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Investigating the Effectiveness of Mind Mapping Technique in Enhancing Technical Vocabulary Learning and Retention

The Case of Mater 1 Students of Construction in The Department of Architecture at Mohamed Khider University of Biskra

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Declaration

I, **ABABSA Wahiba**, do hereby declare that this submitted work is my original work and has not previously been submitted for any institution or university for a degree. I also declare that a list of references is provided forward indicating all the sources of the cited and quoted information. This work was certified and completed at Mohamed khider University of Biskra.

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Abstract

Across various fields and disciplines, mastering technical vocabulary is increasingly essential for achieving proficiency in technical English language. For teachers, a strong foundation of technical terms can facilitate clearer instruction, while for learners, it may significantly enhance lessons comprehension. Despite that, most Algerian University learners often struggle with acquiring and retaining technical vocabulary, primarily due to the traditional teaching techniques. Therefore, the present study aimed to assess the effectiveness of implementing mind mapping technique to improve the learning and retention of technical vocabulary, particularly among Master 1 Construction students at the Department of Architecture, University of Mohamed khider Biskra. To achieve this aim, a mixed-method approach that includes a survey design accompanied by quasi-experimental design was selected. Pre and posttests were conducted for both the experimental group (n=15) and control group (n=15). Additionally, and through a semi-structured questionnaire, feedback was gathered from the participants within the same experimental group (n=15), who received mind mapping-based instruction. Since the total number of teachers was limited to two, only one teacher (n=1) provided insights through semi-structured interview. The results, as predicted, affirmed the effectiveness of the recommended approach, as supported by statistical analysis. Remarkably, the posttest scores of the experimental group exceeded those of the control group with a difference value of (3,30) in means. Moreover, a variation in the means was evident, with the experimental group demonstrating a difference of (4.88) between the pretest and posttest means, whereas the control group showed only a (1.33) difference. The result of the significance value was less than the alpha (.001<0.05), which is strong evidence to reject the null hypothesis and to confirm the alternative hypothesis. Besides, both teachers and learners reflect positive attitudes towards mind mapping. This can indicate the practicality of mind mapping technique in improving students' technical vocabulary learning and retention.

Dedication

I dedicate this work to:

My beloved parents, who have been my source of inspiration and gave me strength when I thought of giving up, who continuously provide their spiritual and emotional support.

My brothers, sisters, and friends who shared their words of advice and encouragement to finish this work.

My cherished little ones of my family, the bright stars who fill my life with love and laughter, Hibat Errahmane, Asma, Rimah, and Rihab.

And to everyone who helped me along the way with assistance, guidance, and encouragement.

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List of Abbreviations and Acronyms

EFL: English as a Foreign Language

STE: Simplified Technical English

ESP: English for Specific Purposes

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General Introduction

Introduction

Language proficiency in any context involves more than just mastering everyday language. It includes diverse linguistic skills and abilities, extending from basic communication to specialized language. Within this broad scope, English technical vocabulary becomes a crucial element in meeting the requirements of learners in various disciplines and professions. Moreover, technical vocabulary learning and retention is fundamental for English as a Foreign Language (EFL) learners, in which it may help students comprehend field-related vocabulary, grasp their lessons easily, and express their ideas effectively.

Most Algerian university learners may face challenges in memorizing and retaining the specialized terminology. They are unable to acquire and store new words easily as well as they have a difficulty in recalling essential terms relevant to their discipline, during conversations or exams. Due to the vast number of technical words to learn in the language, students often feel discouraged, lacking motivation, and unenthusiastic about learning. Furthermore, many teachers still use outdated teaching approaches, such as word repetition, and vocabulary lists, which could not be effective for promoting retention for long period of time. As a result, students may become uninterested, passive and unengaged. Hence, teachers must adopt new teaching strategies that can allow (EFL) learners to expand their specialized terms and foster retrieving. One of these strategies is mind mapping.

Mind mapping technique is a useful visual tool of organizing ideas, starting from a central concept and branching out into related thoughts. It helps in brainstorming, problem-solving, and note-taking by visually representing connections between concepts. This strategy aids teachers make learning more appealing, especially for learners who learn better through visuals, by involving attractive colors, shapes, and pictures into mind maps. Also, mind maps may save time by presenting all necessary information directly. Additionally, they can facilitate

technical vocabulary acquisition, enhance understanding, develop creativity, and enhance memory retention through mixing words and images.

In essence, the increasing emphasis on technical English within Algerian universities, has highlighted the necessity of mastering technical vocabulary. In this regard, mind mapping technique can be recognized as an effective tool for teachers and students to improve the teaching and learning process.

1. Statement of the Problem

Latest studies highlight the necessity of new instructional methods designed for efficiently teaching technical language and specialized vocabulary, particularly for (EFL) learners. This necessity stems from the importance of technical vocabulary proficiency in specific domains, where precise terminology is crucial for boosting students' comprehension of subject-specific materials and fostering effective communication within technical fields.

Algerian Universities are increasingly realizing the significance of integrating technical English instruction across diverse disciplines, including medicine, computer science, economics, and architecture. The University of at Mohamed Khider Biskra is no exception to this shift, particularly among Master 1 students of Construction at the Department of Architecture. These learners demand a strong foundation of technical terms for successfully understand their lessons, assignments, and exams. Additionally, they need this knowledge for effectively reading and comprehending articles, academic journals, and research papers, as well as for writing reports and thesis related to their given speciality. Furthermore, mastery of technical vocabulary is essential for facilitating clear communication in the field and raising the chances for better career opportunities.

Teaching techniques may have a significant impact in technical vocabulary instruction, particularly in students' learning and retention. However, many teachers tend to use teaching

strategies that are not effective for promoting retention for long period of time, in which students may found boring and uninspiring throughout the lessons. Besides, learners may struggle with the challenging task of mastering a sheer volume of technical terms essential for their field of study. This vast vocabulary often involves complex and specialized terminology particular to their distinct domains. As a result, students are required to spend considerable time and effort for acquisition, memorization, and recall. Thus, to overcome this difficulty, teachers are advised to change from traditional teaching methods to more innovative approaches such as visual organizers.

Visual organizers are tools used to visually represent information and ideas in a structured manner that could simplify technical vocabulary learning and recall. Mind mapping can be among the best approaches in this regard. It involves creating diagrams with a central topic branching out to related concepts in order to facilitate brainstorming, planning, and organizing thoughts in a creative manner. It enhances engagement and understanding of complex information by presenting it in an attractive and visually appealing style involving shapes, colors, and pictures. Consequently, mind maps can have the potential to help learners in effectively learning, comprehending, and retaining technical terms. Therefore, this study recommended the use of mind mapping teaching technique for enhancing technical vocabulary learning and retention.

2. Significance of the Study

This study can offer an opportunity for enhancing technical vocabulary learning and retention through the mind mapping teaching technique. Integrating this approach into instruction may facilitate the task for teachers, making acquisition, comprehension, and retention of technical terms easier, as well as enhancing visual appeal, interest, and motivation, by making lessons more engaging for students. Furthermore, incorporating mind mapping

activities into lesson plans can promote autonomous learning, allowing learners to enhance their proficiency in using field-related terminology correctly within context. Indeed, this research can offer essential insights for educators, researchers, and students, as well as function as a guide for further and similar studies regarding innovative teaching methods.

3. Research Questions

- To what extent does using mind mapping as a teaching technique affect the learner's technical vocabulary learning and retention?
- What are the learners' and teachers' views and attitudes about the use of mind mapping technique for enhancing learners' technical vocabulary learning and retention?

4. Research Hypothesis

- We hypothesize that the use of mind mapping technique may improve learners' vocabulary learning and retention.
- We hypothesize that learners and teachers will show positive views and attitudes about the use of mind mapping technique for enhancing learners' technical vocabulary learning and retention.

5. Research Aims

- To assess the effectiveness of mind mapping technique in improving learners' technical vocabulary learning and retention.
- To draw the attention of teachers regarding the significance of implementing mind mapping technique in teaching technical vocabulary for better learning and retention.

6. Research Methodology

To align with the research questions and objectives, a mixed- method approach was adopted. Initially, a quasi-experimental design was employed to assess the effectiveness of mind mapping techniques in improving technical vocabulary learning and retention. This included conducting pretests for both experimental and control groups, delivering mind

mapping-based instruction to the experimental group, and directing posttests to compare improvements between the groups. Furthermore, the study gathered feedback from learners through questionnaires and from teachers via interviews to gain a comprehensive understanding of the utility of mind mapping in technical vocabulary instruction.

7. Sample and Population

The research sample consisted of 30 participants of Master 1, specializing in the Construction Branch, within the Department of Architecture at the University of Biskra. They were selected randomly from a total class population of 42 students. These participants were divided to 15 students comprised the experimental group and another 15 formed the control group. Furthermore, the learners from the experimental group were required to respond to the questionnaire. In addition, due to the limited number of teachers in the department, the interview was conducted with only one teacher, as there are two teachers available.

8. Data Gathering Tools

- Pretest and posttest for students

- Questionnaire for learners

- Interview for teachers

Chapter One: Technical Vocabulary Learning and Retention

CHAPTER ONE: TECHNICAL VOCABULARY LEARNING AND RETENTION

Introduction

Technical English proficiency is one of the most important issues at both the academic and business levels. This chapter provides a general overview about technical English, and how it emerged through time. Furthermore, it defines the term of technical vocabulary, its importance, and underlines the main difficulties students face in learning vocabulary. Finally, this chapter ends by discussing the key factors influencing vocabulary memorization and retention, as well as suggesting effective techniques for enhancing these abilities.

1. General Overview About Technical English

1.1 Definition of Technical Language

Mastering technical language is essential for both professionals in different domains, as well as for learners throughout various disciplines. According to Naumovych (2024), technical language is the specialized vocabulary used within particular sectors, occupations, or disciplines. It also refers to as the field-specific language or jargon. It ensures correctness and precision in communication, in addition to facilitating hard words and terminologies, so that specialists in that field can understand them. For instance, a 'heart attack' is known in medical terminology as a 'myocardial infarction'; however, for a larger audience, common language may utilize the simpler word 'heart attack'.

As mentioned by Rimbey et al. (2023), technical language refers to the subject-specific words and phrases used in a particular area of study or job. It includes the terms and jargon that people in that field use and comprehend. This language is precise and clear in meaning, in which each word has a specific and distinct definition. Therefore, working and communicating in that field could help individuals to develop their understanding of these words and phrases.

Additionally, Milcu (2012) further explained the term technical language as the specialized vocabulary and terms learners need to understand their field of study and communicate effectively. furthermore, she emphasized the significance of learning technical

language in students' education. It allows them to acquire the technical language related to their study, and develop their skills and abilities needed in their profession, leading to better career opportunities (Milcu, 2012). Accordingly, when technical language is not implemented appropriately, it might cause difficulties in communicating efficiently in the same domain.

1.2 History of Technical English

As reported by Anastasia (2022), The history of technical English, specifically Simplified Technical English (STE) started in the late 1970 when the civil aircraft industry faced problems with complicated, and unclear documents. European Airlines requested for help from the European Association of Aerospace Industries to verify the readability of these documents. The American Aerospace Industries found that the documents required simplification. As a result, the Simplified Technical English was created in 1983.

Simplified technical English, as asserted by Anastasia (2022), aims to facilitate the comprehension of technical documentations for individuals with specific English principles. It uses a limited vocabulary and precise rules, it focuses on the usage of necessary information and related terms to avoid ambiguity and confusion, and keeping sentences brief to facilitate understanding. In conclusion, the need for clear communication and better comprehension of technical concepts leads to the emergence and the developments of technical English.

1.3 Definition of Technical English

Mastering technical English can be regarded as the most essential factor for clear and effective communication within different specialized fields. As stated by Naumovych (2024), technical English is defined as an English form primarily used in scientific and technical domains, where being exact and accurate is essential. Moreover, Ahmadzada (2020) added that technical English, in general, refers to the type of English that concerned with specialized topics within a specific field or profession. For example, engineers might need to be able to

precise directions or describe a procedure. However, scientist might need to utilize scientific terminology.

As explained by Mohamed and Alani (2022), Technical English is demonstrated when "Learners study the English that is related to their major or field in which they are involved in work or education" (p.28). In other words, technical English refers to the study of the English language that is directly relevant to students' specialty or profession in which they are involved in. In short, Technical English may play a key role in acquiring specialized languages. It may help learners improve specific field knowledge, language skills, and communication abilities.

1.4 Technical English Versus General English

Technical English and general English are two different forms of the English language, both have specific characteristics and particular purposes. Anthony (1997) mentioned that differentiation between general English and technical English is unclear, although there is a distinction in their focus on language objectives and teaching strategies. In this regard, Hutchinson et al. (1987), claimed that "in theory nothing, in practice a great deal"(p.53). In simpler terms, while technical English might seem similar to general English in theory, it can be significantly different when used in real situations.

Similarly, Mallikarjun et al. (2012) further explained the difference between the two forms of language pointing out that general English is for everyday communication with a large vocabulary and standard grammar for a broad audience. On the other hand, technical English is specialized for fields such as engineering, business, and medicine, using precise vocabulary and simplified grammar in order to exchange technical information clearly. Besides, general English is useful in many different situations, whereas technical English is designed for targeted audience in specific fields (Mallikarjun et al,.2012). In summary, technical English is quite different from general English, particularly in practical usage.

1.5 Technical Vocabulary

1.5.1 Definition of Technical Vocabulary

Technical Vocabulary refers to words and expressions used and understood in particular fields, professions, or academic disciplines. As stated by Liu and Lei (2019), "Technical vocabulary seems to be a straightforward term referring to lexical items used with specialized meanings in a subject known mainly to a particular community of users'' (p.111). In other words, Technical vocabulary is a set of words with specific meanings in a particular field, understood mostly by those in that area.

As stated by Ragini (2005), Technical vocabulary is described as "The specialized vocabulary of any field which evolves due to the need for experts in a field to communicate with clarity, precision, relevance and brevity'' (p.3). In essence, technical vocabulary seeks to facilitate interaction among professionals. Chung and nation (2003) also added that, "technical vocabulary is largely of interest and use to people working in a specialised field'' (p.104). That is to say, technical vocabulary is more useful and important for individuals who work in specified domain.

In summary, individuals use technical vocabulary in order to meet their needs and interests in work and other specialties. This specialized language may help them to develop a specific knowledge in the field, share ideas and information clearly, accurately, and concisely, and improve career opportunities.

1.5.2 Importance of Technical Vocabulary

Technical Vocabulary proficiency is regarded as one of the essential elements required for language mastery and effective communication. As indicated by Woodward (2008), students cannot learn specialized language unless they can understand technical terms. She declared that "learning specialist knowledge in pre-service teacher education involves adopting

technical terms as well as coming to terms with the abstract dimension of the discourse'' (p. 234). In other words, Teachers' training requires learning technical words and phrases.

In addition, stressing the necessity of mastering technical vocabulary and field-specific knowledge. Knoch (2014) confirmed that proficiency in technical terminology is crucial for effective communication in the workplace. Similarly, Nation (2001), further emphasized the significance of specialized vocabulary, in which he declared that "It is wise to direct vocabulary learning to more specialized areas when learners have mastered the 2000-3000 words of general usefulness in English'' (p.187). He affirmed the need for focusing on technical vocabulary learning after mastering general English words.

In the same context, Lie and Leu (2019) also confirmed this assertion, in which they noted that fast advancements in different fields and technology leads to the emergence of new technical terms. Therefore, both experts and students need to keep learning these terms to stay current and be skilled in their fields. This constant learning helps them communicate effectively and understand the latest changes and innovations in their areas.

Concerning reading technical texts and content, Grabe (1988) indicated that "reading is a dialogue between the reader and the text" (56). This means that reading is an essential skill in foreign language learning. It is not a passive activity, but an active exchange between the reader and the text. Similarly, Anthony et al. (1997) stated that "The mayor quantity of information that a person receives is through reading, which is useful to improve the vocabulary and the rhetoric forms used in people's profession. Nowadays, reading has been the base of the curricula of ESP" (p.5). In essence, reading in specialty materials such, textbooks, academic journals, technical reports is substantial for acquiring domain knowledge and follow development in the discipline.

Equally important, writing in technical contexts is a crucial skill that is required for professionals and specialists in different fields. In this regard, Solés et al. (2007) pointed out

that writing is a major aspect of daily work in many professions. People in a company write to ask questions through inquiry letters, exchange information about projects with progress reports, help managers in making decisions based on recommendation reports, communicate within the company using memos, and maintain contact with colleagues and others via emails. Solés et al. (2007) added that these activities indicate the importance of writing for many technical workers. It helps specialists, and researchers to communicate effectively both within and across their disciplines. Besides, technical writing skills may make documents clear and easy to understand, which reduces time spent interpreting unclear reports.

Additionally, it is generally recognized that listening is a fundamental aspect of effective communication that needs more than hearing words. This was supported by Guo and Wills (2006), who stated, "it is the medium through which people gain a large proportion of their education, their information, their understanding of the world and human affairs, their ideals, sense of values" (p. 3). In the same vein, highlighting the importance of listening in language learning, Peterson (2001) declared, "no other type of language input is easy to process as spoken language, received through listening … through listening, learners can build an awareness of the interworkings of language systems at various levels and thus establish a base for more fluent productive skills" (p. 87). In simpler words, listening to technical materials could be a fundamental skill that learners should master.

Maslova (2017) further described the importance of listening in technical language context as the most frequently used receptive skill in both daily life and work. She pointed out that listening is the most simple and effective way for learners to acquire new languages based on different specialties, needs, and purposes. In short, listening skill can be a key aspect in the process of learning foreign languages in general and technical languages in particular.

Moreover, speaking is an important component of field-specific language proficiency. It helps learners to communicate ideas and thoughts clearly and confidently. As reported by

Ramadhani (2017), who claimed that enhancing speaking skill may allow for successful communication in specific, specialized contexts. This involves focusing on clear pronunciation, correct grammar, and on the understanding of specialized vocabulary and phrases used in these contexts. Similarly, Richards (2008) asserted that many second language or foreign language learners prioritize English speaking proficiency and evaluate their progress based on improved spoken language skills.

In the same way, Sterba' (2014), findings indicated that speaking proficiency helps students gain practical skills for their field of study, boosting self-confidence, and enhancing career opportunities with language expertise. It expands subject-specific vocabulary and reduces speaking anxiety. Consequently, technical vocabulary is a key factor for English language learners because they need sufficient technical terms to represent ideas and enhance their abilities in reading, writing, listening, and speaking.

1.5.3 Vocabulary Learning Difficulties

Learning vocabulary is a significant element for achieving EFL proficiency. It is acknowledged as the foundation for developing language skills and abilities. Emphasizing the important role of vocabulary learning, Wilkins (1972) stated, "Without grammar very little can be conveyed, without vocabulary nothing can be conveyed'' (p.111). That is to say, vocabulary is the foundation of language. This assertion is also confirmed by Hatch and Brown (1995), who mentioned that building languages is based on vocabulary, which also crucial for facilitating communication" (P.1). In other words, vocabulary can be considered as the building block of language proficiency. Besides, Thornbury (2002) further identified and examined the main causes that make vocabulary learning difficult including pronunciation, spelling, grammar, and meaning. He explained them as follows:

15.3.1 Pronunciation

According to Thornbury' (2002) studies, words with sounds that are hard for learners to pronounce are harder to learn. Words that may be hard to pronounce usually have sounds that certain learner groups are not familiar with words like strength, crisps, and breakfast are examples of words that many learners find challenging due to their consonant clusters.

1.5.3.2 Spelling

As stated by (Thornbury, 2002) Mismatches between the sounds in a word's spelling and pronunciation are likely to be the source of errors and can make a term more complex. There are several noticeable irregularities in English spelling, even though most spelling follows the rules. Particularly difficult are words such as foreign, listen, headache, climbing, bored, honest, cupboard, muscle, etc.

1.5.3.3 Grammar

It is known that many L2 learners find grammatical structures to be a source of confusion. In that vein, Thurnbury (2002) confirmed that if the word's syntax differs from that of its native language it may also be misleading. Spanish learners of English, frequently wrongly believe that 'explain' has the same structure as both 'tell' in English and 'explicar' in Spanish. This leads to phrases like 'be explained me the lesson'. Thurnbury (2002) also added that it can be more difficult for them to remember whether verbs like 'enjoy', 'love', or 'hope' are followed by an infinitive (to swim) or a -ing form (swimming). Particularly difficult are phrasal verbs; some can be separated 'she looked the word up', while others are not such as 'she looked after the children'.

1.5.3.4 Meaning

Understanding the meaning of words is essential in language learning. It may improve learners' language skills and reduce communication challenges. Thurnbury (2002) declared, "when two words overlap in meaning, learners are likely to confuse them'' (p.28). In particular,

words like "since" and "still," which have several meanings, can also be difficult for students to understand. Thus, when a word is learned, accepting a second or different meaning can be difficult. Another factor that can impede word acquisition is unfamiliar concepts. For this reason, most learners will find it difficult to learn and seem extremely unclear when it comes to culture-specific vocabulary like cricket-related terms; a sticky wicket, a hat trick, a solid innings.

1.6 Vocabulary Learning, Memorization, and Retention

1.6.1 Definition of Vocabulary Learning

Mastering vocabulary plays a crucial role for those learning English as a foreign language or as a second language. According to Tozcu and Coady (2004), vocabulary learning is a significant component of both second language and foreign language learning, playing a key role in academic success, reading comprehension, and overall language proficiency.

As outlined by Grauberg (1997), vocabulary learning includes four main stages:

a) **Discrimination**: it is the initial stage. It requires the capacity to differentiate sounds and letters accurately for effective language use.

b) **Understanding the meaning**: it involves comprehending the idea presented by the foreign term or expression, which may be facilitated by connection or the presence of a similar term in English.

c) **Remembering:** it is the next phase after the introduction and explanation of new items. It contains assuring retention. When the learners understand the meaning of the term, they may no longer feel the need to focus on it, as a result, they can forget it.

d) **Consolidation and extension of meaning**: the process of word absorption occurs gradually, with full integration into the learner's personal vocabulary items.

1.6.2 Definition of Memorization

Memory is one of the most important subjects in education. It plays a key role in building the cognitive skills and abilities. Both teachers and researchers consistently involved in understanding the complexities of memory and its influence on students' retention. Maming et al. (2023), defined memorizing as the capacity to transfer reading content or objects into memory, store them there, and then retrieve them back to the subject in memory. The right brain, left brain, and midbrain are the three areas that make up the human brain, however, the left brain is the responsible for memorization. Maming et al. (2023) added further that memorization is the process of entering information into the brain for later application.

In addition, memorization is described as: the process of repeating or saying a list or a text without forgetting any word. For instance, poems, texts, word lists, multiplication tables, etc. are memorized (Le Grand Dictionnaire Terminologique, 2020). Moreover, Thuot et al. (1994, as cited in Güneş, 2020), added that, "The process and operation of memorization is based on the logical organization of information in the mind, establishment of relationships between prior knowledge in memory and new information, and frequently reactivation of the memorized contexts" (p.410). In simpler words, memorization involves arranging data, connecting previous, and new knowledge, and recalling information.

According to Merriam-Webster, memorization is the act or process of memorizing something, commitment of something to memory. In the light of this, Cambridge dictionary described memorization as: the act or process of learning something so that you will remember it exactly. In summary, and according to these statements, memorization is a mental process that involves storing information to memory for later recall.

1.6.3 Definition of Retention

Retention becomes a crucial factor in the process of learning English as a second or foreign language. It includes not just remembering vocabulary and grammar but also

memorizing cultural and contextual knowledge of the language. Stressing the significance of memorization and retention, Thornbury (2002) stated, "the learner needs not only to learn a lot of words, but to remember them. In fact, learning is remembering'' (p.23). This idea asserted that learning new words and information is important, as well as the ability to remember them. It claimed that learning's purpose is not only to acquire information, but also to retain and recall it efficiently.

In addition, Merriam Webster Dictionary defined retention as: (b) an ability to retain things in mind specifically and a preservation of the aftereffects of experience and learning that makes recall or recognition possible. In other words, retention ability is primarily depending on practice, as it strengthens memory and facilitates recall or recognition of information when needed.

In the same context, Haycraft (1978, as cited in Khabiri & Pakzad, 2012) added that words that are connected to each other can be remembered more easily because their meanings are used together with the entire meaning of the sentences they are part of. Additionally, words that have a connection to one another are easier to recall, as a result, the meaning of words deeply stimulates the mind and leads to better memory retention.

From the point of view of Radvanski et al. (2022),"The clearest finding in research on memory is that as more time passes from when information was first learned, the less likely it is that it will be remembered" (p.1699). That is to say, memories weaken with time, making it harder to recall information, particularly the information learned during the first learning stage. In short, retention is a principal component for memorizing vocabulary items, grammatical rules, and ultimately mastering English as a foreign language.

1.6.4 Factors Affecting Memory Retention

Research studies, such as of Amin and Malik (2014), Thornbury (2002), and Dotson (2016), highlighted the importance of memory retention in different areas, specifically in

language learning. They showed that memory retention directly impacts students' cognitive skills and their abilities for mastering English as a Foreign language. Moreover, as believed by those researchers, it is crucial to recognize that there are several factors that may affect memory retention, including attention, motivation, goal setting and accomplishment, learning styles, and teaching strategies.

1.6.4.1 Attention

As reported by Dotson (2016), it is important to select and give importance to the encoding and retention of information process, because of the finite capacity of human memory. Attention can be a key factor that aids in selectively encoding items into memory. For example, Students that are interested in engineering, might demonstrate a strong desire in learning field-related terms. Their interest encourages them to explore deeper into vocabulary learning, which improves their memory and comprehension of engineering concepts.

1.6.4.2 Motivation

According to Thornbury (2002), memorization of new vocabulary is not based only on the desire to learn them. Students who are highly motivated tend to spend more time practicing and rehearsing which ultimately improves their memory. For educators, comprehending the reasons behind their students' motivation and involvement in the classroom activities is crucial; as students enter the classroom, their motivation boost their readiness for acquiring new information, participation in the learning process, and retention of information.

1.6.4.3 Goal Setting and Accomplishment

Setting goals is an important step before starting any task or activity, particularly in educational context. From the viewpoint of Dotson (2016), it important for students to determine the exact goals they aim to achieve, as goal setting motivates them to easily reach their objectives in learning. Besides, Doran (1981) added that setting goals follow SMART strategy, that means specific, measurable, attainable, realistic, and time bound. Thus, this

strategy may provide the students with clear understanding of their improvement and progress towards their target aims, leading to better remembering of data.

1.6.4.4 Learning Styles

Learning styles are viewed as the preferred learning approaches that facilitate students' acquisition of knowledge. As mentioned by Tie and Umar (2010), learning styles have significant influence on students' interaction and engagement in classroom. The research demonstrated the value of learning styles in acquiring the basic terms and concepts, especially in how students preferred style of learning strengthen their memory retention, cognitive capacities, and critical thinking abilities.

1.6.4.5 Teaching Strategies

The determination of specific approaches that facilitate successful learning and teaching is crucial subject. These particular actions that promote efficient learning are defined as teaching strategies. In this regard, Ayua (2017) stated that, "A teaching strategy is therefore an educational technique, method or plan of classroom actions or interactions intended to accomplish specific teaching/learning goals" (p. 5). In simpler words, teaching techniques may have a significant impact on facilitating students' learning. In the same context, Tie and Umar (2010) study results further indicated that the instructional methods and teaching strategies used in classroom may play a crucial role in students recall. Implementing different teaching methods such as visual aids, pair work, and group discussion, assures that all students have the chance to interact with learning materials in a manner that matches their preferences and learning styles. Therefore, this could increase learners' understanding, retention, and performance.

1.7 Vocabulary Memorization and Retention Techniques

Memorizing a variety of words and expressions may causes an obstacle for language learners, since it requires them to remember not only the meaning of words but also their

pronunciation and function. However, there are various techniques can be implemented in order to facilitate vocabulary acquisition on one hand, and to improve memorization and retention on the other. Such techniques may include mimicry, mnemonics, flashcards, picture dictionaries, and mind maps.

1.7.1 Mimicry

As indicated by Nuha (2016), and Fauziati (2002), Mimicry is a technique that aids students in enhancing their vocabulary acquisition and retention in foreign language learning. The mimicry memorization method, also known as the information -drill approach. It is based on the imitation and retention of vocabulary. This method starts with guidance provided by a native speaker or recordings, then the students will seek to recall a considerable number of relevant vocabulary and expressions. Theses memorized words and sentences can help for further language learning activities.

1.7.2 Mnemonics

The concept 'mnemonic', as reported by Amiryousefi and Ketabi (2011), is derived from the Greek expression Mnemosyne, indicating the act of remembering in connection with Greek Goddess. They emphasized the effectiveness of using this method, "Mnemonic devices are useful ways of enhancing vocabulary learning and recall" (p.181) some research studies on memory indicated the effectiveness of mnemonics as a learning strategy, particularly for memorizing lists of specific words. Cook (1989) study findings shown that mnemonics can help encoding data into memory and simplifying the retrieval of new information by implementing innate memory processes such as forming acronyms or sentences from the first letters of the words, using visual imagery and mantal representations, and creating connections between the information needed to be remembered with others already known.

1.7.3 Flashcards

According to Merriam Webster (2024) flashcard is: "a card bearing words, numbers, or pictures that is briefly displayed (as by a teacher to a class) usually as a learning aid". Similarly, flashcards are described as little cards with pictures, text, or symbols, designed to motivate and activate students' understanding and recall of concepts. (Arsyad, 2002). Moreover, based on the study results of Senzaki et al. (2017), flashcards can play a crucial role in enhancing vocabulary memorization and retention. This strategy motivates learners to exceed definition repetition, encouraging deeper comprehension, and better memorization.

1.7.4 Picture Dictionaries

As stated by Suniyasih et al. (2020), and Wulandari et al. (2021), at various educational levels, from early childhood to higher education, picture dictionaries are essential tool for English language learners. These dictionaries define words meanings through images, including topics such as family and sports. Using picture dictionaries has several benefits, making the learning process both enjoyable and efficient. These materials enhance the learning environment by implementing real-word examples. Indeed, learners can effectively improve their ability to memorize, recall, and retain information, particularly when acquiring foreign language through picture dictionaries.

1.7.5 Mind Maps

Mind mapping, as defined by Bawaneh (2019), is a visual representation combining diagrams and texts. It helps teachers and students in structuring written content for easier recall and retrieval of information. This method centered on creating a orderly and visually appealing chart on a single page, using concise and memorable graphics. Afana and Al-Jaish (2009) further explained the mind mapping process, in which the central idea extends into branches, according to a specific categorizing. Buzan and Buzan (1995) also affirmed that mind maps stimulate both the brain's right and left hemispheres, enhancing the cognitive processing.

Consequently, they enable students to explore new terms and create connections between them in order to facilitate the retention and recall of information for long time.

1.8. Assessing Vocabulary Knowledge

1.8.1 Vocabulary Definition

according to Random House Webster's Unabridged Dictionary, vocabulary is the stock of words used by or known to a particular people or group of persons. In other words, vocabulary is the overall stock of words used by an individual to express ideas in a particular language. In light of this, Nation (1990) added that vocabulary can be classified into three categories: (1) a limited set of high-frequency words, needing a significant focus from both teachers and learners; (2) a vast number of low-frequency words, requiring the proficiency of coping strategies; and (3) specialized vocabulary, relevant to professionals in specific fields.

1.8.2 Vocabulary Testing Reasons

As maintained by Cameron (2002), Testing vocabulary knowledge is crucial for many reasons. It provides educators and administrators with insights into their students' vocabulary proficiency, to identify any acquisition difficulties. Additionally, vocabulary tests can be an effective tool for checking learners' vocabulary improvement. Consequently, these tests may help teachers and educators evaluate continuously students' language progress efficiently.

1.8.3 Types of Vocabulary Testing

As mentioned by Silvia, (2012), and similar to other types of assessments, a vocabulary test includes different types, and each type have a clear purpose and function. First, the achievement test. this test evaluates learners' word acquisition. Second, a diagnostic test that identifies gaps in learners' vocabulary knowledge, Third, a placement test, which is administered to determine suitable class placement. Finally, a proficiency test is conducted to assess overall language proficiency in by evaluating vocabulary skills.

Conclusion

To conclude, this chapter primarily draws attention to the significance of teaching technical English, which cannot be neglected. Technical vocabulary mastery is essential for success in different educational and professional fields. Indeed, most research investigations indicated that EFL learners may enrich their technical terms stock through a variety of successful memorization strategies, and effective retention techniques. However, it is crucial that (EFL) learners first recognize the importance of learning technical vocabulary for better achievement in the academic and occupational world.

Chapter Two

Mind Mapping as a Teaching Technique

CHAPTER TWO: MIND MAPPING AS A TEACHING TECHNIQUE

Introduction

Graphic organizers are regarded as important visual aids in education. They may help learners by organizing thoughts and ideas, facilitating comprehension, and enhancing retention of information. Among them the mind map, which is one of the most useful graphic organizers. This chapter introduces definition of graphic organizers and identifies their types. Moreover, it explains the concept of mind map, its steps, and advantages. Finally, this chapter concludes with the importance of mind maps in improving technical vocabulary learning and retention.

2. General Overview About Graphic Organizers

2.1 Definition of Graphic Organizers

Graphic organizers are visual tools that aid vocabulary learning by organizing information visually, making it easier to understand and remember new terms. They also facilitate teaching by presenting lessons in attractive and appealing manner, through images, colors, and shapes. According to Parker (2006), Graphic organizers:

are visual representations that help us gather and sort information. They help students see patterns and relationships between the given information. With only a few words, concepts are clarified, information and ideas are organized, and complex relationships are shown between the elements. And as an added bonus, graphic organizers help teachers figure out how students think. (p.4)

In other words, graphic organizers, are visual aids that help in organizing and gathering information, allow students identify connections between the terms, and provide teachers with students' thinking methods.

In addition, Lovitt (1994) defined Visual organizers as visualised diagrams that help organizing and emphasizing information and vocabulary. Besides, Hameed and Umer (2023) further described the concept of a graphic organizer as a crucial tool used for teaching, learning,

and presenting information. It simplifies complex ideas by combining words and visuals and identifying relationships between terms and thoughts. In the same context, stressing the important role of visual organizers, Maccini and Gagnon (2008) stated that "words and or phrases are used to connect the content information in a meaningful way to help students gain a clearer understanding of the materials" (p.1). In essence, these tools are key components that assist learners in linking different pieces of information. As a result, this may make comprehension easier.

Moreover, Benjamin and Crow (2010) underlined the usefulness of graphic organizers, in which he mentioned that "Graphic organizers not only help students see relationships and make connections, but also, they serve as memory cues. Best graphic organizers are those that offer enough latitude that everyone's' graphic organizers do not end up looking the same" (pp.56-57). In simpler terms, graphic organizers are not just beneficial in linking concepts, but equally effective in enhancing memory retention and recall of information.

Furthermore, From the point of view of Gallavan & Kottler (2007, as cited in Nicholas, 2008), graphic organizers are essential educational materials that can be implemented to suit the needs of various student from different levels. Teachers play a crucial role in choosing the most suitable methods based on particular aspects such as learners' age, comprehension capacities, the lesson content, and the learning circumstances. Consequently, both teachers and learners would have effective and enjoyable learning experiences avoiding pressure and discouragement. (Gallavan & Kottler, 2007, as cited in Nicholas, 2008). In conclusion, based on these statements, visual organizers are key elements in simplifying teaching and learning process.

2.2 The Importance of Using Graphic Organizers in Vocabulary Learning and Retention

Graphic organizers are recognized as effective aids for enhancing vocabulary learning and recall. They visually introduce new concepts effectively; therefore, comprehension and memory retention improved. As believed by Shoari and Farrokhi (2014), and Zaini et al. (2010), the best learning experience occurs when learning is meaningful, and using graphic organizers is the tool for reaching that. In addition, Barani et al. (2010) claimed that vocabulary, as the basic of communication, can make understanding phenomenon possible. Although words are small units, they are crucial for creating sentences, so the method of teaching them to learners is very important.

Besides, Ellis and Howard (2007) explained that graphic organizers, have three major benefits. Firstly, they aid in boosting students' retention of the topics that the teacher taught and simplifying information to reduce complexity and ambiguity. Secondly, they decrease the cognitive pressure associated with processing of information, thus they may facilitate understanding and learning. Finally, they promote strategic learning by helping students notice essential information and understand the key terms.

Moreover, Chen and Wu (2015) mentioned that graphic organizers, like charts and diagrams, help remember things better by making it easier to store data in the brain, so it can be found in short time when needed. Leahy and Sweller (2016) emphasized that using pictures and words together may develop the cognitive processing; in which, it helps people think better, remember more, and understand easier. This helps to make learning less tiring for the brain. Hence, It is important to choose teaching tools that have both pictures and sounds for the best learning results.

Further, Herrlinger et al. (2017) research findings showed how visual aids affect memory, they found that using pictures helped people remember better, both in the short term and the long term. Additionally, they said that looking at pictures instead of just reading or hearing information enhance information memorization and retention. In the same vein, Knoll et al. (2017) added that combining new knowledge with existing one can be enhanced by using external visuals such as semantic maps. To conclude, using graphic organizers, and visual aids is crucial for improving vocabulary learning, memorization, and retention

2.3 Types of Graphic Organizers

Graphic organizers are visual tools that help organize information in a clear and structured manner. According to Hameed and Umer (2023), Tacaiochta & Leibheal (2008), and Kasim et al. (2021), There are several types of graphic organizers, including: tree chart, sequence chart, vocabulary graphic organizer, idea wheel graphic organizer, tri pie, brain droplets (wisdom pearls), fishbone diagram, word star, and mind map.

2.3.1 Tree Chart

According to Hameed and Umer (2023), the tree chart is a helpful method for categorizing and organizing information, appearing as a real tree. Its structure aids in visually representing the order of topics. The main title or topic must be at the top, bellow that the subtopics expanding in a form of branches. This structure makes it easier to understand the relationships between different pieces of information. Additionally, the tree chart's similarity to a family tree can further help in understanding complex concepts and thoughts.

Figure 2.1: Tree chart
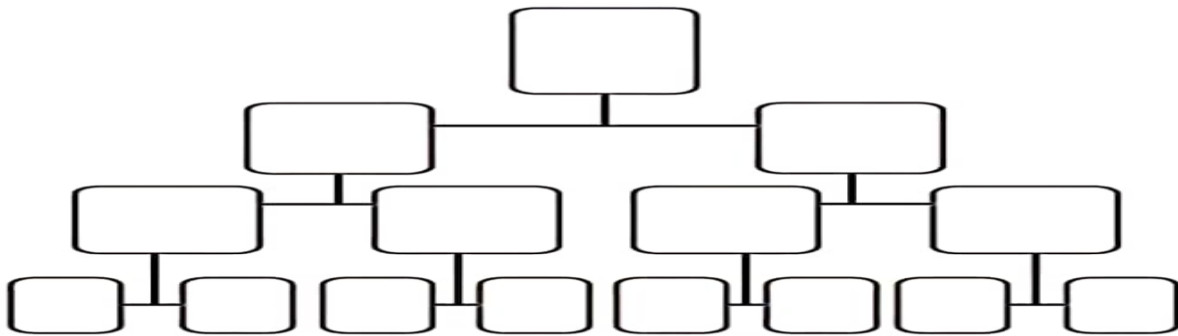
Note: Tree chart, From Storyboard That.com

2.3.2 Sequence Chart

Tacaiochta and Leibheal (2008) defined the sequence chart as a tool used to organize and remember a series of events or steps in order. Also, it is helpful for teaching the factors influencing a particular phenomenon. Teachers may provide disordered information for students to arrange in the correct sequence. Consequently, Students collaborate to reorder unorganized ideas properly, and participate in the learning process by discussing the correct order. When they are doubtful about their work, they may seek help from other groups, or from the teacher, based on the classroom instructional rules.

Figure 2.2: Sequence chart
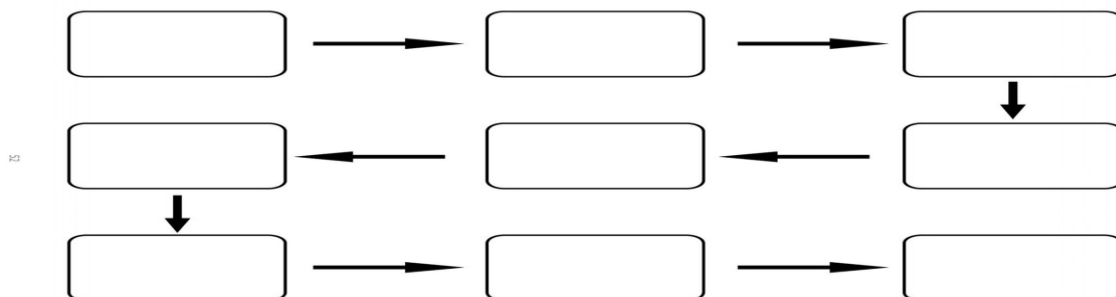
Note: Sequence chart. From *Using graphic organizers in teaching and learning.* (p.14), By Tacaiochta and Leibheal, 2008. Second Level Support Service.

2.3.3 Vocabulary Graphic Organizer

Vocabulary graphic organizers, as mentioned by Hameed and Umer (2023), are used for the sake of evaluating the vocabulary knowledge of learners. It helps teachers with the capability to implement various visual aids, such as pictures, and introducing variety of components including the definition of the word, its synonyms and antonyms, and examples involve that word; to assist students in the acquisition of new vocabulary, as well as in mastering words usage.

Figure 2.3: Vocabulary graphic organizer
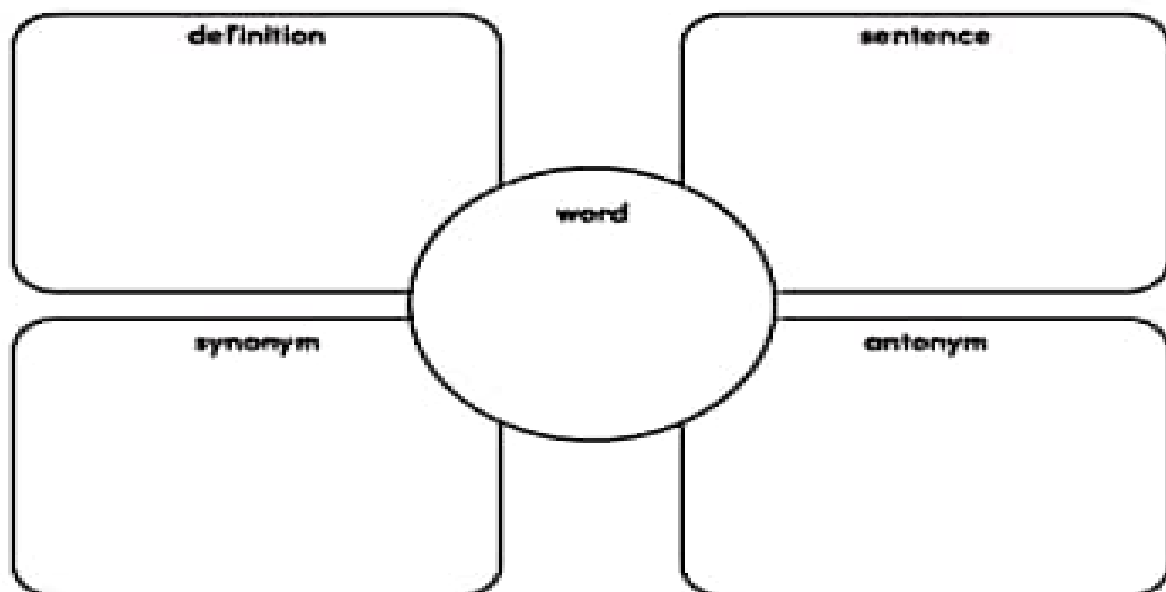
Note: Vocabulary graphic organizer. From TPT.com

2.3.4 Idea Wheel Graphic Organizer

The Idea Wheel Graphic Organizer is a helpful tool used for both brainstorming and organizing thoughts simultaneously. In this visual organizer, the central part of the chart contains the main topic under study. Surrounding this central topic, there can be additional

circles or shapes, including a bigger size circle divided into sections, or interconnected bubbles. (Hameed and Umer, 2023).

Figure 2.4: Idea Wheel graphic organizer
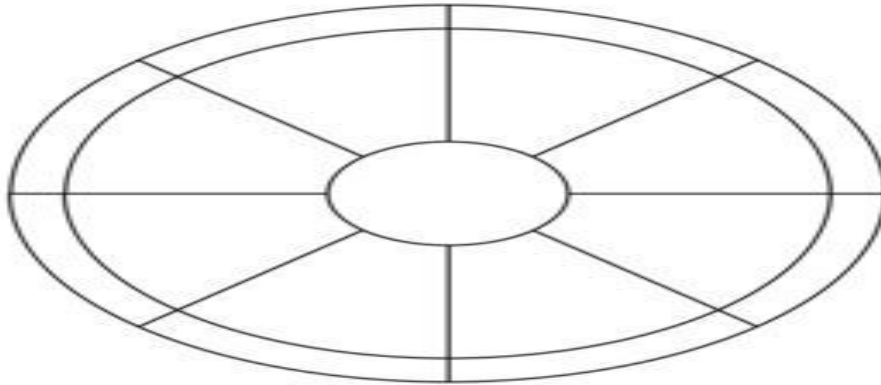
Note: Idea Wheel Graphic Organizer. From TPT.com

2.3.5 Tri Pie.

Tacaiochta and Leibheal (2008) described Tri pie vocabulary organizer as one of most helpful graphic organizers, that utilized for classifying opinions and points of view. Additionally, It plays a key role in helping people think deeply by focusing on different sides of an issue at the same time, which may need a critical thinking. while usually students only emphasize on one side of the subject, Tri pie can aid them consider all possible perspectives. Therefore, implementing this educational instrument, specifically in small groups, could be advantageous practice since it provides several different ideas about the same topic.

Figure 2.5: Tri pie
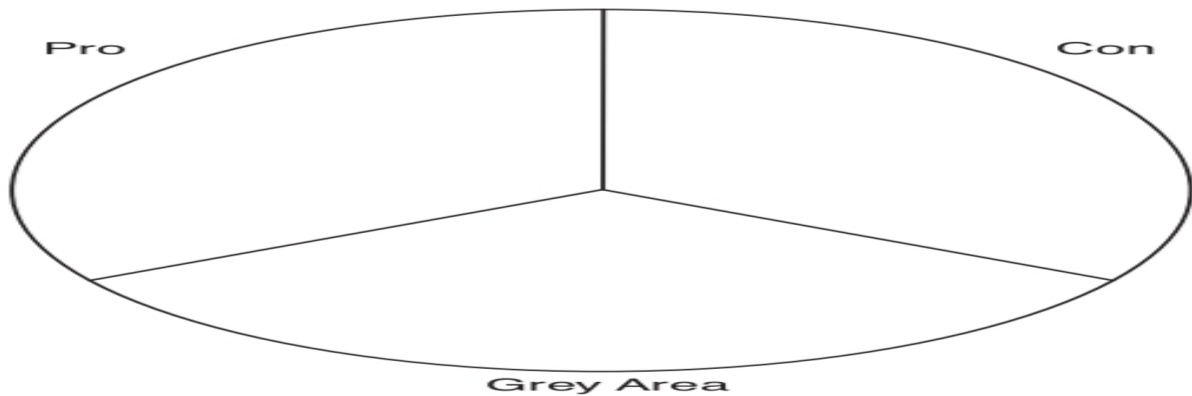
Note : Tri pie. From *Using graphic organizers in teaching and learning.* (p.39), By Tacaiochta and Leibheal, 2008. Second Level Support Service.

2.3.6 Brain Droplets (Wisdom Pearls)

The brain droplet, based on Tacaiochta and Leibheal (2008), is a tool used for brainstorming ideas, such as writing essays or studying for exams. Teachers usually search for new ideas when starting a lesson in class. But when students brainstorm their thoughts in small groups, specifically if there is a leader student, their ideas could be better. In these small groups, everyone wants to help reach the goal, that may lead to reducing frustration when sharing ideas. In addition, exchanging information between groups can allow all learners to benefit.

 Figure 2.6: Brain droplets (wisdom pearls)

Note: Brain droplets (wisdom pearls). From *Using graphic organizers in teaching and learning.* (p.14), by Tacaiochta and Leibheal, 2008. Second Level Support Service.

2.3.7 Fishbone Diagram

As outlined by Kasim et al. (2021), The Fishbone diagram was introduced in 1986 by Kaoru Ishikawa as a teaching tool that allows to determine main causes of a problem. Also, it aids in the brainstorming process before writing, and helping students focus on their main ideas. Additionally, it encourages the collection, flow, and development of more ideas. This diagram is beneficial, since it identifies cause-and-effect relationships, facilitates brainstorming in groups, and develop creative thinking to maintain progress.

Figure 2.7: Fishbone diagram
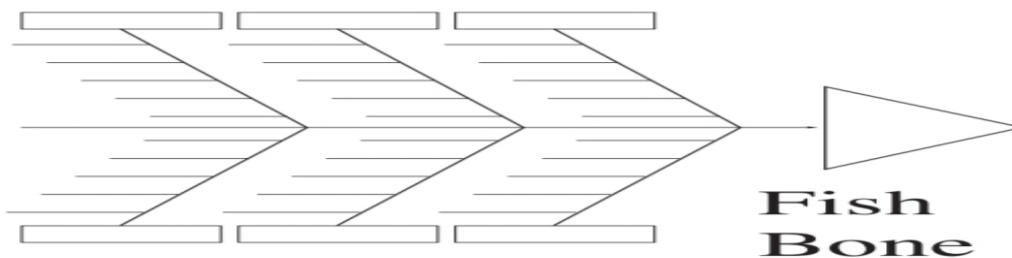
Note: Fishbone diagram. From *Using graphic organizers in teaching and learning.* (p.21), by Tacaiochta and Leibheal, 2008. Second Level Support Service.

2.3.8 Word Star

Dau (2015) introduced the word star as a visual aid designed to help students recognizing unknown words and acquiring new vocabulary. It functions as a graphic organizer, allowing students to explore various aspects of a word, including its syllabication, part of speech, synonyms, antonyms, and usage in context. To use the organizer, students first brainstorm a list of unfamiliar words they seek to learn. Then, using dictionaries, they write the relevant information for each word and complete the related sections on the organizer.

Figure 2.8: Word star
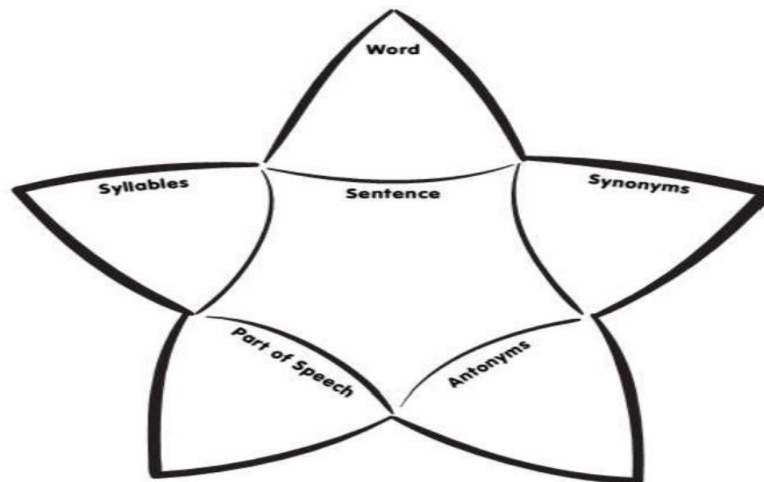
Note: Word star. From Graphic Organizers–Effective Tools for Teaching Vocabulary. (p.6), by Dau, 2015. In *The 2nd International VietTESOL Conference Hanoi (Hal. 7). Vinh: Research Get*.

2.3.9 Mind Map

Tacaiochta and Leibheal (2008) defined the mind map as a useful tool for brainstorming and visualizing thoughts and ideas. It allows people to discover new concepts related to a topic and connecting them easily. Additionally, it helps in structuring information in a visually attractive manner through branches, allowing for better comprehension. Hence, a mind map is an important material that aids in both idea creation and information organization.

Figure 2.9 Mind map
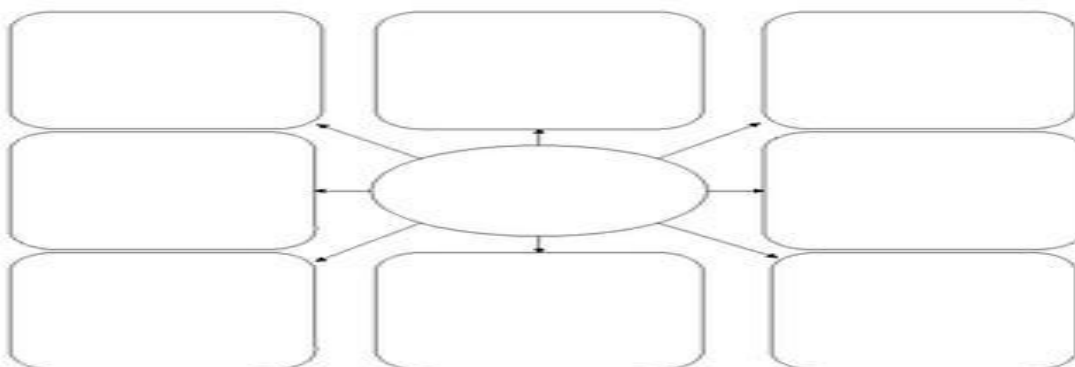
Note: Mind map. From TPT.com

2.4 General Overview About Mind Map

2.4.1 The History of Mind Map

Mind map is regarded as one of the most useful techniques for organizing and visualizing information, specifically for teaching and learning. According to Buzan (1976), and Buzan (1986), mind map introduced for the first time by the psychologist and brain researcher Tony Buzan. Because of the fact that numerous functions are performed by the two hemispheres of the brain, the creation of mind mapping aimed to use both sides to enhance memorizing capacity and performance.

Referring to Buzan and Buzan (1993) book, Buzan found through his research that learning was not necessarily better with more effort. This led him to analyze traditional learning methods, search and study about topics such as learning styles, memory techniques, and explore cognitive processes. His study of psychology and brain science revealed the brain's effectiveness when engaged in intellectual activities. He also, created creative approaches, such as radiant thinking, by using methods like combining words and colors when taking notes.

As declared by Meier (2007), The purpose of mind maps was helping people taking notes and expressing ideas in attractive manner. The unrestricted structure of mind maps aids the innate mental activity, with time, mind mapping has been employed as a technique for visually representing thoughts and information concerning a particular theme. This method has been applied in various domains and situations. As a result, there has been a progressive utilization of mind mapping software, which involved in project management applications as a visual tool when discussing projects.

2.4.2 Definition of Mind Map

Mind map is viewed as one of the most efficient instructional techniques in education. The use of mind mapping significantly improves teaching effectiveness, learners' participation, and lesson comprehension. Buzan (2004), the leading researcher in the field of cognitive visualization and the originator of mind maps, defined the concept of mind mapping as: "a colorful, visual form of note-taking that can be worked on by one person or a team of people. At its heart is a central idea or image. This is then explored by means of branches representing main ideas, which all connect to this central idea" (p.10). In other words, mind maps are flexible methods that can be easily used by either individuals or groups. Also, they have multiple usage in different domains such as education, business, and personal application.

According to Cambridge Dictionary, mind map is a type of diagram (simple plan) with lines and circles for organizing information so that it is easier to use or remember. Besides, Al-Jarf (2011), explained the term mind map as:

> A graphic organizer in which the major categories radiate from a central idea and sub-categories are represented as branches of larger branches. It is a visual tool that can be used to generate ideas, take notes, organize thinking, and develop concepts. Teachers can use it to enhance learning. It is helpful for visual learners as an illustrative tool that assists with managing thought, directing learning, and making connections. It is a skill that cuts across ability levels and encompasses all subject matters. It enables students to better organize, prioritize, and integrate material presented in a course. (p.4)

In essence, mind map is a useful visual organizer that provides different advantages such as thoughts creation, noting observations, and developing ideas. Thus, this strategy aids teachers make learning more appealing, as it facilitates acquisition especially for learners who learn better through visuals; it allows them constructing relationships between the ideas, shows

clear and organized steps in gaining knowledge, making lessons content easier to be understood.

Furthermore, Rabeka (2014) further described mind mapping as a teaching method focuses on drawing a diagram that present the principal idea centrally, linking different information including words, thoughts, and expressions together. In the same context, Budd (2004), added that a mind map is "an outline in which the major categories radiate from a central image and lesser categories are portrayed as branches of larger branches" (p. 36). That is, a mind map has large groups of items spread from the main idea and smaller groups extended in form of branches from bigger ones.

In short, and according to those statements, mind map is one of the most successful and effective instructional technique that have a crucial role in simplifying both the teaching and learning processes through introducing courses in visually attractive manner, improving learners' interest and participation, and boosting their comprehension.

2.4.3 Mind Map Founder

As reported by Buzan and Buzan (1993), Tony Buzan, the creator of mind maps TM, born in London in 1942. He is also the president at the Brain Foundation, and the establisher of the Brain Trust and the Brain Clubs. He is the one who introduced the concept of Mental Literacy. Buzan completed his education at the University of British Columbia in 1964 with double Honours in Psychology, English, Mathematics, and the General Sciences. He was employed at the Daily Telegraph on Fleet Street in 1966 and edited the International Journal of MENSA.

Buzan has several publications that translated into different languages. He is an advisor to both government departments and multinational organizations. He is known as 'Mr. Brain' and has and he initiated the Memoriad, and the World Memory Championships and participated

in the establishment of the Mind Sports Olympiad. He also known as the 'Mental Olympiad Games'. He focused extensively on aiding individuals who have learning difficulties. (Buzan & Buzan, 1993).

Tony Busan has the World's highest 'creativity IQ' and a guide to international Olympic Rowing Squads and The British Olympic Chess Squads. Additionally, he gained the Eagle Catcher Award from EDS, besides to the YPO Leadership Award, for his valuable achievements. (Buzan & Buzan, 1993).

2.4.4 Steps of Mind Mapping

Mind mapping is an approach that simplifies the teaching process for educators as well as the acquisition of knowledge for learners. As explained by Green (2014), several factors may impact the formation of a mind map such as the map's specified objective, the personality, the group size, and the method of presenting the terms and figures. Green (2014) further described the steps of making a mind map as follows:

1) Gathering the necessary supplies, including papers, pencils or markers in different colors. Checking the lightning, temperature, and seating arrangement are all appropriate in case of having collective conversation, while working alone requires a comfortable location such as a bedroom.

2) placing an image representing the main topic at the central point of a horizontal paper to avoid the overlap of the topic branches and maintain clarity. Using an image rather than just writing the main topic word may cause brain stimulation, making the activity motivating and enjoyable. Employing several colors can activate the right side of the brain and lead to a more comprehensive mind map.

3) Branching out the principal ideas from the central image through these instructions:

a. Designing curved bold lines extending from the central image to the principal ideas. Curved lines allow for additional ideas, and bold lines indicates their significance, while having a constant length show the connection of the ideas with the central image.

b. Writing the principal ideas briefly, using multiple colors that may enhance the clarity of the mind map and facilitate the retention of information.

2.4.5 The Advantages of Mind Maps

Mind maps are helpful approaches that provide infinite benefits in education, aiding learners in learning new concepts effortlessly, and helping teachers delivering lessons more effectively. This was supported by Green (2014), who highlighted the significance of mind map usage, listing its advantages as the following:

- Using mind maps helps in finding more effective solutions rapidly, through visual arrangement of thoughts that accelerate the data processing, boosting creativity in a limited period of time. Thus, this may result in achieving progress in one's career.

- Mind mapping improves collaborative brainstorming by encouraging active contribution from all group participants, visually organizing ideas, and making it easier to includes different points of view into the overall work.

- Mind mapping improves accomplishment, as previously discussed, aiding in problem solving, simplifying the recall of crucial ideas, and improving teamwork. Consequently, this leads to increasing productivity and performance.

- Mixing words and images in mind mapping boosts memory retention better than using only words. This method is six times more efficient in memory retention and storing images for future recall. In addition, underlining key points with keywords in mind mapping is more effective than representing the entire subject.

- Connecting and categorizing ideas may improves the precision of thought and promotes the discovery of new ideas when exploring different subtopics. Besides, recalling interconnected points could be more accessible than separated ones.

- A mind map presents a summary of the major and the minor ideas, showing both, broad concepts and specific details. This method makes complex information simple, and aids in comprehension of the entire topic.

- mind mapping saves time by presenting all necessary information directly, different from classical learning methods that involve memorizing isolated information. In mind mapping, ideas are summarized rapidly, due to its structured form, making data processing and memorization easier.

- When facing lack of ideas or facing writer's block, utilizing a mind map can help to stimulate the flow of ideas and maintain progress. By asking fundamental questions such as why, where, what, when, and how.

2.4.6 The Disadvantages of Mind Maps

Although it is true that mind maps are significant tools that help in organizing ideas, improving comprehension, and enhancing memorization and retention, it is important to recognize that these tools may have some disadvantages. In this context, Green (2014) suggested few limitations as follows:

- It might be difficult and time consuming to adopt new behavior or different attitude. Similarly, implementing mind mapping as a new technique may require patience and effort. Research indicates that it may take twelve sessions for individuals, who have difficulties using mind mapping, to adapt. While some may find it easier to employ mind mapping, others may prefer note-taking. However, with practice, even those who may face challenges can learn to use mind mapping effectively.

- when comparing note-taking to mind mapping; notes can be understood by people who were absent at the lecture; however, it could be difficult for those not involved in the mind mapping session to understand due to its visual aspects such as key terms and symbols. Therefore, mind mapping is only helpful for those who are present in the class.

- Mind maps creation can be an obstacle for some learners, particularly for beginners, even though it seems simple. Structuring a well- designed mind map may requires skill and effort; however, asking teachers can be beneficial to learn the main procedures of mind mapping process. Accordingly, the objective is not just a map creating, but also enhancing learning by facilitating comprehension and boosting information retention.

2.4.7 Improving Technical Vocabulary Learning and Retention Through Mind Maps

Mind maps indeed play an important role in enhancing vocabulary learning, memorization, and retention, especially within English for Specific Purposes (ESP) contexts, and technical vocabulary domains. According to Dudley-Evans and John (1998), there are two types of ESP vocabulary. The first is semi-technical terms, which are commonly used in everyday language but more dominant in technical situations. The second is technical terms, which have specialized meanings in particular field and can differ across disciplines. (Dudley-Evans & John 1998). It is clear that having large background of technical vocabulary is essential. This claim was supported by Adawiyah and Bambang (2009, as cited in Poedjiastutie & Rifah, 2019), who mentioned that possessing proficient technical skills is essential for individuals to enhance their expertise in their specific fields as well as for success in their professions and for progression in their careers.

In addition, stressing on the significance of vocabulary, Lewis (1993) stated that, "language consists of grammaticalized lexis, not lexicalized grammar" (p.34). Thus,

vocabulary is viewed as fundamental elements in learning new language; however, acquiring a large amount of vocabulary would require continuous effort. Besides, Schmitt (2000) highlighted the necessity of learning vocabulary, confirming that having a clear understanding of words is essential for being able to communicate effectively and for learning a foreign language. In this context, Nation (2022) added that the vocabulary learning and linguistic usage are interconnected, in which knowing more words may facilitate the use of language effectively, while using language actively can enhance one's vocabulary acquisition.

As claimed by Marunevich et al. (2021), and Buran and Filyukov (2015), the traditional practice of repetition for vocabulary acquisition could be considered as inefficient method recently. On the other hand, there is an increasing interest in new vocabulary teaching techniques in order to achieve an effective English language instruction among EFL learners. (Buran and Filyukov, 2015; Marunevich et al., 2021). Therefore, from the point of view of Edwards and Cooper (2010), Mind mapping is one of the current, and successful approaches for storing and recalling information in the mind. In that vein, Li et al.'s (2010) study results, about how Chinese university students use mind maps to learn new words, indicated that using mind maps helped these students learn a wide variety of common English words, phrases, and idioms more effectively. Equally, In Al-Jarf's (2011) research findings shown that mind maps can significantly boost L2 learners' vocabulary and make it easier for them to remember words. Also, he asserted that using mind maps, combined with other types of maps such as concept maps, and argument maps, can improve L2 learners' language skills, especially their vocabulary stock.

Further, regarding the significant role that mind maps play, Nesbit and Adesope (2006) stated that organizing ideas in form of a map can help students by simplifying mantal processes and by showing how different ideas are connected. Similarly, Al-Jarf (2011), and Nation (2001) remarked that students who used mind maps to learn English vocabulary connected new words

with ones they already knew. This helped them understand and remember the words better. (Al-Jarf, 2011; Nation, 2001). Additionally, Schmidt (2015) pointed out that mind maps are significantly helpful for students in learning and remembering English words due to their interest- stimulating, attractive form which includes pictures and shapes. Also, some researchers have shown in their studies that visual materials are helpful for making people learn languages and improve vocabulary skills.

Moreover, in Wannas et al. s' (2022) research that investigate the effectiveness of mind mapping on learning ESP vocabulary for engineering, the results shown the efficiency of utilizing mind mapping in enhancing comprehension and fostering deeper understanding and recall of subject-specific terminology. In conclusion, and based upon all arguments mentioned before, mind map can be considered as an effective, successful, and practical technique, for the learning and retention of technical vocabulary, in general, and for engineering learners in particular.

Conclusion

To sum up, the main emphasis of this chapter is highlighting the role of mind map technique in improving technical vocabulary learning and retention. The scholars and researchers indicate that mind map is an effective aid that can help to present information in clear, well-structured, and attractive manner. Furthermore, it may promote technical vocabulary learning, memorization, and recall of information of (EFL) learners. Hence, integrating mind map in teaching can be and effective strategy for achieving technical vocabulary richness and mastery.

Chapter Three

Fieldwork and Data Analysis

CHAPTER THREE: FIELDWORK AND DATA ANALYSIS

Introduction

In the third chapter of this research study, a data analysis is presented through focusing on the pre-test and posttest, as well as the insights gathered from students' questionnaire and teachers' interview. This chapter is divided into three parts. The first part examines the data collected from the data gathering instruments and tools. The second part study the findings and conclusions based on the research hypothesis. Additionally, the last part of this study explores the educational implications and recommendations. It also seeks to validate its hypotheses and answer the research questions posed earlier, by employing the visual aids of tables and graphs to facilitate the interpretation and the comprehension. Finally, the consideration of the results will provide valuable recommendations and pedagogical implications that can help teachers enhance their instructional strategies and create more effective environment for their learners.

3.1 Research Methodology

3.1.1 Research Approach

The current research employs a mixed-method approach, aligning with the nature of the study and the aim of assessing the practicality of integrating mind mapping techniques to enhance technical vocabulary learning and memory. Initially, a quasi-experimental design was used, includes pretests for the experimental and control groups, implementation of mind mapping-based instruction for the experimental group, and posttests to evaluate improvements for both groups. Additionally, a survey research design was employed to gather insights from learners through a questionnaire and from teachers via interviews, for the purpose of providing a comprehensive understanding of the utility of mind mapping in teaching technical terms.

3.1.2 Population and Sampling

The research sample includes 30 participants of Master 1, specializing in the Construction Branch, within the Department of Architecture at the University of Biskra. They were selected randomly from a total class population of 42 students. These participants were divided to 15 students comprised the experimental group and another 15 formed the control group. Furthermore, the learners from the experimental group were required to respond to the questionnaire. In addition, because of the limited number of instructors in the department, the interview was conducted with only one teacher, considering the availability of two teachers.

3.1.3 Limitations of the Study

The current study aims to enhance technical vocabulary learning and retention through mind mapping technique. Nevertheless, it encountered several limitations and challenges. Initially, the population under investigation was restricted to a single class consisting of 42 students, which could possibly limit the generalization of the results to a broader population. Additionally, obtaining sessions for the treatment faced difficulties due to schedule constraints and administrative issues. Moreover, the limited number of teachers in the interview stage, where only one instructor out of two participated. This might have reduced the amount and depth of information and insights gathered from the interview.

3.1.4 Data Collection Tools

Specific data gathering tools was selected to collect data that would help to answer the research questions and meet the goals of this study. These tools included tests conducted before and after the treatment, a questionnaire administrated to learners, and an interview for teachers to investigate their perceptions about using mind mapping technique in enhancing technical vocabulary learning and retention.

3.2 The Quasi-Experiment

3.2.1 Description of the Quasi-Experiment

3.2.1.1 The Pretest

On February 11, 2024, both a control group and an experimental group had the pretest. each group includes 15 students, the time located was thirty-five minutes. After obtaining the supervisor's approval, the pretest made by the researcher, was administered. The vocabulary included in the pretest was based on the themes included in learners' Technical English module lectures and was approved by the teacher. This ensured that the specific technical vocabulary used in the pretest was appropriate and relevant for the study's objectives. The pretest consists of four distinct exercises, each designed to assess different aspects of technical vocabulary comprehension. In the first exercise, students are tasked with naming pictures of various construction materials and equipment. This exercise is used to assess students' retention and remembering ability. The second exercise requires students to fill in blanks with appropriate technical vocabulary terms, which aims to evaluate their capacity to correctly implement technical vocabulary in the right context and usage. The third exercise involves selecting the corresponds to the meaning of a given technical term. Finally, in exercise number four, students match each technical vocabulary word with its description in order to check their understanding of the vocabulary meaning. (See Appendix 1).

3.2.1.2 The Treatment

The treatment was three lessons designed in the form of mind maps, presented in visually attractive, and appealing manner. These mind maps involved varied colours, shapes, and illustrative images to enhance understanding. Each lesson had a duration of one hour and comprised fifteen technical vocabulary terms related to their specialized field of study, more

specifically to construction. Throughout the lessons, the researcher intended to create a gradual increase in the level of complexity from basic to more advanced concepts. Within each lesson, every technical term is accompanied by a picture, a definition, and an example sentence, where the term is included, in order to foster learners' acquisition, comprehension, and retention of the field- related vocabulary. It's important to note that the selection and verification of these terms were overseen by the technical English module instructor. (See Appendix 2,3,4).

3.2.1.3 The posttest

The posttest administered to the two groups a week after the treatment. It lasted for thirty-five minutes. The post-test maintained similar design to the pretest. The only difference was in the third exercise, where students were asked to determine whether the sentences were true or false to assess their ability to identify the correct meaning of the technical vocabulary mentioned. (See Appendix 8).

3.2.2 Data analysis of the pretest and posttest

The analysis of the pretest and posttest results is conducted using SPSS program. The study focuses on the descriptive analysis of the results rather than inferential statistics, which was not necessary due to the small sample size.

Table 3.1

Pretest and posttest scores comparison

	Experimental Group			Control Group	
P	Pretest Score	Posttest Score	P	Pretest Score	Postest Score
01	13.5	18	01	12	14
02	12	16.5	02	12	13.5
03	11.5	17	03	12	13
04	11.5	15.5	04	11.5	10
05	11	11	05	10	13
06	9.5	15.5	06	10	12
07	9.5	16	07	8.5	10
08	8.5	15	08	08	10
09	08	15.5	09	08	08
10	7.5	08	10	08	07
11	07	14	11	7.5	10
12	07	12.5	12	07	09
13	06	11	13	07	7.5
14	5.5	10	14	6.5	9.5
15	04	09	15	6.5	08

Notes. P = Participant number.

Table 3.2

Descriptive statistics (posttest results)

Group	N	Mean	SD
Experimental	15	4.83	2.12
Control	15	1.33	1.33
Total	30	3.08	2.49

Notes. n = Sample size. SD = Standard deviation.

Based on the information in the table, the mean of the experimental group, which is (4.83), is approximately four times larger than the mean of the control group, which is (1.33). It strongly demonstrates a significant difference between the two groups. This difference can indicate that the treatment or intervention applied to the experimental group, involving the implementation of mind mapping technique, had a significant impact on enhancing technical vocabulary learning and retention.

Table 3.3

Paired samples correlations

Correlations		Students group	Difference
Student's group	Pearson Correlation	1	.715
	Sig. (2-tailed)		.001
	N	30	30
Difference	Pearson Correlation	.715	1
	Sig. (2-tailed)	.001	
	N	30	30

Notes. n = Sample size. Sig = Significance level.

The given P value (,001) is less than the alpha (,001 < 0,05). This can indicate there is a significant relationship between the variables in this research, which is strong evidence to reject the null hypothesis, suggesting that the observed results are highly unlikely to occur if there is no true difference and effect. Therefore, it generally supports the idea that there is a significant difference and effect present in the data, which strengthens the validity of the findings.

Table 3.4

paired samples correlation

		N	Correlation	Sig
Pair 1	Pretests and Posttest	30	0.33	0,033

Notes. n = Sample size. SD = Standard deviation.

A correlation coefficient of 0.33, which is less than alpha (0.33<0.05) indicates a strong positive correlation between the paired samples. This suggests that there is a notable relationship between the variables being measured in the paired samples.
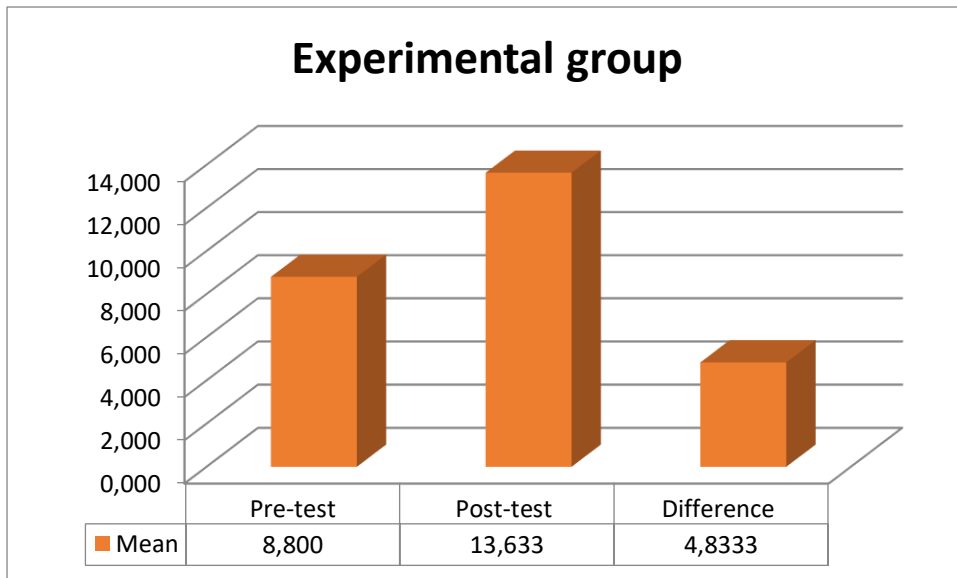
Figure 3.1 Experimental group pretest posttest means and the mean difference.

From Figure 3.1, it is evident that the pretest and posttest means of the experimental group reveal a significant difference. The posttest means notably exceed the pretest means with a value of (4.883). So, we can conclude that there is an improvement in performance after the intervention. Additionally, this variation ensures the effectiveness of the mind mapping technique in enhancing students' technical vocabulary learning and retention among the experimental group.
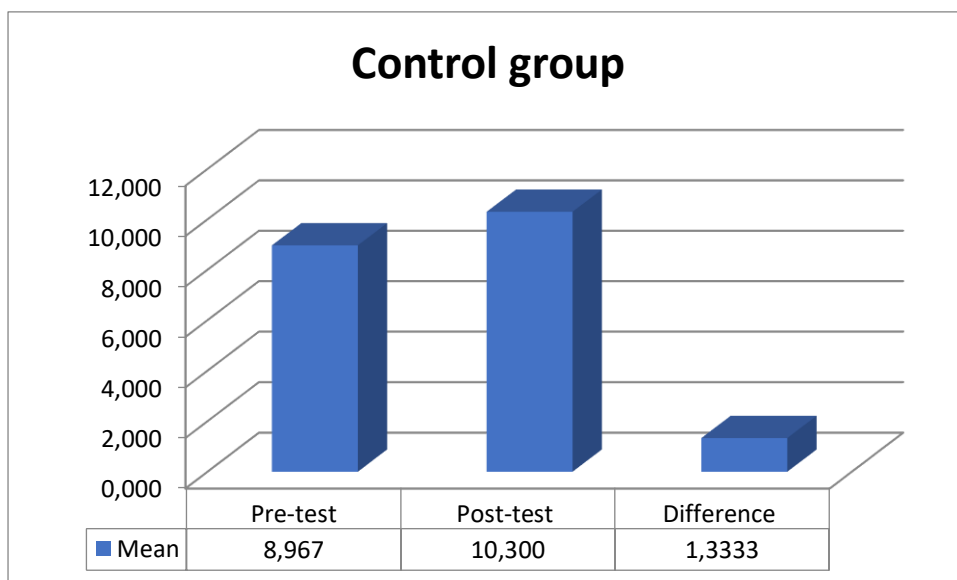
Figure 3.2. Control group pretest posttest means and the mean difference.

The provided graph demonstrates the mean scores of the control group. There is only a slight improvement comparing the pretest and posttest means, with a difference of 1.33. This progress is understandable, since the control group had instruction sessions using the classical approach of teaching; a text-based construction, in which the lesson content structured as a text including technical terms. (See Appendix 5,6,7).

Control Group and Experimental Group Pretest Posttest MeanTitle
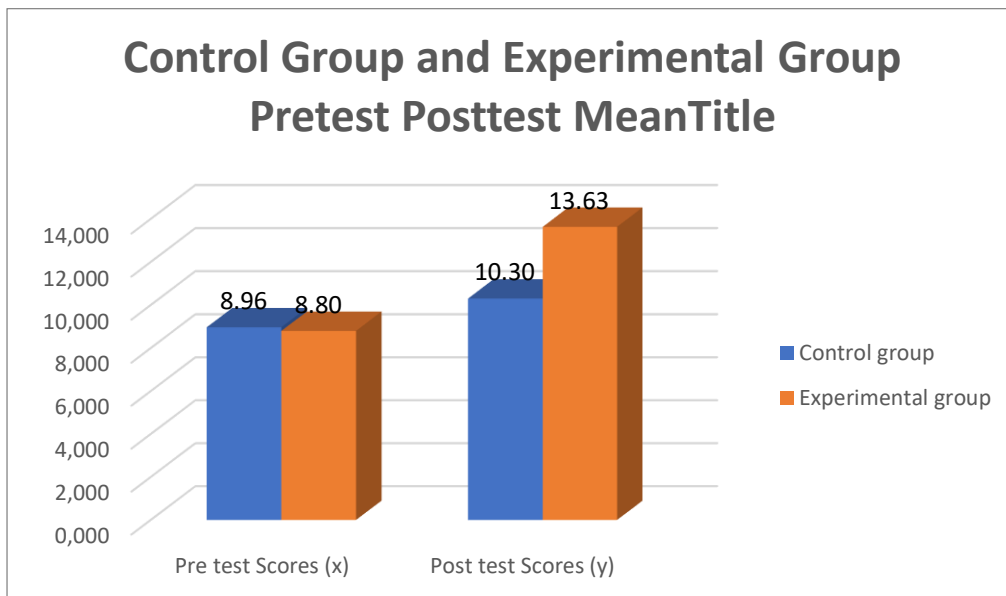
Figure 3.3 Control group and experimental group pretest posttest means.

The chart above summarizes the concluding results of the tests. It shows how scores of both pretest and posttest changed between the two groups. This bar graph indicates that the difference between the pretest scores is nearly absent (only 0.16). Such insignificant variation in scores emphasize that the two groups are extremely similar. This resemblance may ensure that any observed changes following the intervention are likely due to the treatment rather than group differences.

The analysis of the remaining section of the graph suggests a significant improvement in the post-test performance for both groups. However, after a comparison of the pretest mean scores of both groups, it is observed that the experimental group have a mean score of 8.80,

while the control group mean score is 8.96. In the posttest, the mean score is 13.63 for the experimental group and 10.30 for the control group. After receiving the treatment, the experimental group clearly performed better than the control group, as illustrated by the graph. This observation is supported by a notable difference in the mean score of the posttest (3.30). Thus, it can be inferred that the treatment positively impacted students' technical vocabulary learning and retention.

3.3 Students' Questionnaire

This data gathering tool was designed to achieve three main goals. The questionnaire aims, firstly, to gain insight into learners' attitudes towards the utilization of the mind mapping technique for improving technical vocabulary learning and retention. Secondly, to measure learners' realization regarding the importance of technical vocabular, to investigate the advantages offered by this teaching method, and to determine any challenges faced during the treatment. Thirdly, to identify any potential challenges or further suggestions expressed by the learners, for facilitating the implementation of the mind mapping approach and improving its effectiveness.

3.3.1 Administration of the Questionnaire

The questionnaire was distributed on March 25, 2024, after the treatment sessions and the posttest. The questionnaire was administered to 15 students belonging to the experimental group.

3.3.2 Piloting And Validating of the Questionnaire

A pilot and validation study were conducted to evaluate the questionnaire's clarity, comprehensiveness, and appropriateness of items. The pilot test involved three students selected from the total of fifteen. The questionnaire feedback from participants leaded to slight

modifications and revisions aimed at enhancing questionnaire clarity and precision. Moreover, the questionnaire content was confirmed through a detailed review done by the Technical English module teacher as an expert, in addition to the supervisor. They carefully assessed each questionnaire item's relevance, coherence, and suitability to ensure correspondence with the study objectives.

3.3.3 Description of the Questionnaire

The questionnaire consists of three sections. The first section explores participants' awareness of the importance of learning and retaining technical vocabulary, as well as the main factors may hinder this process. The second section focuses on the advantages that mind mapping could offer for technical vocabulary acquiring and remembering. Lastly, the third section explores any challenges encountered with this instructional strategy and collects additional comments and suggestions regarding its use. (See Appendix 9).

3.3.4 Analysis of the Students' Questionnaire

Section One: Technical Vocabulary Learning and Retention

Item 1. In your opinion, what is the main aspect you focus on when learning a foreign language?

Table 3.5

Students' main focus when learning foreign languages

		Number	Percentage
a)	Mastering pronunciation	4	27%
b)	Learning grammar rules	2	13%
c)	Building a diverse vocabulary	8	53%
d)	All of the above	1	7%
	Total	**15**	**100%**
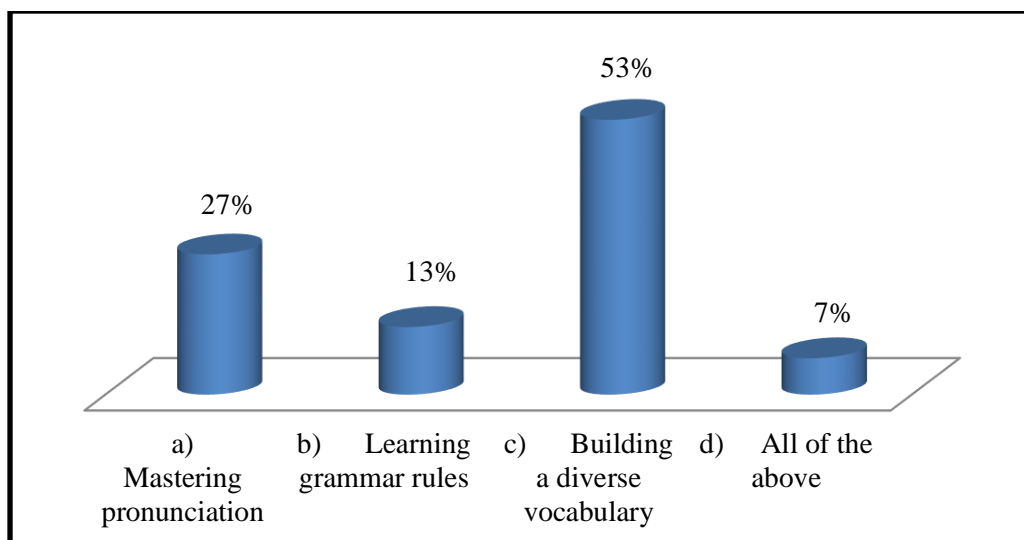
Figure 3.4 Students' main focus when learning foreign languages

This item seeks to understand students' perspectives regarding the main aspect they emphasize when learning a foreign language. Specifically, we analyzed which elements learners prioritize; mastering pronunciation, understanding grammar rules, or expanding their vocabulary. From table 3.5 and Figure 3.4, it is shown that the majority prioritize expanding their vocabulary (53%), which corresponds to eight participants; four students prioritize pronunciation (27%); Two emphasize grammar rules (13%), while only one student who view all these aspects as equally essential (7%). Consequently, These findings highlight the learners' awareness regarding the importance of vocabulary enrichment during language learning process.

Item 2. To what degree is learning technical vocabulary important in your field of study?

Table 3.6

Students' opinions about the importance of learning technical vocabulary

Option	Number	Percentage
a) Very important	6	40%
b) Important	9	60%
c) Not important	0	0%
d) Not important at all	0	0%
Total	**15**	**100%**
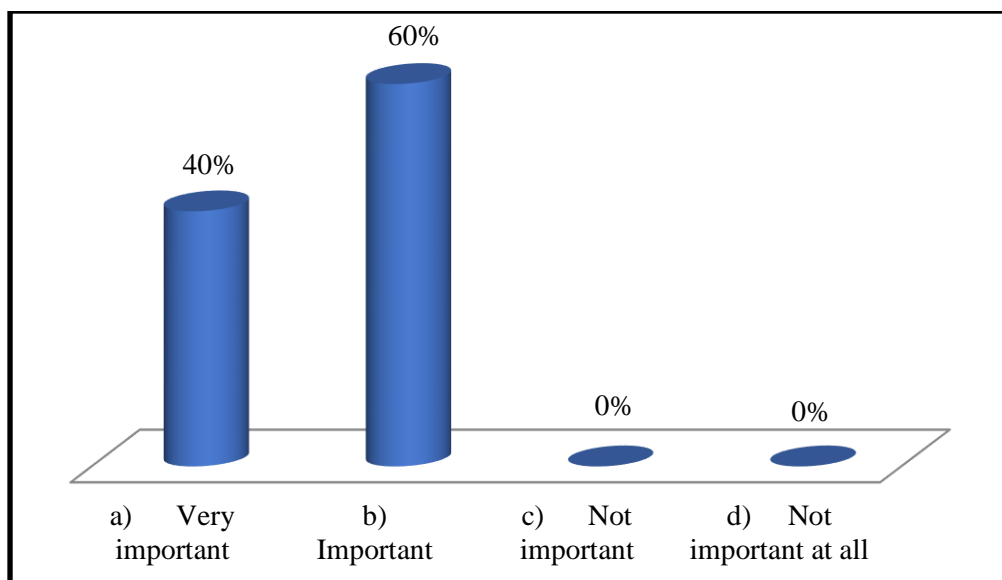
Figure 3.5 Students' opinions about the importance of learning technical vocabulary

The question inquires about the importance of learning technical vocabulary in the field of study. Based on table 3.6 and figure 3.5 six students consider it very important, representing (40%) of the responses, while nine students view it important, constituting (60%) of the responses. Notably, none of the students indicated that technical vocabulary lacks importance. This clearly reveals the success of mind mapping strategy.

Item 3. What kind of difficulties you may face when learning technical vocabulary?

 Table 3.7

Learners' difficulties in learning technical vocabulary

Option	Number	Percentage
a) Pronunciation	5	33%
b) Meaning	7	47%
c) Spelling	2	13%
d) Grammar	1	7%
Total	**15**	**100%**
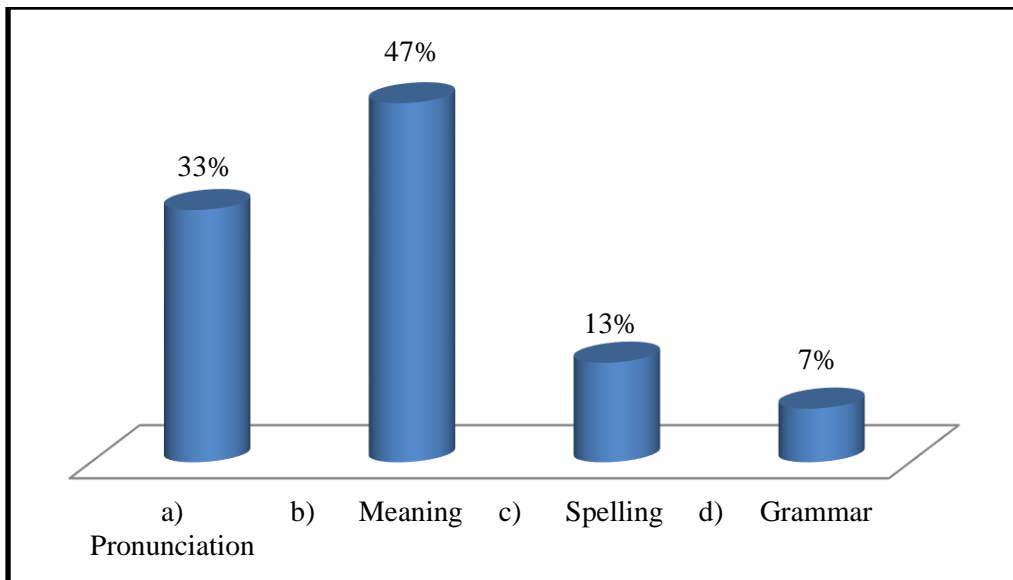
Figure 3.6 Learners difficulties in learning technical vocabulary

If you have others, please state them.

- Lack of visual aids

- Absence of contextual examples

As indicated in the above in the table3.7 and figure 3.6, the inquiry revolves around the difficulties learners may encounter in mastering technical vocabulary. Among the respondents, four students, representing (27%), identified pronunciation as a difficulty. Two students, accounting for (30%), highlighted issues with spelling. The majority of eight students, constituting (53%), expressed struggles with determining meaning. Lastly, grammar was identified as a challenge by only one student, representing (7%) of the responses. Learners required to add further obstacles they could face during learning technical vocabulary. They reported that lack of visual aids and examples can be a source of difficulty. However, these challenges can be overcome using mind mapping technique.

Item 4. Why do you think you need strong vocabulary related to your field of study? (You may choose more than one option).

Table 3.8

Students' personal needs for technical vocabulary

Option	Number	Percentage
a) For effective communication in the field.	2	13%
b) For better career opportunities.	2	13%
c) For achieving success in assignments and exams that require English language competency.	6	40%
d) For reading and comprehending, articles, academic journals, and research papers.	0	0%
e) For writing reports and thesis.	0	0%
a+c	1	7%
b+c	1	7%
b+e	2	13%
c+e	1	7%
Total	**15**	**100%**
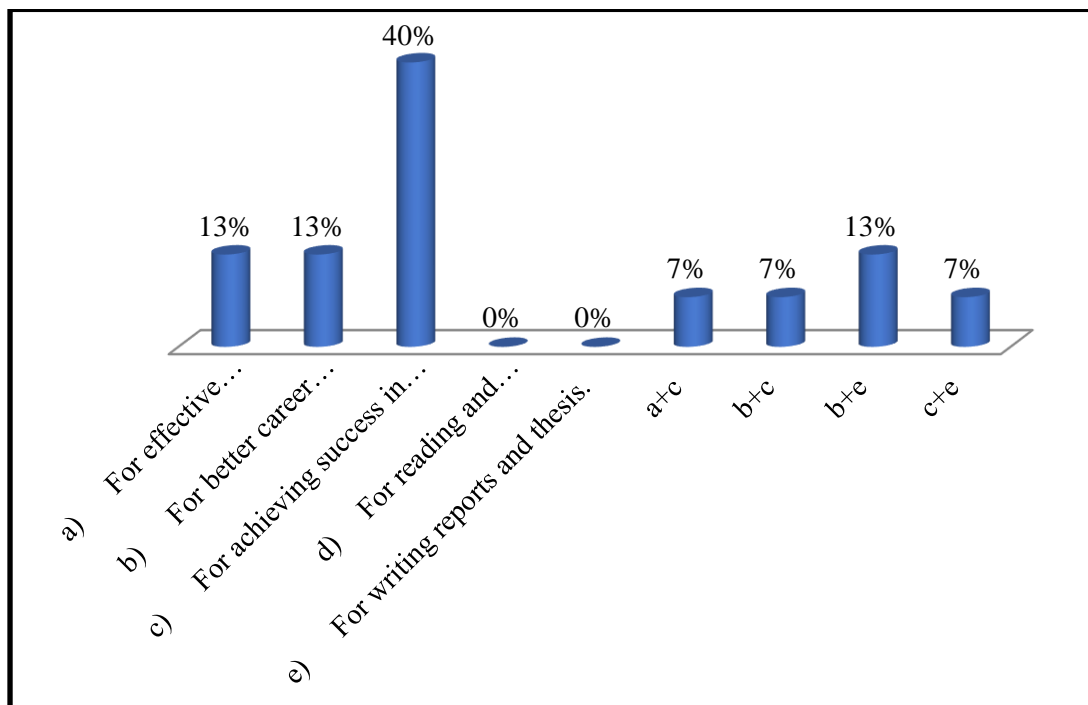
Figure 3.7 Students personal needs for technical vocabulary

If you have others, please state them.   (None)

This inquiry explores students' individual needs for technical vocabulary. The highest priority with a percentage of 40%, as it indicated in table 3.8 and figure 3.7, is achieving success in assignments and exams that require English language competence. Additionally, 13%

prioritize effective communication, better career opportunities. Meanwhile, it is notable that certain needs were chosen more than once, each with distinct level of importance, in which 7% highlights various combinations of these aspects as a lower level. Thus, this variation in learners' needs can ensures the extensive significance, and wide range of advantages that learning technical vocabulary may provide for learners.

Item 5. In your view, is it necessary to focus on retaining new vocabulary when learning English language?

Table 3.9

Learners' perspectives about technical vocabulary retention importance

Option	Number	Percentage
a) Strongly agree	4	27%
b) Agree	11	73%
c) Disagree	0	0%
d) Strongly disagree	0	0%
Total	**15**	**100%**
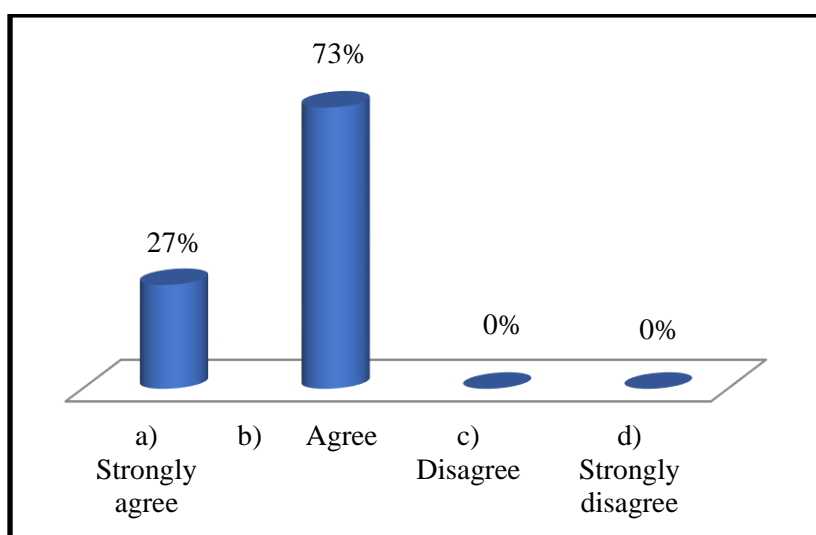
Figure 3.8 Learners' perspectives about technical vocabulary retention importance

Please, provide your justification.

- I strongly agree because retaining new vocabulary help me understand English better and feel confident.

Technical vocabulary retention is crucial for learners in specialized fields. Therefore, this question was posed to ascertain its significance. From table 3.9 and the accompanying figure 3.8, it's evident that all learners recognize the importance of technical vocabulary retention. Four students, constituting (27%), strongly agreed with the statement, while (73%) indicated agreement. This can underline students' realization of the significance of technical vocabulary retention. Students' justification shows that retention new vocabulary help them gaining better understanding and more confidence.

Item 6. In terms of your technical vocabulary retention, how satisfied are you?

Table 3.10

Learners' satisfaction with their level of technical vocabulary retention

Option	Number	Percentage
a) Very satisfied	2	13%
b) Satisfied	5	34%
c) Dissatisfied	6	40%
d) Very dissatisfied	2	13%
Total	**15**	**100%**
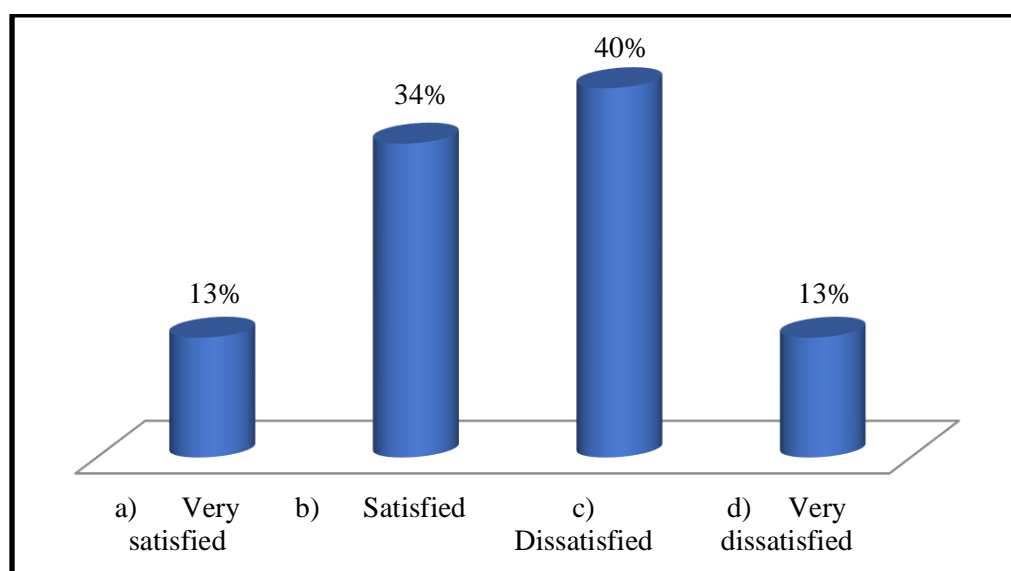
Figure 3.9 Learners satisfaction with their level of technical vocabulary retention

From the data presented in the table 3.10 and figure 3.9, it's apparent that learners' satisfaction levels with their technical vocabulary retention vary. Specifically, two students, constituting (13%), express being very satisfied, while five students, representing (34%), indicate satisfaction. However, six students (40%), report being dissatisfied, and two students (13%), express being very dissatisfied. This observation shows a significant dissatisfaction among learners with their overall technical vocabulary retention. Hence, implementing new strategies for enhancement, such as mind maps, is recommended.

Item 7. In your experience, what are the main factors that may hinder your ability to retain technical vocabulary?

Table 3.11

Main factors affecting Learners' Technical Vocabulary Retention

Option	Number	Percentage
a) Lack of comprehension	1	7%
b) Insufficient background knowledge	5	33%
c) Poor memory strategies	3	20%
d) Ineffective teaching methods	6	40%
Total	**15**	**100%**
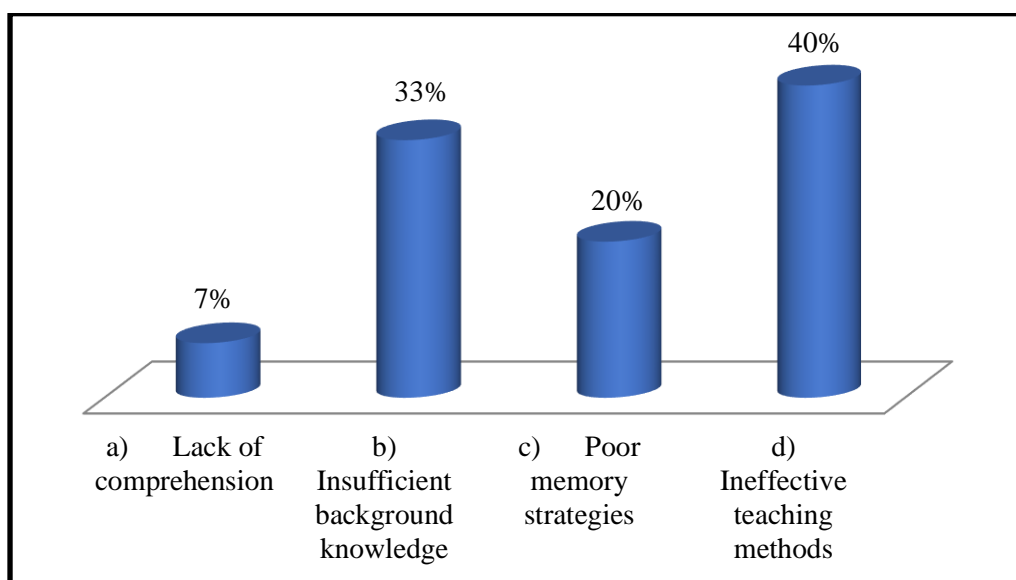
Figure 3.10 Main factors affecting learners' technical vocabulary retention

If you have additional factors, please mention them.

- Limited opportunities for using technical vocabulary in communication.

By including this question, we seek to gain insights into the different challenges learners may encounter in retaining technical vocabulary. The results from table 3.11 and figure 3.10 uncovers that learners face several obstacles in retaining technical vocabulary. While one student, or (7%), reports a lack of comprehension, five students, constituting (33%), identify insufficient background knowledge as a barrier. Additionally, three students, forming (20%), mention poor memory strategies, while six students, accounting for (40%), highlight ineffective teaching methods. Moreover, a students mentioned that restricted utilization opportunities of technical terms could be an additional obstacle. As a result, we can conclude that teaching approaches can pose a considerable obstacle to learners in retaining technical vocabulary, which assert the need for the adoption of new teaching techniques such as mind mapping.

Item 8. Which of the following stages do you find more challenging with regard to technical vocabulary?

Table 3.12

Learners' viewpoints about the most challenging stage during the process of learning technical vocabulary

Option	Number	Percentage
a) Acquisition	3	20%
b) Understanding meaning	8	53%
c) Usage in context	4	27%
Total	**15**	**100%**
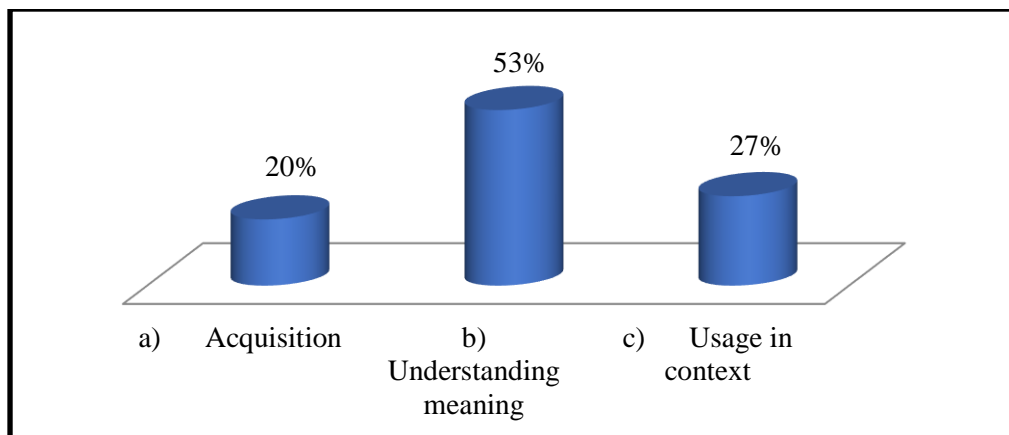
Figure 3.11 Learners' viewpoints on the most challenging stage during the process of learning technical vocabulary

Please, explain.

- I think that understanding meaning is the most difficult stage because I often cannot comprehend technical terms meaning.

According to the table 3.12 and figure 3.11 above, learners perceive different stages of technical vocabulary acquisition differently. Three students (20%) find the acquisition stage challenging. Understanding meaning is identified as the most challenging stage, with eight students (53%). Usage in context follows closely behind, with four students (27%) indicating challenges in applying vocabulary in context. One student reported that technical vocabulary comprehension is the most difficult phase during learning. This analysis notes that the majority of learners face challenges in understanding technical vocabulary meaning.

Section Two: Mind Mapping Technique and Teaching

Item 9. From your standpoint, does the teaching strategies affect your understanding and retention of the lesson?

Table 3.13

Learners' attitudes towards the effect of teaching strategies on the understanding and retention of the lesson

Option	Number	Percentage
a) Yes	12	80%
b) No	3	20%
Total	**15**	**100%**
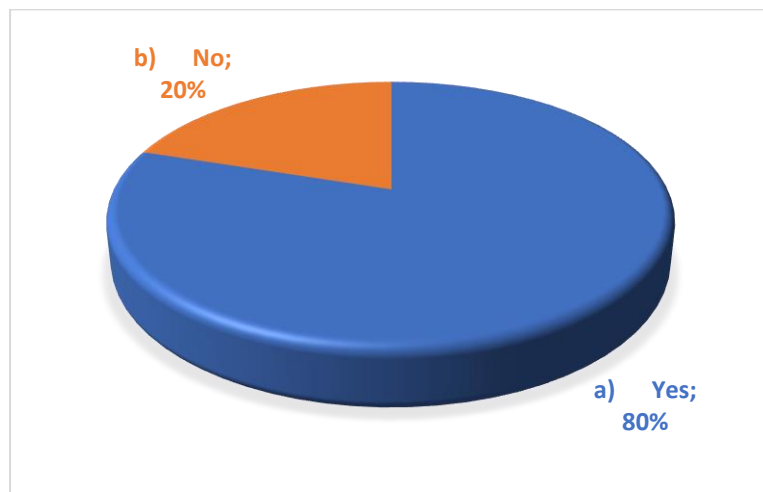
Figure 3.12 Learners' attitudes towards the effect of teaching strategies on the understanding and retention of the lesson

If yes, say how.

- The way teachers teach affects how well I understand and remember information.

This item entailed to examine students' perspectives on the impact of teaching strategies on their understanding and retention of the lesson. As illustrated in table 3.13 and figure 3.12 the majority of students, comprising (80%), believe that the teaching strategy significantly influences their understanding and retention of the lesson. However, only 20% of students indicated that the teaching strategy does not affect their understanding and retention. One of the participants highlighted that teaching method can influence his understanding and retention. This suggests that most students view teaching strategies as crucial factors in facilitating their learning and retention of lesson material, and highlights the importance of effective teaching methods in supporting student success.

Item 10. What strategies do you rely on in learning and retaining new technical vocabulary?

Table 3.14

Learners' Strategies in learning and retaining new vocabulary

Option	Number	Percentage
a) Repetition and review	3	20%
b) Vocabulary lists	6	40%
c) Contextual guessing	2	13%
d) Mind mapping	4	27%
Total	**15**	**100%**
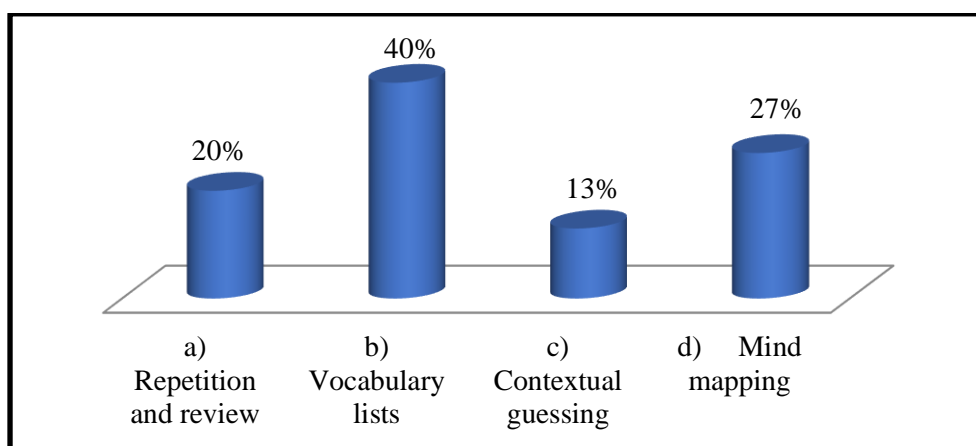
Figure 3.13 students' strategies in learning and retaining new technical vocabulary

After investigating students' strategies for learning and retaining technical vocabulary, the findings from the table 3.14 and figure 3.13 reveal a diverse range of approaches utilized by students. It is observable that vocabulary lists are the most frequently used strategy, as prioritized by six students (40%). Repetition and Review are favored by three students (20%) of the respondents. Meanwhile, Contextual Guessing is identified by two students (13%), while four students (27%), choose mind mapping as their preferred strategy. These findings imply that learners tend to use traditional techniques, such as word lists, for mastering technical vocabulary.

Item 11. If you use mind mapping technique, how often do you use it for learning technical vocabulary?

Table 3.15

Learners' frequency of mind mapping technique usage for learning technical vocabulary

Option	Number	Percentage
a) Rarely	2	13%
b) Sometimes	6	40%
c) Often	5	34%
d) Always	2	13%
Total	**15**	**100%**
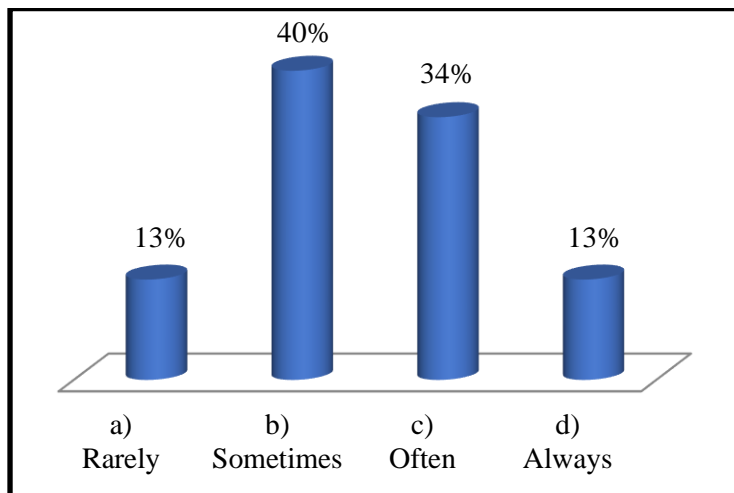
Figure 3.14 Learners' frequency of mind mapping technique usage for learning technical vocabulary

In the learners' frequency of mind mapping technique usage for learning technical vocabulary, From the figure 3.15 and table 3.14, it is observable that two students (13%) reported rarely using the technique, while six students (40%) indicated sometimes. Furthermore, five students (34%) stated they use it often, and two students (13%) mentioned always using it. Accordingly, it is possible to conclude that learners may have the opportunity to enhance and refine their use of mind mapping by incorporating it more consistently into their study activities. This approach would allow them to extend the benefits of mind mapping for effectively learning and retaining technical vocabulary.

Item 12. To what degree was the technical vocabulary introduced in the researcher's taught sessions relevant to construction?

Table 3.16

Learners' evaluation of the relevance of technical vocabulary to construction, in the researcher's sessions

Option	Number	Percentage
a) Very relevant	10	67%
b) Somewhat relevant	5	33%
c) Not very relevant	0	0%
d) Not relevant at all	0	0%
Total	**15**	**100%**
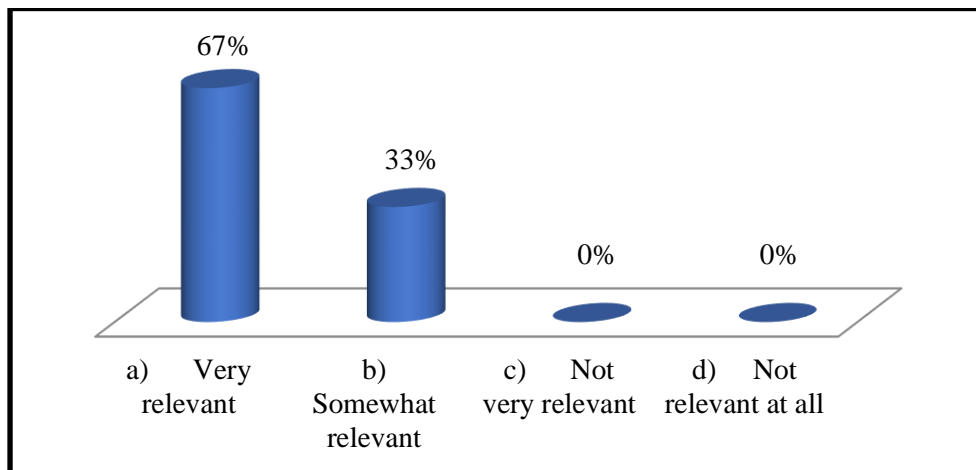
Figure 3.15 Learners' evaluation of the relevance of technical vocabulary to construction, in the researcher's sessions

As illustrated in the table 3.16 and figure 3.15, this question searches for insights into learners' perceptions regarding the relevance of technical vocabulary introduced during the researcher's sessions, particularly to construction. The majority of the participants, constituting ten students (67%), considered it "very relevant," while 5 students (33%), regarded it as "somewhat relevant. Remarkably, none of the respondents indicated any lack of relevance about the lessons. This can lead to the conclusion that the lessons delivered using mind mapping technique were successful.

Item 13. From your perspective, how helpful did you find the mind Mapping technique in learning vocabulary related to construction during the researcher's sessions?

Table 3.17

Learners' opinions about the usefulness of mind mapping technique for learning construction-related vocabulary during the researcher's sessions.

Option	Number	Percentage
a) Very helpful	12	80%
b) Slightly helpful	3	20%
c) Not helpful	0	0%
d) Not helpful at all	0	0%
Total	**15**	**100%**
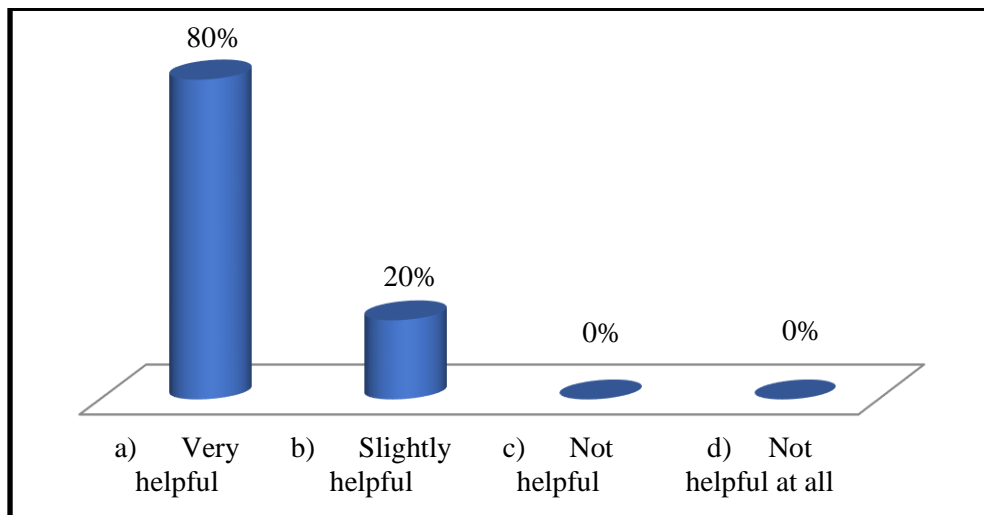
Figure 3.16 Learners' opinions regarding the usefulness of mind mapping technique for learning construction-related vocabulary during the researcher's sessions.

Please, Justify.

- I found it very helpful because it helped me understand and remember construction vocabulary better.

This inquiry is incorporated to investigate the learners' attitudes towards the efficiency of mind mapping technique in simplifying their technical vocabulary acquisition. From table 3.17 and figure 3.16, it is clear that all the participants regarded it as useful. Twelve respondents (80%) found this instructional strategy very helpful for learning construction-related vocabulary during the research sessions. Besides, three participants(20%), expressed that they

viewed it as slightly helpful. significantly, none mentioned perceiving the technique not helpful. Also, One learner ensures that this teaching approach facilitates his understanding and memorization. Therefore, this finding can ensure mind mapping approach effectiveness.

Item 14. What advantages does mind mapping offer in terms of technical vocabulary learning?

Table 3.18

Learners' views on the advantages of using mind mapping in technical vocabulary learning

Option	Number	Percentage
a) Improving autonomy and self-learning	0	0%
b) Making the learning process simple, effective and interesting	0	0%
c) Facilitating word visualization and exploration through pictures, colors and shapes	1	7%
d) Enhancing understanding, retention and memory recall	0	0%
All of them	3	20%
More than one advantage	11	73%
Total	**15**	**100%**
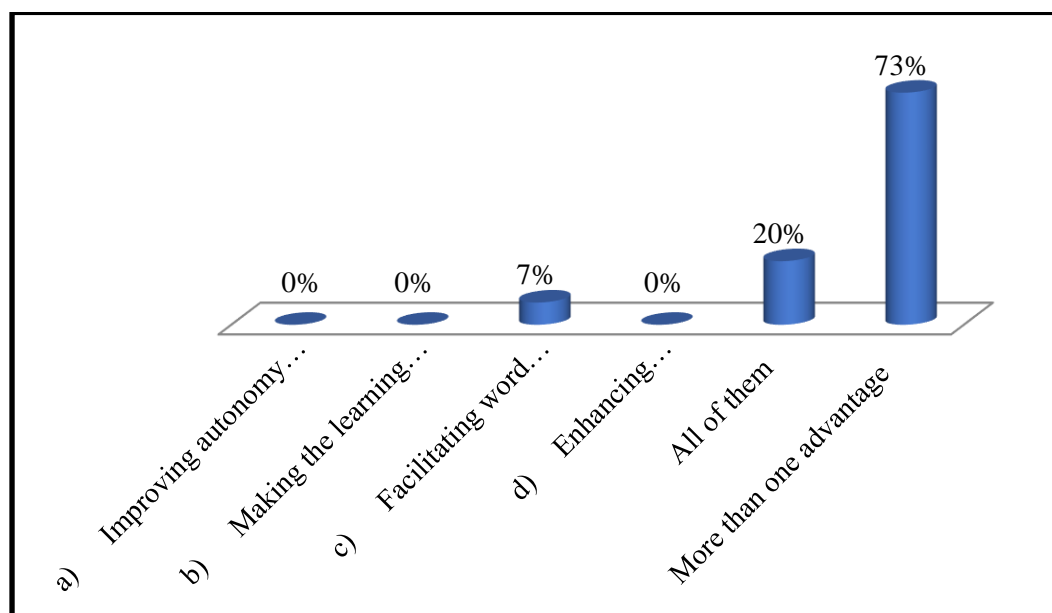
Figure 3.17 Learners' views on the advantages of using mind mapping in technical vocabulary learning

If you have others, please specify them.

- It helps me learn many words in short time.

In this question, learners were asked to evaluate the benefits of employing mind mapping in technical vocabulary learning. It aims to assess the features this technique promotes, such as enhancing autonomy and self-learning, simplifying the learning process, making it effective and interesting, facilitating word visualization and exploration through various visual elements, and improving understanding, retention, and memory recall. Interestingly, based on the table 3.16 and figure 3.17 a significant majority, comprising (73%) of the students, recognized that mind mapping provides more than one advantage in technical vocabulary learning. Moreover, (20%) of the students indicated that they perceive all the qualities that the mind mapping technique can provide. Besides, another participant add that this technique helped him learn large number of words in limited time. These responses can strongly indicate the effectiveness of this approach for learners in the specialized fields.

Section Three: Challenges and additional suggestions

Item 15. Did you encounter any difficulties or limitations while using the mind mapping technique to learn technical vocabulary?

Table 3.19

Learners' responses about the encountered difficulties and limitations in using the mind mapping technique for technical vocabulary learning

Option	Number	Percentage
a) Yes	3	20%
b) No	12	80%
Total	**15**	**100%**
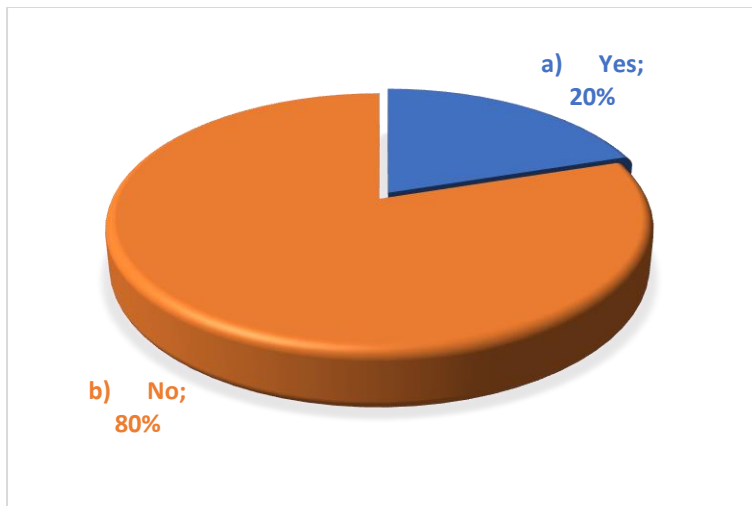
Figure 3.18 Learners' responses about the encountered difficulties and limitations in using the mind mapping technique for technical vocabulary learning

If yes, please describe.

- Organizing the information is difficult

- The details are limited

- The process is time-consuming

From table 3.19 and the accompanying figure 3.18, it is revealed that the vast majority of learners (80%) did not encounter any difficulties while learning through mind mapping. However, three respondents (20%) did indicate facing some challenges during this process. Moreover, the reason behind exploring the learners' descriptions was to allows respondents to further express the obstacles and difficulties they experienced during the learning process, as well as to determines the constraints of the mind mapping approach. While one participant reported challenges in organizing information, another highlighted the limited details, and a third mentioned the time-consuming nature of the process.

Item 16. In your opinion, would it be beneficial to replace traditional teaching strategies by the mind mapping technique for teaching technical vocabulary?

Table 3.20

Learners' standpoints regarding the superiority of mind mapping technique in learning technical vocabulary compared to traditional strategies

Option	Number	Percentage
a) Yes	13	87%
b) No	2	13%
Total	**15**	**100%**
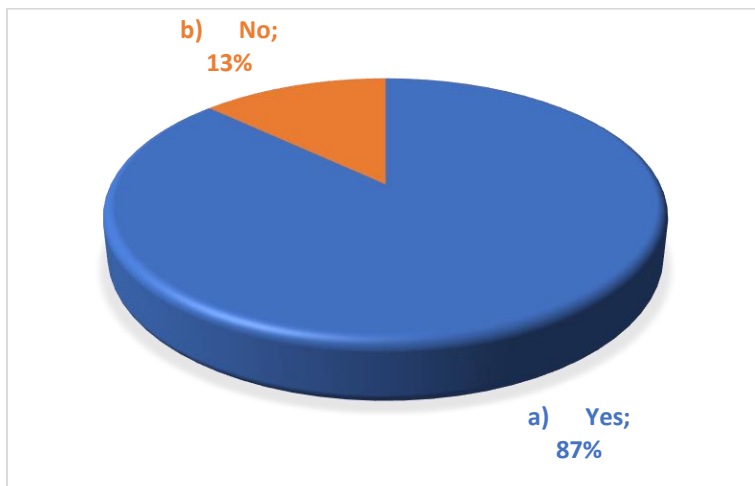
Figure 3.19 Learners' standpoints regarding the superiority of mind mapping technique in learning technical vocabulary compared to traditional strategies

If yes, please justify.

- Mind maps facilitate the comprehension of technical vocabulary specially through pictures.

- I find that using mind maps improves my memorization of technical vocabulary.

- mind mapping makes the learning process more enjoyable, which increase my motivation.

In terms of the learner's perspectives on the effectiveness of mind mapping technique for learning technical vocabulary in contrast to traditional methods, the results in the table 3.20 and figure 3.19 indicates a significant majority of thirteen participants (87%) in agreement. while only two students, comprising (13%), expressed disagreement. This analysis suggests a

dominant preference among learners for utilizing mind mapping as a teaching technique. Also, the exploration of learners' justifications aimed to gain deeper insights into the qualities and benefits learners may experience such as enhancing understanding, boosting memorization and retention, and raising motivation and enjoyment.

Item 17. Do you have any additional comments or suggestions regarding the use of the Mind Mapping technique for enhancing technical vocabulary learning and retention.

This question is included to gather comprehensive feedback from students regarding their experiences with the mind mapping technique for learning technical vocabulary. In addition to evaluating the effectiveness of the method, it aims to capture any additional insights, comments, or suggestions that learners may have. This approach allows to gain a more detailed understanding of the students' perspectives and provides valuable contribution for possible enhancements or adjustments to the teaching strategy. The responses to this question demonstrate a shared agreement among learners regarding the effectiveness of the mind mapping technique for learning technical vocabulary. one learner reported that "it makes technical vocabulary learning process simpler and easier". Other student mentioned that "using colors and pictures in mind maps makes me interested and motivated to study". Another participant stated that "I have noticed a significant improvement in my ability to remember technical terms". Overall, learners' views support the effectiveness of the mind mapping technique for teaching technical vocabulary.

3.4   Teachers' Interview

The Teachers' interview aims to investigate the teaching strategies employed by teachers for technical vocabulary, shedding light on their perspectives regarding the efficacy of mind mapping in this context. Through specific inquiries, it seeks to uncover the methods used, challenges faced, particularly concerning the integration of mind mapping to enhance technical

vocabulary learning and retention and their perceptions about the potential benefits of integrating this approach into their teaching practices.

3.4.1 Administration of the Interview

The interview was conducted on May 12, 2024, in the architecture department, specifically targeting educators in the construction field. This interview was directed to one teacher due to the limited availability of participants. It's necessary to note that the department only consists of two teachers in total.

3.4.2 Piloting and Validating of the Interview

To ensure the clarity, validity, and effectiveness of this interview, It was carefully reviewed by Technical English module teacher as an expert. The teacher provided feedback, indicating that the interview was clear, effective, and suitable for its intended purpose. Besides, this interview received evaluation and confirmation from the supervisor.

3.4.3 Description of the Interview

The teacher's interview includes three sections, each designed to explore different aspects of the teacher's experience and perspectives about the use of mind mapping technique in enhancing Architecture learners' technical vocabulary learning and retention. This semi-structured interview integrates open-ended questions seek to extract detailed responses from teachers, while close-ended questions aim to obtain concise answers from them. The first part gathers information about the teacher's level of teaching, experience duration, and any relevant training in language teaching methodologies. The second part focus is on the teacher's views regarding the importance of technical vocabulary, methods for teaching and assessing it, and challenges students face in learning and retaining such vocabulary. The final section explores the teacher's familiarity with mind mapping, its potential for teaching technical vocabulary, advantages, challenges in implementation, and belief in its effectiveness for improving student learning and retention. (See Appendix 10).

3.4.4 Analysis of the Teachers' Interview

Section One: Background Information

1. What level (s) do you teach as a teacher in the Department of Architecture?

    This question aims to determine the teaching level of the teacher.

The teacher's answer was Master 1 level.

2. How long have you been teaching English at the Department of Architecture?

    By inquiring about the duration of teaching, the researcher seeks to gain comprehensive understanding about the instructor's depth of experience and familiarity with the challenges and requirements associated with teaching English within the architecture discipline.

 The teacher's response was 3 years. It indicates that she is a novice teacher.

3. Have you received any training or professional development related to language teaching methodologies? If yes, would you describe please?

    This inquiry intends to ascertain whether the teacher has acquired any training or engaged in professional development activities to realize the level of preparation and expertise in language teaching methodologies?

    The teacher's reply was negative, stating no prior training or professional development regarding language teaching methodologies.

Section Two: Teachers' Attitudes Towards Technical Vocabulary Learning and Retention

4. How important do you consider technical vocabulary learning and retention in the field of Architecture?

    The reason behind incorporating this question is to measure the importance of technical vocabulary learning and retention in Architecture field.

The teacher replied:

I consider technical vocabulary learning and retention to be crucial in the field of architecture. It not only facilitates communication within the profession but also preparing architecture students for their future careers.

5. What methods or techniques do you currently use to teach technical vocabulary to your students?

This question aims to uncover the specific strategies educators currently utilized in teaching specialized terminology to students.

The teacher answered:

I currently employ text-based materials to teach technical vocabulary to my students.

6. In your opinion, what are the main challenges students face when learning technical vocabulary?

Including this question seek to ask the interviewer to mention the main challenges and obstacles students may face while learning technical vocabulary.

The instructor responded:

The main challenges students face when learning technical vocabulary often revolve around the large volume of terms they need to acquire, difficulties in understanding their meanings, and the struggle to apply them effectively in context.

7. What is your evaluation of the overall level of students' retention concerning technical vocabulary in your courses?

The researcher, through this question, tends to understand teachers' evaluation to their students' retention level regarding technical vocabulary learning in their courses.

The teacher said:

In my assessment, the technical vocabulary retention among students is average, but there is a need for improvement, as it is not meeting expectations.

8. What strategies do you usually employ to help students retain technical vocabulary?

The primary purpose of this inquiry is to explore the strategies teachers use to facilitate students' technical vocabulary retention.

The instructor answered:

I commonly employ group discussions as a strategy to support students in retaining technical vocabulary.

Section Three: Teachers' Opinions about Mind Mapping Technique

9. To what degree are you familiar with the concept of mind mapping?

Through this question, the researcher's objective is to assess the teacher's level of knowledge and experience in using this instructional technique.

The teacher replied:

While I have a basic level of familiarity with mind mapping, but I am not highly experienced in it.

10. Have you ever used mind mapping technique in your teaching?

The researcher tends to recognize whether the teacher has previously utilized the mind mapping technique in teaching.

The interviewer said:

No, I have not used mind mapping technique in my teaching.

11. To what extent do you think mind mapping could enhance and facilitate teaching technical vocabulary?

This question aims to explore the effectiveness of using mind mapping to improve the teaching of technical vocabulary.

The instructor said:

I am not very familiar with, but I think it could help in organizing complex technical vocabulary visually, making it easy to remember them.

12. In your opinion, what advantages does mind mapping technique offer for teaching technical vocabulary?

The researcher seeks to gather the teacher's viewpoints about the strengths of this approach.

The teacher reported:

In my view, mind mapping for teaching technical vocabulary offers visual clarity, encourages active learning, and aids in effective organization and retention.

13. What difficulties or challenges you may face in implementing mind mapping technique in your teaching?

By implementing this question, the researcher attempts to highlight the potential obstacles and difficulties associated with integrating mind mapping technique into teaching.

The instructor claimed:

I think that one of the primary challenges I may face is students' resistance or unfamiliarity with the mind mapping technique.

14. From your standpoint, do you believe that using mind mapping technique could improve students' learning and retention of technical vocabulary?

The main focus of this inquiry is to reveal teachers' insights and perceptions regarding whether mind mapping technique could improve students' learning and retention of technical vocabulary.

The teacher stated:

As I have mentioned before, I'm not very familiar with mind mapping, but I believe it can aid students in learning and retaining technical vocabulary. However, I'd need more experience to confirm its effectiveness.

3.5   Discussion of the Results

3.5.1   Discussion Results of the Quasi- Experiment

Based on the results acquired from this study, it is clear that while both groups showed improvement, the experimental group revealed more considerable progress. Notably, the data collected from the quasi-experiment highlighted a considerable difference in the post-test scores between the experimental and control groups, with the former displaying significantly higher scores, showing a difference of (3.30) in means. Also, a variation in the means was clear, with the experimental group presenting a difference of (4.88) between the pretest and post-test means, while the control group showed only a (1.33) difference. The significance value of both groups was below the alpha level (.001 < 0.05), providing strong evidence to reject the null hypothesis and support the alternative hypothesis.

Furthermore, Learners in the experimental group not only attained better scores but also presented a remarkable ability to quickly and effectively comprehend technical vocabulary. This can underscore the positive impact of mind mapping techniques on the learners' field-related vocabulary acquisition and recall and highlight the numerous advantages of employing mind mapping strategy in instruction. Moreover, the simplicity with which learners in the experimental group developed their technical vocabulary underlined the flexibility and accessibility of this creative approach. Therefore, implementing mind mapping technique can offer teachers a powerful tool to enhance learning outcomes and boost learners' vocabulary learning and retention in specialized fields.

3.5.2   Discussion Results of Students' Questionnaire

The analysis of the students' questionnaire revealed that the majority of the students positively encouraged the use of mind mapping technique for improving technical vocabulary learning and retention. They reported that mind mapping made the learning process more enjoyable and engaging, facilitated comprehension of technical vocabulary through visual aids,

and improved memory retention. In addition, learners recognized that this approach may enhance their learning experience by enriching their technical terminology. Hence, the student's questionnaire provided valuable insights into learners' perceptions of the effectiveness of mind mapping for learning technical vocabulary. In conclusion, the positive feedback suggests that mind mapping has the potential to be a valuable tool in enhancing vocabulary learning in technical fields and disciplines.

3.5.3 Discussion Results of Teachers' Interview

The data collected from the teacher's interview responses shed light on their perspective regarding the potential efficacy of the mind mapping technique in enhancing student learning and retention of technical vocabulary. Moreover, the teacher expressed optimism about the technique's benefits, despite their limited familiarity with it. Also, it was noted that mind maps can encourage active learning, facilitate effective organization of ideas, and promote better understanding and recall of technical terms. In addition, the teacher highlighted the need for specific training to effectively integrate mind mapping into their teaching practices. To conclude, we can infer that teachers have positive views about the implementation of mind mapping technique in teaching technical vocabulary.

3.6 Findings and Results

The primary aim of this research was to examine the effect of mind mapping technique in enhancing technical vocabulary learning and retention. This involved investigating how the utilization of mind maps may influence students' comprehension, retention, and memory recall of technical terms over time. Besides, this study intended to investigate the views and perspectives of learners and teachers regarding the incorporation of mind mapping strategy. This study adopted was a mixed-methods approach to gather comprehensive data. This approach combines quantitative techniques, such as quasi-experimental design, with qualitative methods, including questionnaires for learners and interviews for teachers. The

researcher aimed to capture the rich qualitative insights provided by participants' responses concerning the effectiveness, challenges, and potential benefits associated with integrating mind maps.

Moreover, in relation to the research questions, the first one which is, To what extent the use of mind mapping technique affects learners' technical vocabulary learning and retention? this question sought to assess the impact of employing mind mapping on learners' acquisition and retention of technical terms. The data gathered from quasi-experimentation underscored a significant difference in the post-test scores between the experimental and control groups, in which the former exhibited notably higher scores with a difference value of (3,30) in means. Moreover, a variation in the means was evident, with the experimental group demonstrating a difference of (4.88) between the pretest and post-test means, whereas the control group showed only a (1.33) difference. Also, The result of the significance value of both groups was less than the alpha (.001<0.05) which is strong evidence to reject the null hypothesis and to confirm the alternative hypothesis.

Furthermore, these variations suggested a direct relationship between the implementation of the mind mapping technique and improved technical vocabulary learning and retention. The observed relationship between the dependent variable (technical vocabulary learning and retention), and the independent variable (the mind mapping technique), indicated that the intervention itself was responsible for the observed effects and not from external factors or due to chance. Therefore, based on the statistical analysis, it can be inferred that the intervention had a substantial impact on the experimental group, which can strongly validate the first hypothesis concerning the efficacy of the mind-mapping technique in enhancing technical vocabulary learning and retention.

Moreover, the aim of the second research question which is, What are the teachers and learners' views and perceptions about the use of mind mapping technique in enhancing

technical vocabulary learning and retention, was to explore the attitudes, opinions, and perspectives of both teachers and learners regarding the use of the mind-mapping technique in enhancing technical vocabulary learning and retention, as well as to gain insights into the potential benefits offered by this approach. Indeed, based on the findings from learners' questionnaire, and teachers' interview responses, positive perspectives observed among both teachers and learners toward the use of mind-mapping techniques in enhancing technical vocabulary learning and retention. Therefore, this can validate the second hypothesis which suggested that teachers and learners maintain positive attitudes towards the utilization of mind-mapping techniques for enhancing technical vocabulary learning and retention.

Accordingly, the research results can significantly confirm the alternative hypothesis; The use of mind mapping technique may enhance technical vocabulary learning and retention.

Conclusion

This chapter focused on the analysis and evaluation of the findings. Additionally, it presented a theoretical background of the chosen methodology of research. Then, data were gathered using three different tools; quasi-experimentation, students' questionnaire, and teachers' interview. The results from these instruments were analyzed and discussed in detail to confirm the proposed hypothesis. Thus, this investigation led to significant conclusions that can affirm the efficacy of mind mapping techniques for improving technical vocabulary learning and retention.

Suggestions and Recommendations

- Special attention should be given to technical vocabulary, as it significantly contributes to the development of academic and professional competence through the acquisition of specialized terms.

- Implementing mind mapping technique, as reported by teachers, can significantly improve the acquisition, comprehension, and memory retention of technical vocabulary.

- Considering learners' perspectives, integrating mind mapping approach into instruction can increase the visual attractiveness, interest, motivation, and efficacy of technical terms learning and recall.

- Incorporating mind mapping activities into lesson plans can make technical vocabulary learning more enjoyable and engaging for students.

- Learners can enhance their proficiency in using technical vocabulary in context through reading, writing, listening and speaking exercises.

- Learners must take responsibility of their own learning of technical vocabulary, along with teacher' instruction.

- Teachers are advised to change from traditional teaching and to adopt more innovative approaches.

- Teacher should adopt a culture of sharing their teaching experiences and methodologies for continuous pedagogical improvement.

- Before determining teaching techniques, teachers should take into regard the learners' styles, needs, and interests.

- Teachers need comprehensive training in teaching methodologies to enhance their instructional strategies and pedagogical approaches.

- Specialized training is essential for educators to utilize mind mapping techniques proficiently in teaching technical terms.

General Conclusion

General Conclusion

In current society, technical English proficiency becomes crucial for success in various disciplines and domains. Technical vocabulary forms the foundation of effective communication, enabling individuals to express their ideas clearly and efficiently. Due to this significance, this research focuses on examining the effectiveness of mind mapping technique in enhancing technical vocabulary learning and retention. Besides, This study aims to provide valuable insights about learners' and teachers' views regarding the efficacy of integrating this approach for the improvement of specialized terms acquisition and recall. Therefore, the investigation is conducted to validate or reject the research hypothesis, and to find answers to the research questions.

This study is composed of three interconnected chapters. The first two chapters focused on presenting the literature review. In the first chapter, the researcher tends to highlight the essential aspects of technical vocabulary, learning, retention. Moreover, the second chapter main concern is the mind mapping technique and its applications in teaching. While the third chapter is about the methodology adopted in the study, the data collection tools used, as well as specific suggestions and recommendations.

Further, In order to collect data and test hypothesis this research involves a mixed-methods approach, combining both quantitative and qualitative research techniques to gather comprehensive data and insights. The researcher incorporates three research instruments. To begin with, the quasi-experiment implemented in two groups with a pre-test, treatment, and a post-test. Along with semi-structured questionnaires distributed to learners and semi-structured interviews conducted with teachers. These assessments are focused on architecture departments, particularly the construction branch, to explore both learners and teachers attitudes and perspectives about improving technical vocabulary learning and retention through mind mapping.

Finally, the analysis of data from statistical and graphical illustrations indicated a remarkable improvement in the posttest scores of the experimental group, which can prove the efficacy of the intervention. The questionnaire revealed a strong preference for the mind mapping technique among participants, indicating its practicality over conventional learning methods. Despite potential challenges in implementing new educational technologies, teachers interviewed expressed satisfaction with the technique's efficacy, and demonstrated optimistic attitudes and perspectives regarding improving technical vocabulary learning and retention through the proposed approach.

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Appendices

Appendix 1: The Students' Pretest

Pretest

Student's full name: …………………………………………….

Exercise 1: name these pictures correctly.

…………………… ………………….. …………………… …………………..

Exercise 2: from the following list of words fill in the blanks:

a. cement   /b. foundation   /c. the building site   /d. steel   /e. hard hat   /f. concrete

/g. build   / h. blueprint   /i. broken   /j. sand   /k. brick

1………………………..is a strong building material made from mixing cement, sand, and water.

2.The house was secured by a strong wall made of……………………….

3.The construction workers used ……………………….bars to build the house foundation.

4………………………..means to construct or institute something.

5.Before constructing the foundation, the building crew laid the soil with……………………

6…………………………is a powder that, when mixed with water forms a paste used in building.

7.There was a ………………………. window in the working place.

8.At…………………………, the construction workers were busy finishing the new project.

Exercise 3: tick √ the correct answer from the options provided.

1.Foundation is:

☐ A type of construction material utilized in covering walls.

☐ The base for a building or construction.

☐ A kind of safety equipment used for protecting construction workers.

2.Circular saw is used for:

☐ Measuring distances.

☐ Fixing loose nails.

☐ Cutting wood and other materials.

3.What should the carpenter do before cutting the wooden board?

☐ Clean it.

☐ Measure it.

☐ Check it.

4.Excavators are used in:

☐ Earth digging.

☐ Road paving.

☐ Concrete mixing.

5.Hard hat is designed for:

☐ Protecting hands from injuries.

☐ Covering eyes from dust.

☐ Keeping heads safe.

6.What does 'decorative' mean in construction.

☐ Strong, moldable substance.

☐ Long-lasting, durable materials.

☐ Adding beautiful attractive features.

Exercise 4: match each word with its definition.

Concrete mixer
Waterproof
Ceramic tile
Scaffolding
To mold
Blueprint

Impermeable
Flooring material
To shape
Construction plan
Blending machine
Construction support structure

Appendix 2: The Treatment Lesson N° 01

Sand
A granular substance made of rocks and minerals that had been finely divided.
Before laying the foundation, the construction crew leveled the ground with sand.

Stone
Is a hard, solid material that is usually found in the soil.
Builders use a mixture of stone, sand, and cement to make a strong foundation.

Cement
Cement is a powder that is created by calcining lime and dye and then adding water to create a paste that gradually solidifies.
The bricks were joined together to form a strong wall using cement.

Glass
Is a hard, transparent, and brittle material composed primarily of silica.
Glass is widely used in modern construction for its beautiful appearance

Broken
It describe something that is damaged or not working effectively.
Before the house could be occupied, the broken window needed to be replaced.

Destroy
To cause unreparable harm or destruction to something.
In order to open the way for a new construction project, the demolition crew will destroy the old building.

Building Site
Is where structures, such as houses and buildings, are being built.
At the building site, the construction crew was occupied, laying the foundation for the new factory.

Construction Vocabulary Lesson 1

Steel
Is a robust, durable metal that is widely utilized in building.
The building workers used steel bars to strengthen the foundation.

Wood
Is a hard, fibrous substance derived from trees that is utilized in construction and furniture fabrication.
The roof of the house was supported by wooden beams.

Concrete
Is water, sand, and cement combined to create a mixture that solidifies into a strong, long-lasting substance.
To provide a sturdy base for the building, concrete was poured into the foundation.

Brick
Is a rectangular block used to construct walls and is usually composed of clay or another material.
property was well protected by a strong wall made of brick.

Plastic
A Synthetic material from polymers, shaped when heated. Widely used for its durability
Plastic piping systems are popular for their durability and ease of installation.

Solid
Used to describe components that are sturdy and not easily broken.
The building relies on solid brick walls for strong and durable support.

Build
To construct or form something
The construction crew worked hard to build the new office.

Construction Engeneer
A construction engineer is a project leader responsible for the design and construction of civil engineering projects.
The construction engineer was providing work instructions to the building crew.

Is an instrument for drilling holes in several materials, such as wood, metal,

Power Drill

New light sockets were installed by the electrician using a power drill

A handhold tool used for applying and smoothing meterials such as concrete.

Trowel

The builder uses a trowel to apply mortar when lying bricks or tiles.

Pointed metal pins for joining materials.

Nails

Nails are used for hanging pictures or fixing loose boards.

Is a safety helmet for construction workers. We're to protect their heads from workplace accidents.

Hard HAT

The examination of the construction site, the engineer was wearing a hard hat.

Is a small handheld device used for lighting dark places.

Flashlight

The worker used a flashlight to see in the dark areas of the building.

Is to plan, organize, and produce something based on detailed requirements.

Design

The new hospital building blueprint was designed by the architect.

It means something that provides protection and safety from harm.

Protective

The workers wear hard hats. To ensure protection

Construction Vocabulary Lesson 2

Circular Saw

An instrument used for cutting various materials such as wood, metal, plastic,

Builders used a circular saw to cut the wooden beams

Hammer

A hammer is a hand-held metal tool that is used to drive nails into materials such as wood.

The construction worker used a hammer to repair loose nails on the rooftop.

Shovel

Is a hand tool used for digging and moving materials such as ground.

Construction workers use shovels to prepare the building site.

Ledder

A vertical device for reaching higher places.

A painter uses a ladder to reach high areas of a wall for painting.

gloves

Handwear for protection, usually made of fabric or leather

Construction workers wear gloves to protect their hands from accidents.

Foundation

Is the base of a building that provides it with support, strength, and stability.

Construction team poured concrete to create the foundation of the new house.

Measure

Using a measuring device to determine the size, quantity, or extent of something,

The carpenter measured the wooden board's length before cutting it.

Decorative

It refers to the elements and features added to enhance the appearnce of something.

The old flooring was replaced with beautiful decorative tiles.

Construction Vocabulary Lesson 3

Dump Truck
- A vehicle used for transporting materials in construction sites, such as soil
- Dump trucks are essential for construction and building opperations.

Ceramic Tile
- A material used for walls or floors made of clay fired at high temperatures.
- The mosaic ceramic tiles around the fireplace beautify the house.

Scaffolding
- A temporary framework that allows workers to reach elevated places.
- During construction projects, workers use scaffolding for house construction.

Barricade
- An obstacle used to close off a road or prevent entry for safety.
- Along the construction work, a barricade was placed there to ensure safety.

Network piping
- A system of pipes installed to transport water or gas to buildings.
- The plumber installed the network piping at the new hospital.

Mold
- To give something a specific shape or form.
- The concrete worker molds the liquid concrete into beautiful sculptures.

Waterproof
- It means something can resist water and humidity.
- Concrete is a solid, durable, waterproof material used in construction.

Excavator
- A heavy excavation machine for digging, demolition, and moving earth.
- In order to dig and prepare the ground for the foundation of the new building, the construction crew uses an excavator.

Concrete Mixer
- A machine used to mix cement, sand, and water to form concrete.
- The construction crew used a concrete mixer to pour the needed quantity of concrete for the project.

Blueprint
- A comprehensive, precise, and well-detailed plan or design for a construction project.
- The architect was explaining the blueprint of the new house to the building crew before starting construction.

Trafic Cone
- A cone-shaped sign used for guiding traffic in different directions or warning of danger.
- The road construction team Place traffic cones around the whole area to warn drivers.

High-visibility Reflective Vest
- They are brightly colored vests that construction workers wear to stay safe and visible.
- Wearing high-visibility reflective vests in construction sites is essential for safety.

Electrical Wiring
- The network of wires and cables installed in buildings to distribute electricity.
- The electrician carefully installed the electrical wiring throughout the house.

Lay
- To set something in a flat position.
- Before pouring the concrete foundation, the workers laid the sand.

Hazardouz
- Means something that may cause danger or harm.
- To reduce hazardous accidents, workers need to wear all their protective equipment.

Appendix 5: The Non-experimental Group Lesson N° 01

Text Reading

<center>Building Materials</center>

Construction relies on a diverse range of materials to build durable and reliable structures. Understanding the fundamental materials used in construction is essential for ensuring the integrity and safety of buildings.

When constructing buildings, various materials are used to create sturdy structures. sand, stone, and concrete are essential for providing a strong foundation. Cement helps to hold these materials together strongly. Steel adds extra strength, while wood and bricks are commonly used for framing and walls. Plastic is also used in construction, offering flexibility and isolation. Construction engineers manage the building process on construction sites, ensuring everything is assembled correctly and meets safety standards. Unfortunately, accidents can happen, leading to damage or breaking of materials, including glass, which is used for its transparency and looks. Despite these challenges, construction engineers work hard to create safe and reliable structures.

In conclusion, the successful accomplishment of construction projects relies on deep understanding of the materials used and their specific roles. From foundational materials like sand and concrete to reinforcement materials like steel, each component plays a crucial role in creating safe and durable structures.

Appendix 6: The Non-experimental Group Lesson N° 02

Text Reading

Construction Tools and Equipment

Construction relies on a combination of tools, equipment, and materials to create sturdy and functional structures. Explaining the components of construction and highlighting their roles is crucial for the construction process.

In construction, tools like the power drill, circular saw, and hammer are required for cutting, drilling, and attaching materials. The trowel is essential for applying and smoothing mortar or plaster, while the shovel assists in digging and moving materials. Nails fix various components together, ensuring structural solidity. Safety equipment, such as the hard hat, gloves, and protective glasses, protects workers from potential hazards. The ladder provides access to elevated areas, while a flashlight aids visibility in dark spaces. Foundation design and measurement are crucial stages in construction, laying the groundwork for a stable structure. While decorative elements add aesthetic appeal to the finished project, enhancing its overall appearance.

To sum up, understanding the importance of tools, equipment, and materials is essential for successful construction projects.

Appendix 7: Non-experimental Group Lesson N° 03

Text Reading

Construction Machinery and Safety Measures

Construction sites are dynamic environments where several tools, equipment, and materials are employed to bring architectural visions to life. Exploring the key components of construction, from machinery to safety measures is essential for the building process.

In construction, machinery like the excavator, dump truck, and concrete mixer are vital for material handling and mixing, boosting efficiency on construction sites. Ceramic tiles and scaffolding enhance surfaces and provide safe access for workers. Safety measures, including traffic cones and high-visibility vests, ensure worker security, while utilities like network piping and electrical wiring are essential for building functionality. Waterproofing through laying and molding protects against water damage and extends building existence.

To conclude, Construction is a complex endeavour that requires particular combination of tools, equipment, and materials. From heavy machinery to safety protocols, every component plays a crucial role in shaping the building project.

Appendix 8: The Students' Posttest

Posttest

Student's full name:……………………………………….

Exercise 1: give the pictures the correct name

…………………..   …………………..   …………………..   ………..………
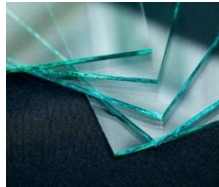
Exercise 2: from the following list of words fill in the blanks:

> a. build /b. flashlight /c. protective /d. hazardous /e. destroy /f. lay /g. traffic cones /h. high-
> visibility reflective vest/i. design /j. construction engineer /k. hammer

1…………….is a project manager who oversees the planning and development of

construction projects.

2.The demolition crew will ………….. the old buildings to eliminate the danger of collapse.

3.The construction workers indicate the building zone with   ……………

4…………….is a metal hand tool used for breaking things and driving nails.

5.The architect will ……………the blueprint for the new hospital.

6…………….is a handheld device used for illuminating dark places.

7.The construction team will …………….a skyscraper.

8.the use of …………… equipment on building sites is essential.

Exercise 3: determine whether each statement is true (T) or false (F).

1	Flashlight is a tool used for making holes in a verity of materials, including metal, wood, and plastic.	…………..
2	Builders may use barricades to prevent access into the construction areas.	…………..
3	Construction sites are hazardous places due to the occurrence of accidents.	…………..
4	The plumber cautiously installed the electrical wiring throughout the house.	…………..
5	Hammer is a small device used for illuminating dim spaces.	…………..
6	The construction worker utilizes a tape measure to determine the size of the window.	…………..
7	The electrician fixed the network piping after finding a leak	…………..
8	The high-visibility reflective vests are sturdy footwear for construction workers.	…………..
9	Building crew wearing protective gear to reduce the danger of construction site accidents.	…………..
10	The painter is responsible for applying paint to different surfaces.	…………..
11	Trowels are used for digging and demolishing various sites and constructions.	…………..
12	The welder is an expert in welding metal objects together.	…………..

Exercise 4: match each word with its definition.

Barricade
Network piping
Hazardous
High-visibility reflective vest
Electrical wiring
To lay

Unsafe environment
Access restriction
Protective gear
Wiring system
Place horizontally
Gas and water distribution

Appendix 9: The Students' Questionnaire

Students' Questionnaire

Dear students,

This questionnaire is a part of a research work. It intends to investigate students' attitudes towards the effectiveness of using Mind Mapping technique in enhancing their technical vocabulary learning and retention in the Department of Architecture. You are kindly requested to answer the following questions by putting a tick (√) in the appropriate box and providing your comments where necessary. Your contribution will be invaluable in completing the research work. We guarantee that all information obtained will be kept confidential and anonymous. Thank you in advance for your responses.

Section One: Technical Vocabulary Learning and Retention

1. In your opinion, what is the main aspect you focus on when learning a foreign language?

☐ Mastering pronunciation

☐ Learning grammar rules

☐ Building a diverse vocabulary

☐ All of the above

2. To what degree is learning technical vocabulary important in your field of study?

☐ Very important

☐ Important

☐ Not important

☐ Not important at all

3. What kind of difficulties you may face when learning technical vocabulary?

☐ Pronunciation

☐ Meaning

☐ Spelling

☐ Grammar

If you have others, please state them.

…………………………………………………………………………………………………

…………………………………………………………………………………………………

4. Why do you think you need strong vocabulary related to your field of study? (You may choose more than one option).

☐ For effective communication in the field

☐ For better career opportunities

☐ For achieving success in assignments and exams that require English language competency

☐ For reading and comprehending, articles, academic journals, and research papers

☐ For writing reports and thesis

If you have others, please introduce them.

…………………………………………………………………………………………………

…………………………………………………………………………………………………

5. In your view, is it necessary to focus on retaining new vocabulary when learning English language?

☐   Strongly agree

☐   Agree

☐   Disagree

☐   Strongly disagree

Please, provide your justification.

………

………

6. In terms of your technical vocabulary retention, how satisfied are you?

☐   Very satisfied

☐   Satisfied

☐   Dissatisfied

☐   Very dissatisfied

7. In your experience, what are the main factors that may hinder your ability to retain technical vocabulary?

☐   Lack of comprehension

☐   Insufficient background knowledge

☐   Poor memory strategies

☐   Ineffective teaching techniques

If you have additional factors, please mention them.

……

……

8. Which of the following stages do you find more challenging with regard to technical vocabulary?

☐ Acquisition

☐ Understanding meaning

☐ Usage in context

Please, explain.

……

……

Section Two: Mind Mapping technique and Teaching

9. From your standpoint, do teaching strategies affect your understanding and retention of the lesson?

☐ Yes

☐ No

If yes, say how.

……

……

10. What strategies do you rely on in learning and retaining new technical vocabulary ?

☐ Repetition and review

☐   Vocabulary lists

☐   Contextual guessing

☐   Mind mapping

11. If you use mind mapping technique, how often do you use it for learning technical vocabulary?

☐   Rarely

☐   Sometimes

☐   Often

☐   Always

12. To what degree was the technical vocabulary introduced in the researcher's sessions relevant to construction?

☐   Very relevant

☐   Somewhat relevant

☐   Not very relevant

☐   Not relevant at all

13. From your perspective, how helpful did you find the mind mapping technique in learning and remembering vocabulary related to construction during the researcher's sessions?

☐   Very helpful

☐   Slightly helpful

☐   Not helpful

☐ Not helpful at all

Please, justify.

………

……….

14. What advantages does mind mapping offer in terms of technical vocabulary learning?

☐ Improving autonomy and self-learning

☐ Making the learning process simple, effective and interesting

☐ Facilitating word visualization, and exploration through pictures, colours, and shapes

☐ Enhancing understanding, retention, and memory recall

If you have others, please specify them.

………

………

Section Three: Challenges and additional suggestions

15. Did you encounter any difficulties or limitations while using the mind mapping technique

to learn technical vocabulary?

☐ Yes

☐ No

If yes, please describe.

…………………………………………………………………………………………

…………………………………………………………………………………………

16. In your opinion, would it be beneficial to replace traditional teaching techniques by the mind mapping technique for teaching technical vocabulary?

☐   Yes

☐   No

If yes, please provide your explanation.

…………………………………………………………………………………………

…………………………………………………………………………………………

17. Do you have any additional comments or suggestions regarding the use of the mind mapping technique for enhancing technical vocabulary learning and retention?

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Thanks for Your Time and Collaboration

Appendix 10: The Teachers' Interview

Teachers' Interview

Dear Teachers,

This interview intends to investigate your attitudes towards the effectiveness of using mind mapping techniques in enhancing Architecture learners' technical vocabulary learning and retention. Your valuable insights are highly valued and will greatly contribute to our research. Thank you in advance for your collaboration.

Section One: Background Information

1. What level (s) do you teach as a teacher in the Department of Architecture?

2. How long have you been teaching English at the Department of Architecture?

3. Have you received any training or professional development related to language teaching methodologies? If yes, would you describe please?

Section Two: Teachers' Attitudes Towards Technical Vocabulary Learning and Retention

4. How important do you consider technical vocabulary learning and retention in the field of architecture?

5. What methods or techniques do you currently use to teach technical vocabulary to your students?

6. In your opinion, what are the main challenges students face when learning technical vocabulary?

7. How do you assess students' retention of technical vocabulary in your courses?

8. What strategies do you usually employ to help students retain technical vocabulary?

Section Three: Teachers' Opinions about Mind Mapping Technique

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9. To what degree are you familiar with the concept of mind mapping?

10. Have you ever used mind mapping technique in your teaching?

11. To what extent do you think mind mapping could enhance and facilitate teaching technical vocabulary?

12. In your opinion, what advantages does mind mapping technique offer for teaching technical vocabulary?

13. What difficulties or challenges you may face in implementing mind mapping technique in your teaching?

14. From your standpoint, do you believe that using mind mapping technique could improve students' learning and retention of technical vocabulary?

Thank You for Your Time and Collaboration

الملخص

في مختلف المجالات والتخصصات ، يعد إتقان المفردات التقنية أمرا ضروريا بشكل متزايد لتحقيق الكفاءة في اللغة الإنجليزية التقنية. بالنسبة للمعلمين ، يمكن أن يسهل الأساس القوي للمصطلحات الفنية تعليما أكثر وضوحا ، بينما بالنسبة للمتعلمين ، قد يعزز فهم الدروس بشكل كبير. على الرغم من ذلك، غالبا ما يعاني معظم المتعلمين الجامعيين الجزائريين من اكتساب المفردات التقنية والاحتفاظ بها، ويرجع ذلك أساسا إلى تقنيات التدريس التقليدية. لذلك هدفت الدراسة الحالية إلى تقييم فعالية تطبيق تقنية الخرائط الذهنية لتحسين تعلم المفردات التقنية والاحتفاظ بها، خاصة بين طلبة الماجستير 1 في قسم الهندسة المعمارية بجامعة بسكرة. ومن أجل تحقيق هذا الهدف، تم اختيار نهج مختلط الأساليب يتضمن تصميم مسح يستوعبه التجريب التجريبي. أجريت الاختبارات القبلية والبعدية لكل من المجموعة التجريبية (ن = 15) والمجموعة الضابطة (ن = 15). بالإضافة إلى ذلك ، ومن خلال استبيان شبه منظم ، تم جمع التعليقات من المشاركين في نفس المجموعة التجريبية (ن = 15) ، الذين تلقوا تعليمات قائمة على الخرائط الذهنية. نظرا لأن العدد الإجمالي للمعلمين كان مقصورا على اثنين ، قدم معلم واحد فقط (ن = 1) رؤى من خلال مقابلة شبه منظمة. وأكدت النتائج، كما سبقت، فعالية النهج الموصى به، على النحو الذي يدعمه التحليل الإحصائي. ومن اللافت للنظر أن درجات الاختبار البعدي للمجموعة التجريبية تجاوزت تلك الخاصة بالمجموعة الضابطة بقيمة فرق (3.30) في المتوسطات. علاوة على ذلك ، كان الاختلاف في الوسائل واضحا ، حيث أظهرت المجموعة التجريبية فرقا قدره (4.88) بين الوسيلة الأقرب وطريقة الاختبار البعدي ، بينما أظهرت المجموعة الضابطة فرقا (1.33) فقط. كانت نتائج قيمة الدلالة لكلا المجموعتين أقل من ألفا (0.01.>0.05) ، وهو دليل قوي على رفض فرضية العدم و تأكيد الفرضية البديلة. إلى جانب ذلك ، يعكس كل من المعلمين والمتعلمين مواقف داخلية وإيجابية تجاه رسم الخرائط الذهنية. يمكن أن يشير هذا إلى التطبيق العملي لتقنية رسم الخرائط الذهنية في تحسين تعلم المفردات التقنية للطلاب والاحتفاظ بها.