack of investigations into how computer- and learner generated graphic organizers can be combined and used in teaching language skills as new computer programs can provide enhanced and enriched graphic organizers. There is also a paucity of research on the effects of graphic organizers in L2 listening skills.

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