

Effects of Mind Mapping on Learning ESP Vocabulary: A Case Study

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ABSTRACT

The current study aims at examining the effects of using mind mapping strategy on learning ESP vocabulary. To this end, this study employed a quasi-experimental pre-test --post-test design to examine a cohort of 74 ESP students who were distributed as in: an experimental group (33 participants) and a controlled group (41 participants). The experimental group received mind mapping instruction whereas the controlled group received traditional instruction. The impact of the mind mapping strategy was measured using a pre-test and a post-test. The results of the study revealed that there was a significant difference in the mean scores between the pre-test and the post-test results in the experimental group. However, there was no significant difference in the mean scores of the post-test between the experimental and controlled groups which implies that both mind mapping and traditional vocabulary teaching techniques had similar effects on language learning.

Keywords: : English for Specific Purposes; Mind maps; Teaching ESP vocabulary; Vocabulary learning strategies.

1. INTRODUCTION

Engrained in English language teaching and learning, English for Specific Purposes (ESP) has become vital for postgraduate education, specialized corporates and different industries training as most course books are written in English or translated into English. ESP, Hutchinson and Waters (1987) defined, is an approach to teaching and learning English that is based on learners' needs. Hoa and Mai (2016) maintained that it involves course textbooks and materials modified according to learners' goals and preferences. ESP is identified as partially different from general English in terms of its content, purposes, instruction methods and techniques (Rahman 2015).

Language acquisition commences with learning vocabulary which is one of the vital components that ESP learners are bound to master. Many language learners, however, find it quite challenging to learn and recall ESP vocabulary for the purposes of speaking and writing.

The significance of this study lies in revealing the impact of mind mapping on participants' vocabulary learning performance. This, in turn, provides considerable insights to both students and instructors who are involved in the educational process. While ESP students identify creative ways to learn field-related vocabulary in a visual way, instructors discern useful methods to boost their students' vocabulary learning skills. This study highlights the relevance of integrating mind mapping in vocabulary instruction and making the process of acquiring semi-technical vocabulary enjoyable and simple. It also fosters a positive and stimulating environment, encouraging students to devote more time to studying ESP vocabulary. The study attempts to answer the following research questions:

RQ 1: What is the effect of mind mapping as a technique on learning ESP vocabulary?

RQ 2: To what extent does mind mapping as a technique for learning ESP vocabulary differ from traditional vocabulary teaching?

2. LITERATURE REVIEW

Language is one of the major signs of mental development, an instrument of understanding and is intertwined tightly with thoughts (Baskin et al. 2017). It represents the main vehicle that conveys thoughts, and thus the power of words is emphasized. Schmitt (1997) refers to the fact that communication cannot be effective without sufficient knowledge of vocabulary and vocabulary acquisition. For this reason, scholars conducted research on vocabulary learning strategies.

Vocabulary teaching, Panoh (2021) and Noom-Ura (2013) argued, is sometimes problematic due to several reasons including that many teachers are not confident, not aware of vocabulary teaching best practices and/or that they harbored inadequate knowledge of how to begin. So to speak, both teachers and students agree that the acquisition of vocabulary is central in teaching and acquiring a new language (Walters, 2004).

Lack of vocabulary knowledge represents one of the major challenges that learners face in the language learning feat. Schmitt (2000) underlines the importance of vocabulary learning, stating that lexical knowledge is necessary for communicative competence and foreign language acquisition. Nation (2022) proceeds to explain the relationship between vocabulary knowledge and language usage as complementary, indicating that vocabulary knowledge facilitates language use, and language use, in turn, contributes to greater vocabulary knowledge. According to Steven Stahl (2005), vocabulary instruction entails much more than searching up words in a dictionary and employing them in a sentence.

Said (2021) classified vocabulary into three categories. The first category is language skills-based vocabulary which is concerned with the receptive skills: listening and reading and the productive skills: speaking and writing. The second category is language knowledge-based vocabulary which is divided into oral and visual vocabulary; the former is used in spoken English while the latter is concerned with written English. The third category is content-based vocabulary which is concerned with general and technical vocabulary. Hatch

and Brown (1995) distinguished between two types of vocabulary: receptive and productive vocabulary. Another classification suggested by Gruneberg and Sykes (1991) categorized vocabulary into active and passive vocabulary. The first type is the one that students were taught and were expected to be able to use whereas the second one is the vocabulary that the students would realize when they encounter.

Marunovich et al. (2021) argued that typical repetition is no longer an effective strategy for vocabulary learning and acquisition and have sought out cutting-edge methods to help with vocabulary learning. Despite the efforts that have been expended to discover and implement successful techniques and strategies in teaching English as a foreign language, there are still problems teachers and students face in the language classroom. Therefore, the demand for an innovative and adaptable strategy in teaching and learning language has become essential in recent years (Buran and Filyukov 2015).

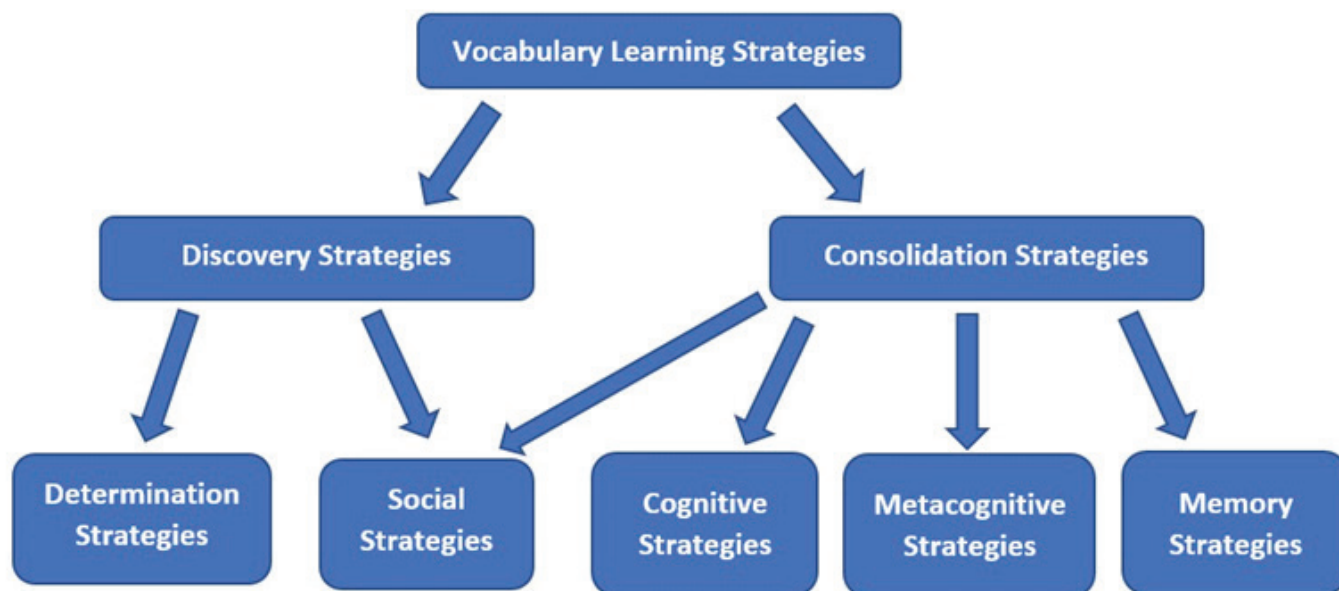
Vocabulary Learning Strategies (VLS), Schmitt (1997) defined, is a student-centered strategy for vocabulary acquisition and is considered one of the key language learning strategies. Such strategies, Nation (2022) determined, are complex, include choice, require knowledge and advantage from continual developmental education and enhance the efficacy of vocabulary learning and application. Schmitt (1997) constructed a taxonomy of the vocabulary learning strategies that is based on the classification of Oxford's taxonomy of language learning strategies. In his taxonomy, strategies are categorized into two major classes under which there are five subcategories. The major classes are the discovery and consolidation strategies. The former is concerned with exploring the meaning of a word whereas the latter is concerned with consolidating words by memorizing techniques.

The determination strategy is a sub-category of the discovery strategies. The determination strategy refers to learners' ability or self-study when trying to find the meaning of a word without requesting any assistance. The social strategy is the learning of new vocabulary through social interaction. The memory strategy is the

association of new words with the existing knowledge. The cognitive strategy is another subcategory; however, it does not encourage students to be engaged in mental processing but uses a more mechanical way.

The metacognitive strategy includes the evaluation and the monitoring of the progress of an individual. Schmitt Taxonomy is illustrated in figure 1.

Figure 1: Schmitt Taxonomy of Vocabulary



Note. *Vocabulary Learning Strategies* (1997, p. 205 – 210).

Another recent classification was proposed by Takac (2008) based on a questionnaire that targeted primary school students. The classification categorizes the vocabulary learning strategies into three groups: the formal learning vocabulary memorization technique, the self-study of vocabulary that involves checking the dictionary and taking notes along with associating words with objects, and finally learning incidental and spontaneous vocabulary through situations or in natural settings.

Mind mapping is considered an innovative way of keeping ideas in one’s brain and taking them out as well (Edwards and Cooper 2010). Tony Buzan is the founder of mind maps and his work is based on the human brain research by Dr. Roger W. Sperry, a winner of the Nobel Prize in 1981 in medicine for his research about the principles of left and right hemisphere functioning. While the right hemisphere is responsible for rhythm, spatial perception, gestalt (Wholeness), daydreaming, imagination, colour and size, the left hemisphere is responsible for words, logic, numbers, strings, linearity, analysis and lists (Stankovic et al. 2011).

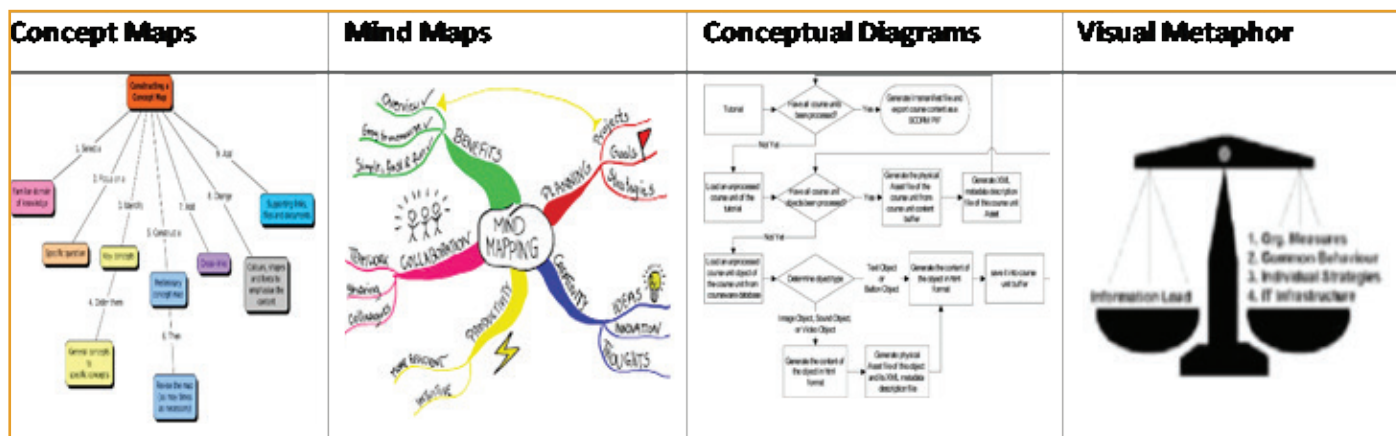
Mind mapping, Buzan et al. (2010) defined, represents

a visual depiction of a mental process that includes diagrams, colours, symbols, and phrases. Drawing on mind mapping’s pictorial feature, teaching and learning can be made vivid while boosting learners’ motivation (Liu et al. 2014). Mind maps, Nesbit and Adesope (2006) contended, alleviate the extrinsic cognitive load on students when they categorize cumbersome amounts of data/concepts and surface the interconnection of related ideas. Students of today’s generation, Dushkova and Tsankov (2015) argued, are called digital students and the creation of mind maps will make it interesting and engaging for them. The use of mind maps is advisable for notetaking, brainstorming, problem-solving, memorizing, researching, planning, consolidating information from multiple sources, presenting information and finally, gaining insight on a complex topic (Adodo 2013).

Mind maps are known under various names such as concept maps, semantic maps, knowledge maps, think-links, graphic organizers and cognitive maps (Al Naqbi, 2011). Wang et al. (2010) stated that mind maps make ultimate use of lines, colours, characters, numbers, pictures and symbols for the purpose recording thoughts and information.

Figure 2 shows the differences between four graphic organizers that are widely used for different academic and business purposes. The classification is adapted from Eppler (2006).

Figure 2: Mind maps, Concept maps, Conceptual Diagram and Visual Metaphor



Note. Adapted from Eppler (2006)

Figure 2 shows that visual organizers vary based on their purposes. The visual organizers, depicted in the figure are the most popular among learners. Mind maps are multi-coloured with images attached to them and have radial layout that illustrates semantic links between parts of learnt material. One kind of mind maps is the concept map. It is a diagram that shows the connections between concepts and their explanation from top to bottom. A conceptual diagram is also a representation of an idea in category boxes with defined relationships, which is usually based on a theory or model. Finally, a visual metaphor a graphic tool that arranges knowledge symbolically using the shape of a familiar natural or man-made object of an activity or tale.

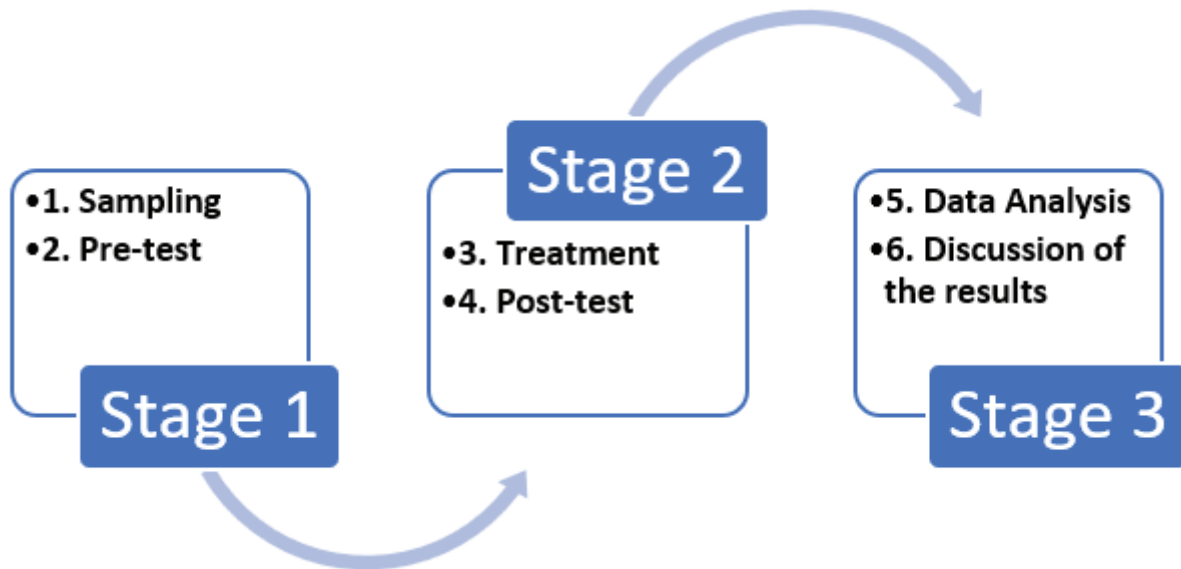
A review of the literature on the effect of mind mapping strategy on learning vocabulary led to several related studies. Buran and Filyukov (2015) explored the attitude of university students towards mind maps in language classrooms generally. Othman (2018) investigated the use of mind maps with elementary school students. Jiang (2020) suggested that mind mapping represents as an effective technique in learning general English vocabulary with an example of the Coronavirus-related vocabulary. Stepankova (2021) explored mind maps as a supplemental material in learning general English vocabulary for secondary school students. Stokhof et al. (2020) investigated whether mind maps are effective in improving students' questioning skills. However, none

of these studies examined the effect of using mind maps as a technique for learning ESP vocabulary during the COVID-19 pandemic, which the current study endeavours to achieve.

3. RESEARCH METHODOLOGY

This study follows an applied, mixed-method and exploratory design. The independent variable is the strategy of mind mapping whereas the dependent variables are vocabulary learning and students' English proficiency. The traditional way of delivering vocabulary was controlled by other instructors who taught vocabulary using the traditional method to the controlled group. Participants' English proficiency levels were measured using the pre-test assessment tool according to the CEFR.

In this study, two groups of undergraduate College of Engineering students Aswan Headquarters (AASTMT) were recruited for the purpose of the study. The first group, which comprised of 33 participants, represented the experimental group that the researcher taught using mind mapping technique. The second group, which comprised of 41 participants, represented the controlled group who received traditional vocabulary teaching. Figure 3 demonstrates the stages that this study followed.

Figure 3: Stages of the Study

The experiment covered the whole duration of the semester, (i.e. a 15-week course). Data were collected using the pre-test and post-test. The Arab Academy for Science, Technology and Maritime Transport typical Placement-test was used as the pre-test to determine the participants' level of English proficiency. The aim of the test was to place students in the ESP course level according to their current language competency. The pre-test test was automatically scored. The computer system and the exam administrators automatically record and document the score. The test took approximately 30 minutes. It covered reading, use of English, and listening. A report of the results was provided based on the Common European Framework Reference (CEFR).

The pre-test is an online progressive test. This means that each item is determined based on the candidate's answer to the preceding item as they proceed through the test. As a result, the test becomes either easier or more challenging until a certain level of skill is reached, allowing the candidate's English level to be verified. Examinees could also know their scores immediately after finishing the test by the computer on which they have taken the test.

The post-test was used to investigate the effectiveness of the mind mapping on learning ESP 1 vocabulary for engineering students. The test is an achievement test that is based on the ESP 1 course curriculum. The post-test was in four sections: Listening, Reading, Language

Use and Writing. It was conducted online through the Google Form platform and the questions were multiple choice questions and True or False. The exam was out of 40 marks: five marks for listening, ten marks for reading, fifteen marks for language use, five marks for writing, and five for the presentation. The test was reviewed several times by two coordinators of the ESP program to ensure its validity, reliability, and practicality.

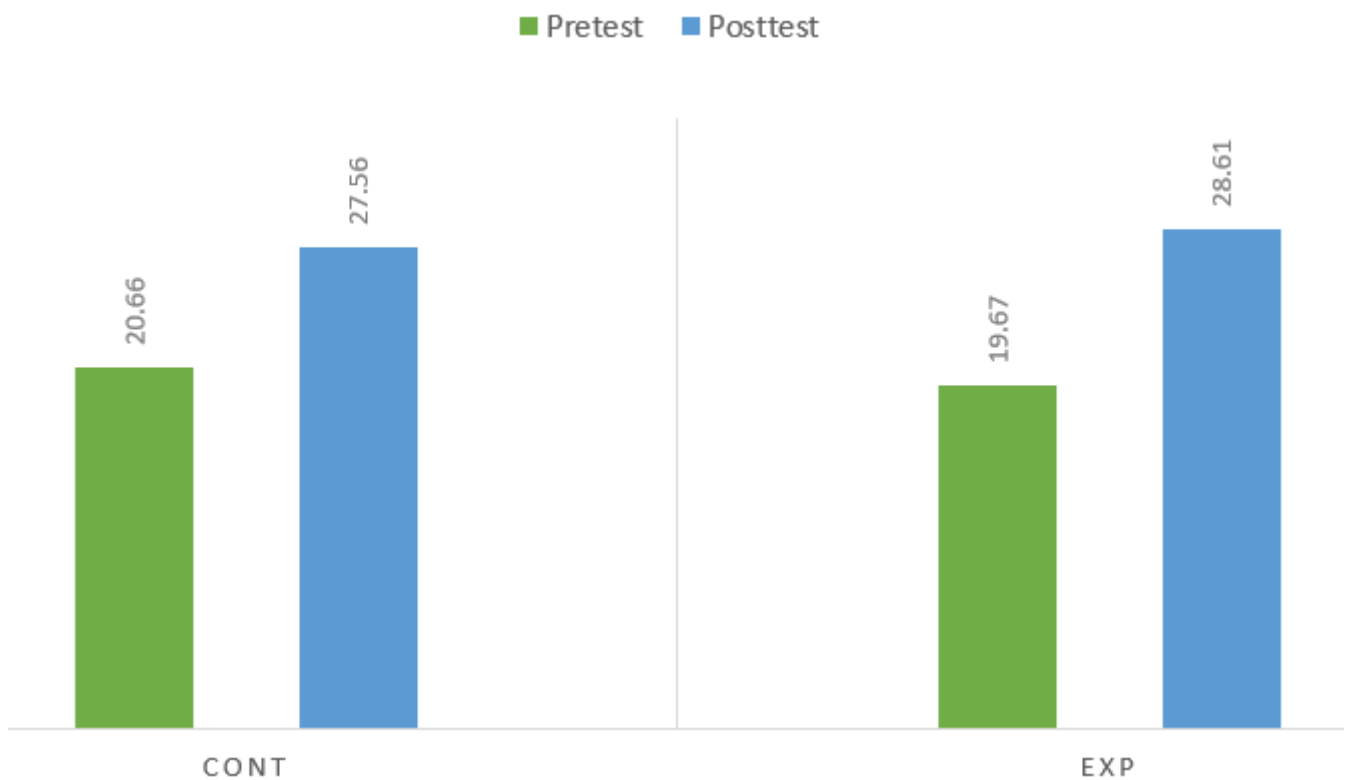
With regard to the implementation of the study, relevant literature in terms of teaching methodologies, vocabulary learning strategies, and mind mapping was reviewed and the sample of participants and place of the study were selected. This was followed by the administration of the online pre-test to participants of both groups. The researcher then identified the syllabus units that needed to be taught and introduced mind mapping in the teaching process in two different ways in the experimental group. The first was through a gap fill activity in which participants were filling in the missing-words spaces in groups and during the class time. The second way was through a summary activity as the participants had to work on their own to summarize the vocabulary they have learned from the lesson and unit. The first activity was implemented in class, in groups and participants were given feedback on their answers from their peer students and from the instructor. The second activity was given as home assignment where participants answered individually on their own and they were given feedback by the instructor only.

The researcher taught the experimental group using mind mapping online, and other instructors taught the controlled group using traditional vocabulary teaching techniques. The researcher avoided teaching the controlled group to maintain independence and objectivity. Participants were taught online via Zoom for ten weeks. Both groups took the post-test online with strict invigilation as all participants took the test on their laptops and showed their test screens through mobile phones during the time of the test to make sure there was no cheating or any sort of manipulation.

4. FINDINGS AND DISCUSSION

The SPSS program was used to calculate the paired t test and independent t test to address the question of the study. The paired t test was computed to compare the results of the pre-test and the post-test in the experimental group and the controlled as well, whereas, the independent t test was computed to compare the results of the post-test in the controlled and experimental groups.

Figure 4: A Comparison between the Experimental and Controlled Groups in Both Tests Mean Scores



Note. "CONT" refers to the controlled group and "EXP" refers to the experimental group.

Figure 4 reveals the difference in the participants' mean scores between the pre-test and the post-test in both groups, the controlled and experimental. The Pre-test mean scores are shown in the green colour while the post-test mean scores are shown in blue. The controlled group's mean scores are 20.66 for the pre-test and 27.56 for the post-test. The experimental group's mean scores are 19.67 for the pre-test and 28.61 for the post-test.

The following tables (1 – 6) demonstrate the descriptive and inferential data of the results of the paired t test in the experimental group and the controlled group. They also show the results of the independent t test to find the significance value. All test calculations were implemented by the SPSS program for accuracy purposes.

Table 1: Controlled Group Paired Samples Statistics

Tests	Mean	N	Std. Deviation	Std. Error Mean
Pre-test	20.66	41	8.22	1.28386
Post-test	27.56	41	4.73	0.73836

Table 1 illustrates that the pre-test mean score in the controlled group was (M= 20.66, SD= 8.22) and that of the post-test was (M=27.56, SD= 4.73). The number of participants who took part in the pre-test and the post-test was (N =41).

Table 2: Controlled Group Paired Sample Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-test	-6.902	9.33	1.45787	-9.8489	-3.956	-4.74	40	0
post-test								

Note. "t" refers to the t value and "df" refers to the degrees of freedom.

Table 2 demonstrates the results of conducting inferential statistics on the data which show the difference in the mean scores between the pre-test and post-test results in the controlled group. The difference in the mean scores between the pre-test and the post-test was (M= -6.9, SD=9.3). The t value was (t= -4.74) and the degrees of freedom were (df=40). Table 2 illustrates that there is a significant difference between the mean scores of the pre-test and the post-test at (P ≤ 0.05). The value suggests that the traditional technique is effective in teaching and learning the English-for-engineering vocabulary.

Table 3: Experimental Group Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pre-test	19.67	33	9.46	1.65
Post-test	28.61	33	4.64	0.81

Note. "N" refers to the number of participants who participated in the pre-test and the post-test

Table 3 reveals that the number of participants who took part in the pre-test and the post-test was 33 which means that it was identical. The pre-test mean score was (M = 19.7, SD = 9.5) and the post-test mean score was (M =28.61, SD = 4.64).

Table 4: Experimental Group Paired Samples Test

Exp group	Paired Sample Test					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-post	-8.94	10.34	1.79959	-12.61	-5.27	-4.97	32	0

Table 4 illustrates the calculations conducted to reveal the difference in the mean scores between the pre-test and the post-test results which was (M = -8.94, SD =10.34). The t value was (t = -4.97) and the degrees of freedom were (df =32). A significant difference was found in the mean scores between the pre-test and post-test results at (P ≤ 0.05). The results indicate that mind mapping is an effective teaching and learning strategy for ESP vocabulary.

Table 5: Experimental and Controlled Groups Statistics

Post-test	N	Mean	Std. Deviation	Std. Error Mean
Exp	33	28.61	4.64	0.80709
Cont.	41	27.56	4.73	0.73836

Table 5 shows the number of participants who took part in the controlled (N= 41) and the experimental (N= 33) groups collectively was (N= 74). The mean score of the post-test in the experimental group was (M= 28.61, SD= 4.46) while the mean score in the controlled group was (M=27.56, SD=4.73).

Table 6: Independent Samples Test Results

	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	0	0.987	0.953	73	0.34	1.05	1.096	-1.14	3.23
Equal variances not assumed			0.955	69.2	0.34	1.05	1.094	-1.13	3.23

Note. "Sig" refers to the significance.

Table 6 illustrates that an independent t test was conducted to compare the results of the post-test in both the controlled and the experimental groups; MD = 1.05, t (73) = 0.95, P = 0.34. No significant difference was found in the mean scores of the post-test in the experimental and controlled groups at (P ≤ 0.05). Based on that, it can be deduced that both methods of teaching and learning the ESP vocabulary have comparable effects when it comes to improving the participants' vocabulary learning skills.

On conducting a paired t test and an independent t

test, it was found that there was a statistically significant difference in the mean scores of the participants' marks between the pre-test and the post-test in the experimental group. That basically means that the primary goal of using mind maps to learn ESP vocabulary was achieved and that it was an effective technique in learning ESP vocabulary. As for the independent t test, it was found that there is no statistically significant difference in the mean scores of the post-test results in both the experimental and controlled groups which means that the mind mapping technique was not better than the traditional method in terms of the effect as the mean scores of the participants' marks were almost the same. However, the experiment was implemented during the Covid 19 lockdown of the city with all academic institutions' complete shutdown, participants were not familiarized with online platforms of learning or vocabulary learning strategies such as mind maps.

They were overwhelmed with various tasks such as meeting deadlines and submitting other courses' projects and assignments. Finally, many students reported a sense of frustration and distress, having to working under such severe conditions. Given the circumstances during the time of the experiment, the results of the post-test of the experimental group would have been significant if more time was given, classes were face-to-face, participants were not overloaded with other courses projects and assignments, and participants worked in a stress-free environment. For these reasons, a replication of the study while taking into consideration the aforementioned conditions may yield more encouraging results for mind maps in the process of learning ESP vocabulary.

The findings of this study confirm some of the findings of previous studies (Buran and Filyukov, 2015; Othman, 2018; Jiang, 2020; Stepankova, 2021; and Stokhof et al., 2020) in terms of the effectiveness of mind mapping strategy in learning English. The findings revealed that the mind mapping strategy may considerably help college ESP learners to learn technical and semi-technical vocabulary via visual representations.

This study would benefit ESP teachers raising their awareness of students' individual differences,

encouraging them to reconsider their teaching methods and approaches in ESP vocabulary instruction, and assisting them in overcoming the challenges that their students face. It might also motivate scientific interest of EFL and ESP teachers to adopt the mind mapping techniques in the post Covid-19 blended teaching and online classes. The study captures the decision makers' attention to integrate the most updated methods in the curriculum to provide the best quality of teaching generally and of language education especially. It is hoped that this study will inspire supervisors to hold training sessions for their teachers on how to utilize mind mapping to teach various areas of English, as well as to prompt researchers to conduct further research on the impact of mind mapping in other disciplines. Overall, mind mapping captures the attention of students and makes learning enjoyable and simple if applied appropriately in classroom. It also generates a pleasant, cheerful, and stimulating environment.

5. CONCLUSION

This study aimed at measuring the effectiveness of mind mapping strategy on learning ESP vocabulary. The findings revealed that mind mapping is an effective technique in learning ESP vocabulary and has almost the same effect of the traditional way of learning ESP vocabulary. However, given more time and better learning environment, it would have yielded better results than the traditional way of learning ESP vocabulary.

This study contributes to the extant literature since it examines the impact of the use of mind mapping strategy on learning ESP vocabulary in particular. The thorough review of the literature revealed that previous related studies examined the effect of mind mapping on learning general English vocabulary. The originality of this study lies in its application of mind mapping on ESP college-level learners, opening up new realms of knowledge and inquiry. Additionally, this study experimented the effect of mind mapping via online learning due to COVID-19 pandemic learning environment. Moreover, participants in the study were allowed to use all types of manual and electronic mind maps such as PowerPoint presentations maps and mind mapping websites which was not permitted in other studies. In previous studies,

participants were only allowed to draw mind maps manually or electronically.

In light of the findings of this study, it is recommended that research should be directed towards investigating the effect of digital mind maps on improving speaking, reading and listening skills in the context of ESP and higher education generally. Scholars are encouraged to study knowledge-based ESP courses to explore the effect of concept maps in comprehending any difficult topics in different ESP fields. They are advised to investigate the effect of mind maps and concept maps in learning grammar for ESP students and language functions.

Another potential direction of research is to explore different types of digital mind maps mobile applications and their effect on boosting students' productivity in writing different ESP texts such as reports and emails. Research on vocabulary studies should be carried out in terms of the most effective strategies to teach and to learn ESP. Scholars may do research on the most frequent spoken and written words used in specific disciplines such as Medicine, Engineering, Business and other domains using specific corpus linguistics or design a corpus for this type of research. They may develop a program to help learners become more autonomous in learning vocabulary.

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