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Technical Vocabulary Teaching/Learning Strategies:

Case study Master One students at the Department of Computer Science / M'sila University

Dissertation Submitted to the Department of English in Partial Fulfilment of the Requirements for the Master's Degree

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Abstract

"Technical Vocabulary Teaching/Learning Strategies" is the topic of this research work. It attempts to examine the common used strategies of teaching and learning technical vocabulary among M1 computer science students and teachers at M'sila University, as well as, to investigate students' awareness about strategies and teachers' performance. In this descriptive study, the data are collected through two questionnaires; the first questionnaire was administered to 40 computer science students and entails five categories based on Schmitt's Taxonomy (1997). The second one, teachers' questionnaire was administered to 10 teachers from different faculties. The data obtained were analysed by using SPSS version 26. The findings showed that M1 computer science students are not fully aware of the importance of TVLSs. Moreover, they do use TVLSs on a moderate level, because they lack knowledge of some strategies. More importantly, they tend to use strategy under different preferences; metacognitive strategies were the most used, while cognitive strategies were the least favourable and within the same group, they deploy some strategies more than others do. On the other hand, teachers stated that they do utilize TVTSs presenting a diverse range of preferences; definitions, synonyms and antonyms, repetition, context clues, dictionary use, translation, visuals and realia, the word parts and using games, although majority of them had not training in teaching ETV. Finally, the study recommends raising students' awareness of the existing strategies.

Key Words: Technical Vocabulary, Teaching Strategies and Learning Strategies.

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List of Abbreviation and Acronyms

ESP	English For Specific Purposes
ETV	English Technical Vocabulary
TVLSs	Technical Vocabulary Learning Strategies
TVTSs	Technical Vocabulary Teaching Strategies
L2	Second Language
DVTSs	Direct Vocabulary Teaching Strategies
IVTSs	Indirect Vocabulary Teaching Strategies
N°	Number
M	Mean
SD	Standard Deviation
Freq	Frequency
%	Percentage
M1	Master One
SPSS	Statistical Package for The Social Science

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General Introduction

1. Introduction

ESP becomes essential to cope with developments in different domains, such as medicine, computer science and engineering. Researchers(e.g., Atay and Ozbulgan, 2007; Williams, 1985; Zahran, 2017; Nwokolo, 2020; Al Zahrani and Chaudhary, 2022; Duong, 2022) have conducted studies to determine effective teaching approaches and learning strategies for ESP learners. Nation (2001) has indicated that understanding the discipline is tied with comprehending technical vocabularies. Therefore, there is a need to prepare learners to deal with them due to the fact that specialized texts contain large numbers of them.

The importance of technical vocabulary is stressed by many researchers (e.g., Woodward-Kron, 2008; Chung & Nation, 2004; Lei & Liu, 2019). Coxhead provides two reasons (2013). First, drawing on research by Woodward-Kron (2008), she states that "students' knowledge of a discipline is closely tied to the specialized language of that discipline" (p. 246). Second, students can show belonging to that community by comprehending its special purposes vocabulary (Coxhead, 2013, p.116).

Teaching and learning specialized vocabulary pose challenges for both teachers and learners due to their size and complexity in technical disciplines, applying strategies become crucial and demanded. Nation (2001) believes that a large amount of vocabulary can be acquired with the help of VLSs.

Having said that, Students' awareness and effective use of technical vocabulary learning strategies enhance their linguistic skills, autonomy, and motivation, which in turn allows them to develop personal learning strategies. Oxford(1990) states that "More highly motivated Learners use a significantly greater range of appropriate strategies than do less motivated learners"(p.13).This may influence both their acquisition and their academic socialization. However this area of research has not received much scholarly attention and many strategies are non-observable. Moreover, the study seeks to investigate teachers and learners use of technical vocabulary teaching and learning strategies in terms of achieving teachers' goals and students' needs in a particular discipline, writing technical essays, or participating in subject specific meetings.

2. Research Problem and Hypotheses

It has been proven that teaching/learning technical vocabulary poses a challenge for English language teachers/learners especially in ESP contexts. As such, it is important to accurately decide what vocabulary will be selected for teaching and what techniques or activities will be used to teach and learn.

Technical vocabulary constitutes a very significant and required knowledge for those teachers who are teaching ESP as well as for students. Therefore, the problem raised in this research is what strategies are used by ESP teachers/students to teach/learn technical vocabulary.

Thus, it is hypothesized that:

1) M1 computer science students may not be fully aware of the importance of TVLSs.

2) M1 computer science students at Mohamed Boudiaf University are medium TVLSs users.

3) Teachers and M1 computer science students at Mohamed Boudiaf University use strategies to teach/learn vocabulary.

4) Teachers and M1 computer science students at Mohamed Boudiaf University deploy some technical vocabulary teaching/learning strategies more than other ones.

3. Significance of the Study

The significance of vocabulary knowledge clearly manifests itself in developing language proficiency process. Therefore, in the scope of ESP, developing technical vocabulary size and knowledge is becoming an interesting procedure for both second language learners and teachers. This research work examines TVTSs / TVLSs that will be beneficial especially in ESP courses. Teachers will make better decisions regarding teaching English technical vocabulary (ETV) by selecting the appropriate strategies on the other hand students' awareness of TVLSs will be raised.

4. Research Questions

This research aims to answer the following questions:

1. Are M1 computer science students aware of the importance of using TVLSs?
2. Are M1 computer science students, high, medium, or low TVLSs users?
3. What are the strategies used by students to learn technical vocabulary?
4. What are the strategies used by teachers to teach technical vocabulary?

5. Objectives of the Study

The main objective of this study is to investigate technical vocabulary teaching strategies (TVTSs) / technical vocabulary learning strategies (TVLSs) used in teaching and learning technical vocabulary at M'sila University. Moreover, this research attempts to examine M1 computer science students' awareness in

addition to their level in using TVLSs. Furthermore, it is crucial to offer insights into the primary strategies employed by teachers to teach specialized words and the key strategies utilized by learners to acquire them.

6.Research method

The current study aims to investigate teachers' and students' used strategies technical vocabulary for teaching/learning. It uses a descriptive method which is conducted through administering online questionnaires for both teachers and students. The questionnaires will be formed to verify the variety of TVTSs and TVLSs teachers and students employ in technical settings to enhance their specialized language in such contexts. The results were analysed quantitatively and qualitatively using SPSS (Statistical Package for The Social Science) and frequency of occurrence (percentages). The chosen sample is composed of both genders,10 teachers and 40 M1 computer science students are selected as representatives samples of the population. M1 computer science students are accepted as representatives since they have extensive repertoire of terminologies included in their courses. As they had enough time in the past three years in the university to engage in their particular domain and discover their own learning styles, more importantly developing their learning strategies.

7. The Structure of the Dissertation

The current dissertation composed of a general introduction, three chapters, and a general conclusion. The first two chapters are theoretical as they deal with the theoretical orientation of the research, while the last chapter is practical. Each of the chapters starts with an introduction and ends with a conclusion.

The first chapter provides information about technical vocabulary including definitions, types of ESP vocabulary, and finally developing vocabulary through the four skills.

The second chapter provides an overview about technical vocabulary learning and teaching strategies including the history of technical vocabulary teaching/learning, awareness-raising of vocabulary learning strategies, technical vocabulary teaching strategies; Direct vocabulary learning strategies (DVTSs) and Indirect vocabulary learning strategies (IVTSs) and technical vocabulary learning strategies; determination strategies, social strategies, memory strategies, cognitive strategies, and metacognitive strategies.

The third chapter is about field of investigation and data analysis. It introduces the overall design of the study, setting and sample, and describes the data collection tools; teachers' questionnaire and students' questionnaire, questionnaire administration procedures, statistical tools for data analysis and reliability and validity of the instruments. Moreover, it will provide data discussions and presentations i.e. interpretation and analysis of the findings, along with a set of pedagogical implications and recommendations.

Chapter 1

TECHNICAL VOCABULARY

1.1. Introduction

Teaching and learning foreign language particularly refers to specific rules that need to be followed in terms of acquiring the target language, such as vocabulary which is considered as a major part in teaching/learning second language. Today's teachers focus on presenting technical vocabulary in ESP courses to their students in order to achieve lessons' goals accurately.

Moreover, teachers' proficiency and learners' competency determine their perception of students in gaining new technical words. Accordingly, developing students' technical vocabulary knowledge is based on their diligence. Thus, this chapter deals with the definition of technical vocabulary and the relevance of vocabulary in ESP besides to its types. As a final point, it can be concluded with the development of vocabulary with the four skills.

1.2. Defining Technical Vocabulary

Given that each discipline has its body of technical and specialized terms; it is hard to learn a language of particular area without working with its terminology. Technical vocabularies are those terms which are closely related and common to a discipline and "differ from subject area to subject area" (Nation, 2001, p 12). Chung and Nation(2004) define technical vocabulary as "subject related, occurs in a specialist domain, and is part of a system of subject knowledge" (p. 252).Based on these definitions, it can be assumed that technical vocabularies are terms that are specific to an academic discipline or terms that have specific meaning for the field they belong to.

It was stated that any lexical item with direct and specific knowledge is relevant to technical vocabulary known only by its users. Nevertheless, this investigation shows an absence of true consensus on how the determination of technical vocabulary can be defined (Liu & Lei, 2019).Chung and Nation (2003) on their part, provide a rating scale which consists of four points scale to measure how close a word is to a particular specialized field in order to differentiate between technical and non-technical words.

Items classified at steps 3 and 4 were considered to be technical words, whereas items at steps 1 and 2 were not (the scale for the anatomy vocabulary).

Step 1 Words such as function words that have a meaning that has no particular relationship with the field of anatomy, that is, words independent of the subject matter. Examples are: *the, is, between, it, by, 12, adjacent, amounts, common, commonly, directly, constantly, early,* and *especially*.
Step 2 Words that have a meaning that is minimally related to the field of anatomy in that theydescribethepositions,movements,orfeaturesofthebody.Examplesare:*superior,part,forms, pairs, structures, surrounds, supports, associated ,lodges, protects*.
Step 3 Words that have a meaning that is closely related to the field of anatomy. They refer to parts, structures or functions of the body, such as the regions of the body and systems of the body. Such words are also used in general language. The words may have some restrictions of usage depending on the subject field. Examples are: *chest, trunk, neck, abdomen, ribs, breast, cage, cavity, shoulder, girdle, skin, muscles, wall, heart, lungs, organs, liver, bony, abdominal, breathing.* Words in this category may be technical terms in a specific field like anatomy and yet may occur with the same meaning in other fields and not be technical terms in those fields.
Step 4 Words that have a meaning specific to the field of anatomy and are not likely to be known in general language. They refer to structures and functions of the body. These words have clear restrictions of usage depending on the subject field. Examples are: *thorax, sternum, costal, vertebrae, pectoral, fascia, trachea, mammary, periosteum, hematopoietic, pectorals , viscera, intervertebral, demifacets, pedicle.*

Table 01: A rating scale for finding technical words (as applied to the anatomy text) (Chung& Nation, 2003, p.105).

In another study about technical vocabulary, Nation (2001) classified this type of vocabulary into four categories, depending on degrees of "technicalness" i.e.; how restricted a word is to a particular area from the most technical to the least. (Coxhead & Nation, 2001, pp. 261-262)

1. The first category: the word form is rarely observed or encountered outside of this particular field. In this category the item is purely technical in terms of meaning and form.

Examples in the field of computing: wysiwyg, rom, pixel, modem

2. The second category: the word form is employed within and beyond this specific field, although it carries different meanings in each case. Words that fall into this category are technical because their general meaning does not provide ready access to their technical use if it is used outside the field of knowledge.

Examples in the field of computing – execute, scroll, paste

3. The third category: The word forms is employed within and beyond this specific field, however, the majority of its uses with a specific meaning, though not all, occur within this field. The specialized meaning it carries in this field can be easily understood through its meaning outside the field.

Examples in the field of computing: memory, drag, window.

4. The fourth category: is more frequently encountered in this field compared to other areas. There is minimal or no significant specialization of its meaning, although individuals with expertise in the field would have a more precise understanding of its meaning.

Examples in the field of computing: print, programme, icon.

Both categories (3&4) are less technical because of their form, in addition to their meaning are not unique to a particular field of knowledge.

1.3. ESP Vocabulary

Vocabulary in ESP is an essential part in learning a second language. Teaching and learning vocabularies are considered as considerable methods for both English language learners and teachers. Moreover, vocabulary is a correlative part of teaching any curriculum that should be taught in an accurate and regular basis. Teachers need to design curricula based on learners' needs and interests in order to determine what approaches or strategies will be used to expand purposeful specialized words (Xhaferi, p.130).

The following detailed points of view distinguish ESP vocabulary stated by Averil Coxhead:

> *ESP vocabulary can be referred to in the literature by very different names from one study to another. These terms include special purpose, specialized, technical, sub technical, and semi-technical vocabulary. In essence, such terms usually refer to the vocabulary of a particular area of study or professional use. The range of a word is important in ESP. That is, a specialized word would have a narrow range of use within a particular subject area. This means that specialized words are expected to*

belong to a particular subject area at university or to a professional discipline. (Coxhead, 2013, pp. 115–116)

Teachers and learners have to estimate courses time that is associated with their language needs. Besides, utilizing this particular purposes vocabulary shows that these learners belong to a certain group. Learners require that language to show understanding, "make meaning and engage with disciplinary knowledge" (Woodward -Kron, 2008, p.246). Another point, ESP learners should reinforce their learning tasks to improve their perception of using specialized words in their particular context, (Nation, 2008, as cited in Coxhead, 2013).

1.4. Types of Vocabulary

The acquisition of vocabulary is the most challenging task for learners who have special purposes in language learning. They not only need to know general service vocabulary but they also need to be familiar with the different types of vocabulary they encountered when working with pedagogical materials used in ESP courses in one way, and to be able to use the specialized vocabulary from their particular field productively in another way.

1.4.1. Technical Vocabulary

In specific domains the focus is mainly on technical vocabulary which means those that are very closely related to the subject area of the text and occurs frequently in texts within a specialty or discipline. Chung and Nation (2003) in their study of technical vocabulary in specialized texts found that as much as "one out of every three words in the anatomy text" was technical (p.109).

1.4.2. Semi-Technical Vocabulary

"semi-technical vocabulary" or what is known also as "sub-technical vocabulary" that is, not the specialized or technical terminology of a discipline, but rather "items which are neither highly technical and specific to a certain field of knowledge nor obviously general in the sense of being everyday words which are not used in a distinctive way in specialized texts" (Baker, 1988, p.91).

1.4.3. Core Vocabulary

Common core or what is generally known as core vocabulary refers to the 2000-3000 words "that provide the basis of about 80 per cent of the words likely to be encountered" (Carter, 1987, as cited in Jordan, 1997). In the domain of lexis , Carter further states that core

items are simple and more central to language than other words where he refers to them as "basic core vocabulary for initial language learning purposes".(1987, p.48).In the specialized fields these words are essential to get the meaning of the technical ones ,Laufer (1989) and Liu & Nation (1985) indicate that for the "successful guessing of unknown words" needs at least 95% or higher coverage rate of the vocabulary that is known of the running words in a text (Waring & Nation 2004,p.12) .

1.4.4. Academic Vocabulary

Many areas of ESP are concerned with academic texts , which emphasize the focus on academic words, namely those words that are common for those who are using English in academic settings and they do not belong to the list of high-frequency words. These words occur quite often in formal contexts such as a newspaper, academic papers, textbooks, and other kinds of special texts. According to Coxhead's Academic Word List (2000), this group of words contains 570 word and "occur reasonably frequently over a very wide range of academic texts; the list is not restricted to a specific discipline" (Nation, 2001, p.17).

1.5. Developing Vocabulary through the Four Skills

Learning any language is based on four skills; listening, speaking, reading and writing. English does not differ where these four skills work on increasing learners' ability for successful communication. Pilkulski and Templeton (2004) clarifies how vocabulary is significant concerning the four skills that enable learners to acquire new words and indicates that the power of words cannot be neglected (as cited in Chotimah&Astiyandha,2022, p.242). Generally it is known that gaining new vocabulary is mostly comes from visual and/or auditory resources that are objects we hear or see. Finally, these acquired items can be used or transferred to written and spoken sources.

Listening and reading vocabulary or what is known as receptive vocabulary are words that are available for recognition during listening and reading .Concerning reading skill ,written discourse tends to use a wide range of vocabulary, thus, it is a good resource for acquiring a broader variety of words. However, other studies showed that the vocabulary obtained from reading are usually small. Therefore the student needs numerous repeated exposures from a great deal of reading that any significant number of words are learned .In ESP reading Williams(1985) also encourages extensive reading and states that "quantity of reading is vital". On the other hand, listening skill helps students to learn vocabularies and gain their correct pronunciation. In Duong's study (2022) , found that Vietnamese tertiary

students listen to the audio files of ESP vocabulary lists many times as a strategy to learn vocabulary.

Writing and speaking vocabulary or what is known as productive vocabulary are words that are available for use when writing or speaking. Students use their receptive vocabulary to promote their skills in order to write or to speak. Thus, speaking foreign language concerned with the learners' level in all four skills; listening, speaking, reading and writing. Akram and Malik (2010) state that the four skills "are all an integral part of typical language proficiency and use".

The learner has to master them fluently in order to use the language in a variety of contexts involving multiple language skills. They often experience strengths and weaknesses in specific skills , for example , some learners can be professional in reading and writing , but they cannot speak and listen ,because their abilities varies from one skill to another . Furthermore, a skilful reader, writer or listener, may not necessarily speak fluently.

1.6. Conclusion

Gaining more vocabularies to acquire second language is such an interesting procedure to develop learners' communicative competence and perception in the field of study. Learners have to determine their goal in learning vocabulary so as to learn the accurate words. Also teachers should be aware of students' needs to expand their knowledge. They need to define how vocabulary is essential, especially technical words and to teach them according to their needs on studying second language in specific area.

Chapter2

Technical Vocabulary Teaching and Learning Strategies

2.1. Introduction

Teaching and learning foreign language, involve special strategies of developing language materials in order to overcome the obstacles and to enhance learners competence in acquiring second language.

In ESP fields such as engineering, medicine, or computer science, specialized vocabulary is essential for effective communication and comprehension of technical concepts. Using appropriate vocabulary teaching /learning strategies can be particularly important in such contexts. Hence, using creative and effective vocabulary teaching and learning strategies in ESP classrooms, students will experience success with the content and will be able to communicate with their particular register. Therefore, the present chapter entitled teaching and learning technical vocabulary provides an overview of the history of teaching/learning vocabulary, awareness-raising of vocabulary learning strategies and the various technical vocabulary learning and teaching strategies might be used by both teachers and students.

2.2. The History of Teaching/Learning Technical Vocabulary

Acquiring technical vocabulary is a major process in learning and teaching specific English. Practitioners, teachers and learners need to develop, explain and understand successful ESP programs. Nonetheless, ESP vocabulary as technical item was a neglected area in teaching and learning foreign language for a long time along with the intensive focus on syntax and phonology (Evans & John, 1998) and teachers (Tskhvitava, 2016). However, with time ESP practitioners and teachers have increasingly been turning their attention to ESP vocabulary. Where technical vocabulary regarded as integral part in specific English contexts .Furthermore, the acquisition of a new vocabulary is considered easier with the use of TVLSs. It has been approved that the implementation of various vocabulary learning strategies has a substantial impact on the performance of English language learners within the context of ESP classroom (Al Zahrani& Chaudhary, 2022).

2.3 Technical Vocabulary Teaching Strategies

ESP learners acquire technical vocabulary in different ways, and with the realization of the importance of teaching technical vocabulary, many techniques to teach and introduce such type of vocabulary have emerged. Alghamdi (2023) developed a classification for the different types of vocabulary teaching techniques. This includes both DVT and IVT strategies (Table 02)

Groups of VTS	Individual VTS that belong to the group
DVT strategies for meaning presentation	Translation, definitions, exemplifications or attention to register, pictures, photos, posters and other illustrations, real objects (realia).
DVT strategies for form presentation	Word parts
DVT strategies for practice	Memory images, semantic mapping, labels, conversations and dialogue, synonyms and antonyms, repetitions, vocabulary tests and games
IVT strategies for discovery	Dictionary use, guessing from context

Table 02: Groups of Individual Vocabulary Teaching Strategies (VTS) (Alghamdi,2023)

2.3.1. DVT strategies:

2.3.1.1. Strategies for meaning presentation

1/ Translation

Translation has been regarded as an effective way of giving the equivalence of words in a target language. Teachers used this strategy exclusively to present the meaning of an item in the native language or in other language, Zahran (2017) supports the use of native language to give the equivalence of the words because this process motivated students to learn English in addition to the valuable time this strategy can save especially with the limited time ESP courses had. In contrary others have some reservations regarding the effectiveness of translation, where the teachers as well as the students will heavily rely on. Furthermore, the non-existence of equivalent translation of certain types of ESP collocations between the students' mother language and the target language (Xhaferi, 2009, p.236); lead teachers avoid direct translation to explain the meaning of a new word. But sometimes it could be useful in ESP classes especially for learners with low English level.

2/ Definition

One of the key strategies to present the meaning of an unknown word in a classroom is using definitions. Where the teacher provides a sentence that contains the meaning or the explanation of the word. He/she may provide a definition orally during explaining the lecture or by presenting it in the context. For example, in the field of the computer science ETV, 'spreadsheet' can be defined in a context such as "A spreadsheet is a tool to create, organize,

and analyse data" However even providing a definition sometimes cannot work for the difficult words; thus, teachers search for another way to convey the meaning of the new word as using more authentic material.

3/Visuals and Realia

A technique often used by teachers to introduce the meaning of the word like using pictures ,photographs, drawing or bring a real objects that present the word .This strategy regarded as the most valid way of communicating the meaning of the words where the learners remember the meaning through their visuals. And it would be more effective if the communicated meaning is used along with a verbal definition, where the meaning will be acquired both linguistically and visually or what is known as dual encoding (Nation, 2001).

2.3.1.2 DVT strategies for form presentation

Strategies used by teacher to present the form of new ETV directly.

1/ The Word Parts

A strategy stands for teaching the forms of words by dividing a word into parts, i.e.; roots and affixes. Chung and Nation (2003) claim that word parts and context guessing are the two major strategies in technical vocabulary teaching. In addition, they argue a large proportion of technical words which have Greek or Latin based forms make use affixes. Therefore, this strategy is more attached to learn such type of vocabulary. Nation (2001) suggests two ways to use this kind of strategies, it can be used to check if the words meaning is well guessed or used to learn unfamiliar words by relating these words to known words or to known affixes (p.264).

From his part, he mentioned two steps to apply the above strategy in learning new complex words:

1. Learners need to be familiar with affixes when they occur in words in order to be able to divide the unknown word into prefixes, roots and suffixes.
2. This step requires two things. First, the learners need to have knowledge about the meanings of the common word parts. To relate the meaning of the word parts to the word' meaning. Second, the learners need to be able to "re-express the dictionary definition of a word to include the meaning of its prefix, and if possible its stem and suffix."(Nation 2001, p.278).

2.3.1.3. DVT Strategies for Practice

1/ Synonyms and Antonyms

Using synonyms and antonyms is another way of teaching vocabulary process. Having said this, identifying synonyms and antonyms for the word can be a better way to remember the meaning of a new word.

Teachers use this strategy to expand students' lexicon and enhance their practical usage. More importantly, their memory for semantically -related words will be enhanced. Synonyms are words that have approximately the same meaning, while antonyms are words that are opposites. Based on the findings of Storkel and Maekawa (2005) synonyms can decrease cognitive demands and facilitate words learning (as cited in Tajik, 2018).

Synonym strategy is a crucial in reading specialized text, Williams (1985) encourages the other reading teachers to assist the learners to develop the searching for a synonym strategy when they meet an unfamiliar word.

2/Using Games

Teachers are responsible for creating a constructive classroom atmosphere to make the process of learning and teaching as engaging as possible, which increase the students' motivation to learn, and to make the process of specialized vocabulary learning more communicative and influential and less boring and frustrating.

Using games when teaching and presenting lexical terms have an impressive effect on students' vocabulary knowledge development by reinforcing important concepts and providing sufficient practice. It follows from here that teachers should create an effective and various kinds of games to increase motivation among students. Puzzle game has been recognized to work in vocabulary acquisition that may stand as a good example.

3/ Repetition Strategies

Repetition strategies are one of the consolidation strategies that help learners store the new words in their minds; according to Peterson's Master TOEFL (2006) vocabulary repetition is "one of the most effective ways to make the word your own"(p.8). In addition to master both meaning and pronunciation, teachers can consider the significance of repetition strategies for consolidating aspects of knowing a word (form and meaning) and deploy these strategies with complicated words that need more efforts to learn and to remember such as long words (Laufer, 1997 as cited in Altalhab , 2018)

The key of repetition is the huge exposure to the word needed to be taught, because one occurrence of a word will not contain enough information for a learner to master the

word(Nation, 2001).Teachers can introduce the unknown word in different and multiple contexts where the student gets the opportunity to come across the word more than once.

2.3.2 IVT strategies

1/Dictionary Use

Another important IVT strategy is the use of the dictionary. Teachers employ this traditional strategy exclusively to explain the meaning of a new word .Using this strategy can be done directly by asking the students to consult the word in the dictionary, or use dictionary along with other strategies as "backup to contextual guesswork" (Grains & Redman, 1986, p.79) to confirm their assumptions, or learn about the word from its structural relationships (synonyms and antonyms).

Peterson's Master TOEFL vocabulary (2006) defines dictionary as "an alphabetical reference list of the words in the language" (p. 3).It includes a word's spelling, pronunciation, part(s) of speech, and irregular forms of the word, definition and etymology. Mainly there are two types:

Bilingual dictionaries "use two languages" (Nation, 2001,p.358). Usually target language and native language, Kirkness (2004) defines bilingual dictionary as "translation dictionary" (p.65). Others as teachers synonymous dictionaries with laziness (Grains& Redman, 1986).Dictionaries regarded as counter-productive in the language classroom mainly because they encourage the use of translation. However, they are still providing vocabulary meanings in a very accessible way and easy access for productive use despite of all the criticism(Nation, 2001).

Monolingual dictionaries "are written all in one language" (Nation, 2001, p.357) .Usually directed for native language learners or foreign learners who are able to interpret definitions and other information in the second language, because they require considerable search skills and proficiency level in the second language. In general monolingual dictionaries contain much more information about each word than bilingual dictionaries do. Thus it is recommended to use bilingual and monolingual dictionaries to complement each other for productive purposes where the best qualities of both can be used (Nation, 2001).

2/Using Context Clues

Guessing from context is using contextual and textual clues to decipher the meaning of unfamiliar words by embedding the concerned term in a context. Within this strategy students learn the item; how it is used, which makes it more memorable. Nation (2001) argued that the main source of acquiring vocabulary is guessing its meaning from context. Stahl and Nagy

(2006) share the same view stating that "much, if not most, of students' vocabulary knowledge is gained through encountering words in context" (p.173).

Some clues present a barrier for the transparency and clearness of the word's meaning, thus the teacher should evaluate the clues being used to make it helpful without any tricky or misleading information, so that the student can guess correctly. Peterson's Master TOEFL vocabulary (2006, p. 11) proposed three types of different context clues:

a. Restatement Clues

Provide a definition of the unfamiliar word right in the passage.

b. Inferential Clues

Can be introduced as the process of combining what introduced as context clue with what the student already knows as his/her previous knowledge to make an inference.

Context Clue + what I know = inference

c. Contrast Clues

In contrast clues the unknown word will be inferenced by presenting an opposite or contrast to it.

Guessing from context is a strategy consists of four steps developed by Clarke and Nation (1980, p. 212) ,they mentioned that it is important to ensure that each step is taken, however the order of these steps does not have to be exact the same. These steps are as follow:

1. Ask the student to decide on part of speech for the given word by look at the word itself and its surroundings.
2. Ask the student to look at the immediate grammar context of the word within a clause or sentence.
3. Ask the student to look on a broader context; extend his /her focus over several sentences look.
4. Ask the student to check that the guess is correct by checking its part of speech; if the word in question contains a prefix, root, or suffix, it could potentially provide a hint regarding its meaning; inserting the guessed word into the original passage to assess its appropriateness.

This strategy can be applied by the teachers in the classroom where they can write all the four steps on the board, and choose one word from the passage to be guessed by all the students, then different students do each step, after practicing other words they become good guessing strategy implementers (Clarke & Nation, 1980, p. 216).

2.4 Technical Vocabulary Learning Strategies

Vocabulary learning strategies are well known as methods to facilitate foreign language vocabulary acquisition. There are many definitions about VLSs which seem closely related to each other. Catalan(2003) defines VLSs as "knowledge about the mechanisms (processes, strategies) used in order to learn vocabulary as well as steps or actions taken by students (a) to find out the meaning of unknown words, (b) to retain them in long-term memory, (c) to recall them at will, and (d) to use them in oral or written mode"(p.56).

Researchers have conducted studies to determine the most used and effective VLSs for learners. In this regard several taxonomies (Oxford, 1990; Gu and Johnson, 1996; Schmitt, 1997; Nation, 2001) have been proposed for L2 acquisition to systematize and expand the use of VLSs.

Oxford (1990) introduced two main groups including direct and indirect strategies. Each contains three strategy groups, the former refers to memory, cognitive, and compensation strategies namely, those which are directly integrated in the target language and need a mental processing of the language in different ways and for different purposes (p.37), while the latter subsumed metacognitive, affective, and social strategies that support learning in many areas without involving the target language directly. Moreover these kinds of strategies are useful for the enhancement of the four skills and all learning situations (p.135). Gu and Johnson (1996) point to metacognitive regulation and cognitive strategies as two main dimensions of vocabulary learning strategies which cover six subcategories of guessing, using a dictionary, note-taking, rehearsal, encoding, and activating, all of which were further subcategorized. Compatible to the mainstream of those Schmitt (1997, 2000) suggested two categories of L2 vocabulary learning strategies including discovery and consolidation strategies which the former referred to determination and social strategies whereas the latter included social, memory, cognitive, and metacognitive strategies. Recently, Nation (2001) developed a comprehensive classification of vocabulary learning strategies consist of planning, sources and processes.

2.4.1. Types of Vocabulary Learning Strategies

Researchers have identified a large number of strategies that learners use to acquire and recall vocabulary. Schmitt (1997; as cited in Schmitt, 2000) proposed a list of different VLSs including five main categories: determination strategies, social strategies, memory strategies, cognitive strategies, and metacognitive strategies(Table 03).

Students may employ these strategies in a different ways under different circumstances such as; availability of materials, time required , students' level and their skills .Furthermore, the notion of VLSs becoming vogue in ESP context because of the high complexity, time taking and the huge amount of vocabulary size compared to the EGP.

1/Determination Strategies (DET):

Schmitt(1997) defines DET as strategies "used by an individual when faced with discovering a new word's meaning without recourse to another person's expertise" (Schmitt, 2000,p.135).By using this strategy students will find the meaning of the words by themselves through analysing parts of speech, analysing affixes and roots, guessing the meaning from the context , and using dictionaries.

2/Social Strategies (SOC):

Strategies based on social relationships and interactions with other people to improve, facilitate and encourage the users in learning second language, which make them seeking opportunities either to discover the meaning of a new word or record and review the known words. For this regard Sanaoui's study (1995) highlighted the need for learners to create their own opportunities for language use inside and outside classroom; for example, ask the teacher, practice new words with classmates in a study group or interact with native-speakers.

3/Memory Strategies (MEM):

Memory strategies are used by learners to recall words. Oxford(1990,pp.38-39) developed memory strategies that consist of four sets, first letter of each made up the acronym CARE; creating mental linkages, applying images and sounds, reviewing and employing action. Moreover, these strategies reflect principles such as arranging things, making associations and reviewing. All these principles must be personally meaningful to the learner. Also the materials used for reviewing must have significance.

According to Schmitt (1997) these strategies include correlating the word with previously acquired information, using visual materials or by grouping. He mentioned that these kinds of strategies facilitate long-term retention because they focused on manipulative mental processing; furthermore such kind of process takes a long time. Thus, it is more recommended to the students with specialized domains where the time will be well spent on the most important and more complex words as high-frequency and technical vocabulary.

In ESP context, training on memory strategies showed successful results in gain vocabulary by Turkish EFL learners (Atay & Ozbulgan, 2007).

4/Cognitive Strategies (COG):

Cognitive strategies refer to the "manipulation or transformation of the target language by the learner" and consist of four sets; the initial letters which constitute the acronym PRAC; practicing, receiving and sending messages, analysing and reasoning and creating structure for input and output. Being composed of these sets means that cognitive strategies are practical for learning (Oxford, 1990, p. 43).

Systematic repetition is considered as the main strategy applied under the cognitive theory for remembering and retrieving word meanings, Milton (2009) states that 'multiple repetitions may not help the initial learning of words, but may help them stay in the memory after learning' (p.227; as cited in Altalhab, 2018, p.146).

5/Metacognitive Strategies (MET):

Certain strategies allow students to consciously decide what suit them in terms of planning, monitoring, and evaluating oneself are known as metacognitive strategies (Schmitt, 2000, p136).In planning , the student usually decides on what , where and how to prioritize , for instance, in ESP context , the focus is normally directed to the technical vocabulary instead of general vocabulary ,while monitoring and evaluating are the direct processes and the strategies that are used to study the words by self-checking ,revision ,and evaluating oneself through word tests or games . Finally, the students will correct the words they received automatically.

It is quite pertinent to think here of metacognitive strategies as a way of boosting autonomy. Moreover, these strategies are regarded as a feature of independent learning. Sanaoui (1995) suggested that helping learners gain control over processes for managing their own learning of lexis is an important step towards autonomy-oriented vocabulary learning and teaching in L2 settings.

6/Discovering and Consolidating Strategies:

Schmitt organized the list of different learning strategies contains of fifth types of strategies (mentioned above), by developing two major classes: (1) strategies that are useful for the initial discovery of a word's meaning, and (2) those useful for remembering that word once it has been introduced

Strategies for the Discovery of a New Word's Meaning	
Strategy Group	**Strategy**
DET	Analyse part of speech
DET	Analyse affixes and roots
DET	Check for L1cognate
DET	Analyse any available pictures or gestures
DET	Guess meaning from textual context
DET	Use a dictionary (bilingual or monolingual)
SOC	Ask teacher for a synonym, paraphrase, or L1 translation of new word
SOC	Ask classmates for meaning
Strategies for Consolidating the New Words	
Strategy Group	**Strategy**
SOC	Study and practice meaning in a group
SOC	Interact with native speakers
MEM	Connect word to a previous personal experience
MEM	Associate the word with its coordinates
MEM	Connect the word to its synonyms and antonyms
MEM	Use semantic maps
MEM	Image word form
MEM	Image word's meaning
MEM	Use Key word method
MEM	Group words together to study them
MEM	Study the spelling of a word
MEM	Say new word aloud when studying
MEM	Use physical action when learning a word
COG	Verbal repetition
COG	Written repetition
COG	Wordlists
COG	Put English labels on physical objects
COG	Keep a vocabulary notebook
MET	Use English-language media (songs, movies, newscasts, etc.)
MET	Use spaced word practice (expanding rehearsal)
MET	Test oneself with word tests
MET	Skip or pass new word
MET	Continue to study word overtime

Table 03: Schmitt's (1997) Classification of VLS (Schmitt 2000, p.134)

VLSs can be applied to a wide range of vocabulary and useful throughout the entire process at acquiring new vocabulary (Nation, 2001). However, considering a particular strategy to recommend as a teacher or selecting the optimal strategy to employ as a student is reliant on the particular situation or environment in which the learning is taking place which means that strategies for learning should not be viewed as inherently good or bad, but rather their effectiveness is dependent on the context in which they are taught and used. In other words, a particular strategy may be effective in one situation but ineffective in another. This highlights the importance of considering a number of variables, including proficiency level, task, text, language modality, background knowledge, context of learning in which a strategy is used, target language, and learner characteristics and then adapting it accordingly (Politzer and McGroarty 1985, as cited in Schmitt, 1997,pp.3-4).

2.5. Awareness-Raising of Technical Vocabulary Learning Strategies

With the existence of many taxonomies and countless strategies' lists students need to become aware of the importance of TVLSs and get trained to use them appropriately so as to advance their learning capacities and increase their motivation.

Interestingly, developing students' knowledge about strategy use and giving opportunities to practice help them to regulate and direct their learning. In other words, the mastery of strategy use paves the way for the students to control their learning .Wenden (1987) mention that "what learners know about the strategies they use" is learning strategy (Takac, 2008, p. 51; as cited in Benyahia et al, 2017, p. 49). Research by Heidari et al. (2012) supports the systematic explicit instruction about language learning strategies in general and vocabulary learning strategies in particular where the findings state that vocabulary learning strategy instruction had positive impact on ESP vocabulary achievement and reading comprehension of students at academic level. Thus, in the learning process giving explicit instruction on extensive number of strategies is highly recommended to raise students' awareness of using these strategies and make them proficient implementers. By means of this process the following learning characteristics appear:

- Students become aware of why, when and how to use the strategies. Thus, helped them achieve higher grades in the tests.
- Improve students confidence, decrease their anxiety, increase their motivation, interest and success in learning English language
- Make students autonomous in learning.

Nation (2001) states that Gu and Johnson's comprehensive study distinguished different types of learners considering the clustering of the various beliefs and strategies they examined, where the active strategy users were among the best students in terms of vocabulary size and proficiency. They were highly encouraged and motivated in using a range of strategies to learn the words they deemed significant; generally, they relied on strategies more frequently than other learners. In addition, they argued that there are an extensive number of strategy options for a language to draw on, however, learners draw on these strategies with different levels of success and skill. Learners could benefit from being made aware of these strategies, how to use them well, and which one to opt for (Nation 2001, p.227).Accordingly, students must be aware of the range of TVLSs that are available so that they can be trained to use them and make them available to use in their learning journey which would reflect their vocabulary competency.

2.6. Conclusion

In summary, TVTSs and TVLSs are two varieties of strategies that employed by teachers and learners in specialized fields, where technical terms occur frequently. Teachers use TVTSs to teach technical vocabulary through a wide range of techniques, such as translating unknown words, providing visual aids and realia, or utilizing context clues., On the other hand, TVLSs help students understand, acquire and retain technical vocabulary, including determination strategies, social strategies, memory strategies, cognitive strategies, and metacognitive strategies.

Teachers can explain unfamiliar words more easily, similarly learners can decode the meaning of unfamiliar words, recall them when needed, and enlarge their technical lexical package, by using the appropriate TVTSs and TVLSs, This, in turn, enables them to communicate more effectively in technical settings and enhances their overall language proficiency.

Chapter 3

Research Methodology, Analysis and Discussion

3.1. Introduction

The previous two chapters dealt with the theoretical part while this chapter is devoted to present the analysis of the obtained data. It consists of two sections; the first section presents a full description of research methodology designed to investigate strategies used by teachers and students to learn/teach terminologies .It provides overall design of the study, a description of the settings and sample, research tools the description of the two questionnaires and their administration procedures, statistical tools for data analysis, reliability and validity of the instruments. This section is considered as an introduction to what will be presented in the second section. The second section is concerned with results presentation, analysis and discussion of the distributed questionnaires for both students and teachers.

3.2.Methodology

3.2.1.Overall Design of the Study

The significance of the study derives from the belief that, for engineering students, specialized terminology is a central element in understanding the discipline. It is therefore regarded as one of the building blocks of disciplinary knowledge that ESP students are expected to construct. To achieve the previously set objectives of research, it seemed to us very useful to base our study on both qualitative and quantitative methods that are suitable to analyse the data which were collected by means of two questionnaires, one of them for ESP students and another for teachers.

3.2.2. Settings and Sample

Concerning to computer science department, it mainly consists of 40 participants which represent 24.39 % of the whole population were selected as representative sample in terms of gender, abilities and leaning styles. The main reason for choosing M1 computer science students are the huge amount of technical terminologies in their courses. They were requested to answer questionnaire by choosing the strategies they rely on to learn technical vocabulary, since they had already studied English in their field years ago. Furthermore, the sample of teachers consisted of 10 teachers from different faculties at M'sila university.

3.2.3. Research Tools

In the field of vocabulary learning strategies, the questionnaire is a common and widely used research tool as it helps researchers identify strategy use. Gao (2004) argues that they "have helped to generate a broad picture of strategy use across different learner populations and to establish relationships between various learner factors and learners' strategy use" (p. 3, as cited in Trendak, 2015, p.116).

Many researchers have applied vocabulary learning strategy questionnaires to gather data in their studies(e.g., Oxford ,1990;Sanaoui ,1995;Gu and Johnson ,1996; Schmitt ,1997; Fan, 2003;Cohen et al.,2003; White et al ,2007), due to their utility which can be summarised as reliable and effective (Trendak, 2015).

3.2.3.1. Description of the Students' Questionnaire

In this study, questionnaire was used as a main instrument in order to identify patterns and preferences of the participants' use of TVLSs, which is based on the taxonomy of Schmitt (1997).

The questionnaire (see Appendix 01) consists of two sections. In the first section, questions are designed to gain demographic information about participants; they include the respondents' gender and age. The second section is divided into two parts, the first part involves two questions related to ETV knowledge and TVLSs, while the second part includes questions that aim to provide the main TVLSs students employ, it contains of 22 items. The items are divided into two main groups, the first for eliciting strategies used to determine the meaning of the vocabulary items when encountered for the first time (1-8); whereas, the latter was devoted to discover which strategies students find most useful to remember the newly learned word (9-22).

The following table gives details about the questionnaire's description:

Types of Strategies		**Items**	**N° of Items**
Learn the meaning of the new words	DET	1-5	5
	SCO	6-8	3
Remember new words	MEM	9-13	5
	COG	14-17	4
	MET	17-22	5
Total		-	**22**

Table 04: Distribution of Strategy Items According to the two Types of Strategy

3.2.3.2 . Description of the teachers' questionnaire

The questionnaire(see Appendix 02) consists of two sections. In the first section, two questions are designed to gain general information about the chosen sample of teachers and the teaching situation; in which these questions require (Q1) teachers to specify their qualifications, and (Q2)their experience in teaching ESP courses. The second section includes 8 questions. The questions in this section divided into two parts. First part contains 5 questions (Q3, Q4, Q5, Q6 and Q7), whereas the second part includes three (Q8, Q9 and Q10) questions, it is worth mentioning that Q8 comprise of 9 items. Basically, all questions present the TVTSs that have been employed by teachers.

3.2.4. Questionnaire administration Procedures

Prior to administering the questionnaires to the targeted participants, they were asked to answer the questions based on their own experiences. There was no limited time for filling out these questionnaires as a matter of letting participants think about their opinions strictly. The questionnaires are administered online for both students and teachers in order to answer the questions to affirm which of the suggested techniques they use to learn/teach technical vocabulary. They are distributed in different ways. The students' questionnaire was translated into Arabic to avoid ambiguity and shared with 40 M1 computer science students via Messenger and Telegram study groups, where as teachers' questionnaire is submitted to 10 teachers from different faculties via their professional emails.

3.2.5. Statistical Tools for Data Analysis

Two techniques were used to analyse the data obtained, SPSS version 26.0and Frequency of occurrence (percentages) in order to reveal the strategies used by students as well as teachers. The data is gathered according to the 5-point Likert scale questions, also it is analysed quantitatively through descriptive statistics in which the frequencies (Freq.), percentage (%) are calculated. Whereas, the mean score (M) and the standard deviation (SD) were calculated by using SPSS.

In both students' and teachers' questionnaires, the statements had five options, which were later given values from 5 to 1 as follows:

(5)=**always use** this strategy

(4)=**often use** this strategy

(3)=**sometimes use** this strategy

(2)=**rarely use** this strategy

(1)=**never use** this strategy

After calculating all the mean scores, the criteria for the interpretations of the mean scores are as follow:

First, a comparison between the values differences to indicate the most and least strategy utilised in which:

A higher mean value means this strategy is more often used.

A lower mean value means this strategy is rarely used.

Second, learners with the mean of 3.5 to 5.0 were considered as high strategy users, learners between 2.4 and 3.5 mean values considered as medium strategy users, and students with the mean of 1 to 2.4 are low strategy users (Oxford, 1990.p, 300).

3.2.6. Reliability and Validity of the Instruments

In the process of obtaining relevant information, the accuracy and consistency or what is known as validity and reliability of a questionnaire forms a major aspect of research methodology (Taherdoost,2016, p.28).

3.2.6.1. Reliability and Validity of Students' Questionnaire

Since this questionnaire is mainly based on Schmitt's questionnaire (1997), and it is adapted in numerous previous studies (Fan,2003; Baskin et al., 2017; Dóczi, 2011; Mustapha et al., 2018; Hajiyeva et al., 2022;Al Zahrani and Chaudhary, 2022), therefore, its construction and validity have been thoroughly investigated. Moreover, a pilot study was distributed to 16 students selected randomly from M1 computer science students at Mohamed Boudiaf University; Alpha Cronbach's reliability coefficient is measured as the indicator of internal consistency of the adapted TVLSs questionnaire.

The reliability was high (0.875) by Cronbach's Alpha coefficients, see table below

Groups	N° of Items	Cronbach's Alpha (α)
Learn the meaning of new words	08	0.655
Remember new words	14	0.861
All Items	**22**	**0.875**

Table05: Cronbach's Alpha Reliability Analysis of the Students' Questionnaire

Note:(**α**≥0.90) excellent reliability;(0.70≤**α**≤ 0.90) high reliability;(0.50≤ **α**≤0.70)moderate reliability;(**α** ≤ 0.50)low reliability(Hinton et al., 2004; as cited in Taherdoost,2016,p.33).

From the table above, "*remember new words*" got the highest value (α=0.861) for reliability while "*learn the meaning of new words*" achieved a **α** value of (0.655). The construct attained reliability of 0.875, which is considered acceptable.

Accordingly, and from what have been discussed before this questionnaire is valid and reliable to analyse the outcomes, and provide answers to the research questions, thus, test the hypotheses of the current study.

3.2.6.2. Reliability and Validity of Teachers' Questionnaire

The questionnaire is distributed to four teachers in the field to establish its reliability and validity, where the suggested items and components of the questionnaire have been represented to them, with the objective of ensure that items are effectively capture the intended research objectives and if there is something ambiguous to remove or something needed to be added. Once their feedback is back, the changes were applied.

3.3.Results Presentation and Analysis

This part is concerned with the results that have been collected through two questionnaires. In doing so, quantitative and qualitative analysis procedures are used. Hence, findings of the gathered data present in the form of tables, bars and pie charts.

3.3.1. Students' questionnaire

3.3.1.1. Section One: Background Information

Students' Profile						
Level	**Master One**					
Gender	**Male**			**Female**		
	16			24		
Age	21 -25	26– 29	More than 30	21 -25	26 -29	More than 30
	15	1	0	21	3	0
Total						**40**

Table 06: On Students' Profile

The table above represents the general information about the students. It is shown that 24 students out of 40 are females. However, 16 participants are males. This indicates that females are much more interested in using TVLSs than males and their ages are varied between 21 and 29.

3.3.1.2. Section two: Technical Vocabulary Learning Strategies

Data Analysis for Research Question One

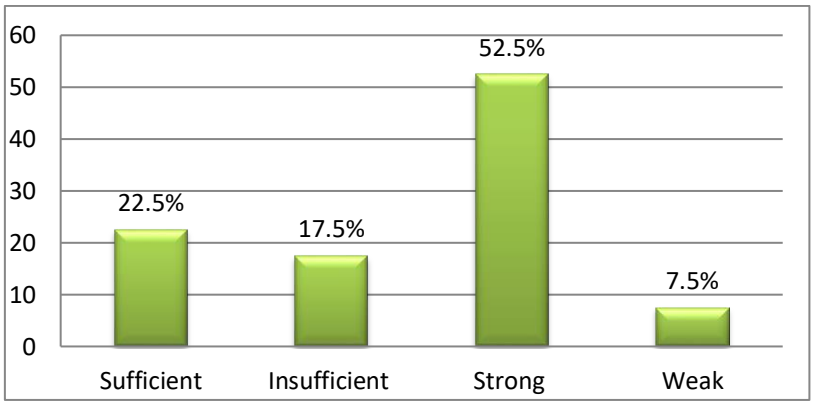
Part One: Students' Awareness of the Importance of TVLSs Use

Q 03: "*How do you assess your technical vocabulary knowledge?"*

This question was asked to students in order to assess their knowledge of technical vocabulary. Students who stated that they have strong ETV knowledge are (52.5%), while (22.5%) of students' ETV knowledge considered sufficient. And seven students out of 40 (17.5%) value their knowledge of ETV as insufficient and stated that they have a limited technical vocabulary repertoire. Whereas, only three students (7.5%) who have weak ETV knowledge.

Options	Rate	%
1 .Sufficient	**9**	**22.5**
2. Insufficient	**7**	**17.5**
3.Strong	**21**	**52.5**
4. Weak	**3**	**7.5**
Total	**40**	**100**

Table07: The Assessment of Students ETV Knowledge



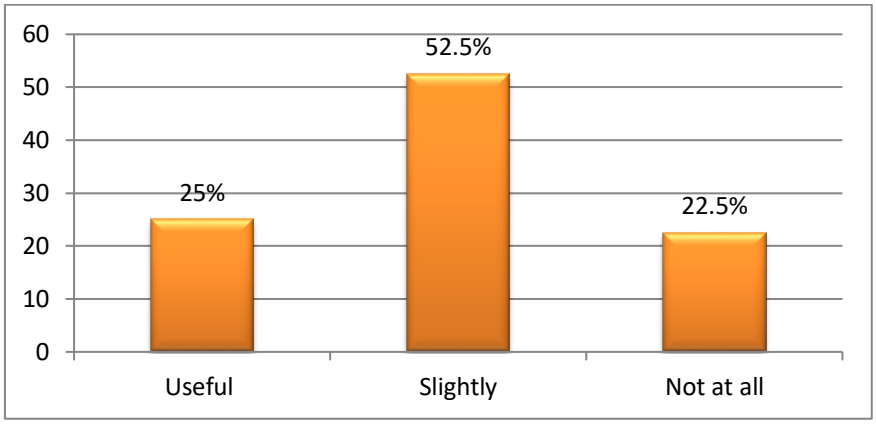
Graph 01: The Assessment of Students ETV Knowledge

Q 04: "*How are Technical vocabulary learning strategies*?"

The fourth question was about the students' attitudes towards TVLSs. Where they were asked to give their opinions about the usefulness of TVLSs, among three options 'useful', 'slightly' and 'not at all' the findings in table 08 and graph 02 indicate that 10 informants show a positive attitude regarding the effectiveness of TVLSs. And twenty one students out of 40 (52.5%) answered that TVLSs are slightly useful, on the other hand, nine (22.5%) of students considered TVLSs as not useful at all

Options	Rate	%
1.Useful	**10**	**25**
2. Slightly Useful	**21**	**52.5**
3.Not at all	**9**	**22.5**
Total	**40**	**100**

Table 08: Students' Attitudes towards TVLSs



Graph02: Students' Attitudes towards TVLSs

Part Two: TVLSs' Use

Data Analysis for Research Question Two and Three

Q5:"*What are the TVLSs do you use*?"

The rationale behind this question was to elicit which TVLSs were employed by master one computer science students as well as to draw a comparison between students' utilisation of the different TVLSs to five categories (DET,SOC,MEM,COG and MET), a detailed analysis of the items that constitute each strategy was conducted; the descriptive statistics (MandSD) results formed in the tables (09,10,11,12,13 and 14).

Overall strategies use of the five categories:

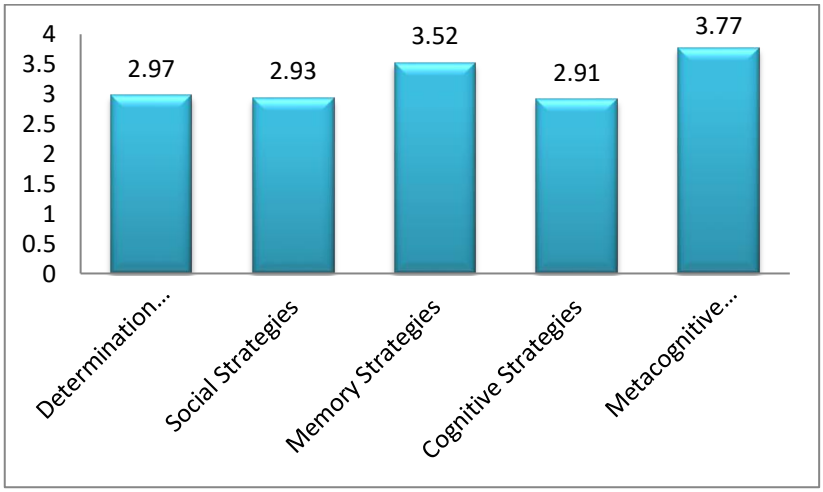
Strategies	Mean	SD	Rank	StrategyUse
Determination Strategies	2.97	0.997	3	Medium
Social Strategies	2.93	1.183	4	Medium
Memory Strategies	3.52	1.224	2	High
Cognitive Strategies	2.91	1.195	5	Medium
Metacognitive Strategies	3.77	1.008	1	High
Total Mean	**3.27**	**1.121**	**--**	**Medium**

Table 09: Mean (M) and Standard Deviation (SD) Values of Five TVLSs Categories

Note: M≥3.5 High strategy use, 2.4≤M≤ 3.5Medium strategy use M≤2.4Lowstrategyuse, Oxford (1990, p.300).

Based on the results in the ninth table, it is clear that the participants are generally medium strategy users (M =3.27). Among the five categories of TVLSs, metacognitive strategies appeared as the most frequently used category by students (M = 3.77) and cognitive strategies were ranked lowest with the mean (2.91)among the five categories. Regarding this investigation students seem to prefer promoting the use of metacognitive and memory strategies as the mean values of these two categories were found to be ranked highest, while

determination strategies took the mean value (2.97), social strategies came next with a mean score of (2.93).



Graph 03: Students' Overall Strategies Use

I. Determination strategies

ItemN°	Statement	Mean	SD	Rank
1.	I divide the new word into root and affixes.	1.95	0.959	4
2.	I use dictionary to check words (electronic or print dictionary).	4.00	0.906	1
3.	I check new words in English-Arabic dictionary.	3.60	1.081	2
4.	I check new words in English-English dictionary.	1.88	0.911	5
5.	I guess the meaning of the word depending on the context.	3.43	1.129	3
Total Mean		**2.97**	**0.997**	--

Table 10: Means and Standard Deviations of Determination Strategies

According to the above table (10), it is obvious that determination strategies are intermediately used by the students under different preferences. Item2, which is "I *Use dictionary to check words (electronic or print dictionary)*." quite popular among computer science students (M =4.00) and item 3"I *Check new words in English-Arabic dictionary*" is another favoured strategy used by the participants of the study (M=3.60). On the other hand, the item number 5, "I *Guess the meaning of the word depending on the context*." is more common (M=3.43) than the first item "I *Divide the new word into root and affixes*" (M =1.95). However, item 4 with the mean of (1.88) "I *Check new words in English-English dictionary*." seems least favoured used determination strategy.

II. Social strategies

Item N°	Statement	Mean	SD	Rank
6.	I ask the teacher to help me (e.g. I ask for translation to the Arabic, ask for paraphrase or synonym of the new word).	2.55	1.239	3
7.	I ask my classmates for the meaning of the unfamiliar word.	3.63	1.055	1
8.	I find out the meaning of the word when I cooperate with others doing a given task.	2.60	1.256	2
Total Mean		**2.93**	**1.183**	--

Table 11: Means and Standard Deviations of Social Strategies

Table 11 presents the results on social strategy use by participants. As the table displays, item 7 (M=3.63) and item 8 (M=2.60) as follows "I *Ask my classmates for the meaning of the unfamiliar word*." and "I *Find out the meaning of the word when I cooperate with others doing a given task*." were reported as most used strategies under the social group. Nevertheless, students also reported that item 6 (M=2.55) "I *Ask the teacher to help me (e.g. I ask for translation to the Arabic, ask for paraphrase or synonym of the new word)*." is occasionally employed strategy by them.

III. Memory Strategies

ItemN°	Statement	Mean	SD	Rank
9.	I draw image of the word in my mind to remember it.	2.50	1.260	5
10.	I set words in groups in a way that it makes me remember them well. (E.g. SYSTEM, DATA, SOFTWARE will be set in the same group).	3.33	1.141	4
11.	I utter the new learned word out loud.	3.75	1.316	3
12.	I memorize the spelling of the new learned word.	3.85	1.252	2
13.	I memorize the pronunciation of the new learned word.	4.18	1.152	1
Total Mean		**3.52**	**1.224**	--

Table 12: Means and Standard Deviationsof Memory Strategies

Table 12 indicates that memory strategies are mostly used by computer science students with total mean of (M=3.52).In details, "I *memorize the pronunciation of the new learned word*.", which is item 13 appeared as the highest used strategy (M=4.18) by the students, item 12(M=3.85) that includes the following statement "I *memorize the spelling of the new learned word*." and item 11(M=3.75) follows by the next words "I *utter the new learned word out loud*.", also considered as a high used strategies items in this category. Furthermore, item 10,

"I *set words in groups in a way that it makes me remember them well. (E.g. SYSTEM, DATA, SOFTWARE will be set in the same group)*"ranked 4 of mean value (3.33).Whereas, item 9 "I *draw image of the word in my mind to remember it*", was the least used item with mean value of(2.50).

IV. Cognitive strategies

Item N°	Statement	Mean	SD	Rank
14.	I keep with me a note book to write new words that I want to remember.	1.80	1.090	4
15.	I utter the new word many times, in order to remember it.	4.05	1.131	1
16.	I write the new word many times.	2.53	1.305	3
17.	I form sentences by myself using words I lately learned.	3.25	1.255	2
Total Mean		**2.91**	**1.195**	--

Table 13: Means and Standard Deviations of Cognitive Strategies

Table 13 illustrates that the fifteenth item "I *utter the new word many times, in order to remember it.*"(M=4.05), is the most used strategy among computer science students. While item 17 "I *form sentences by myself using words I lately learned*. "was ranked as the second most used strategy under this category with the mean of(3.25). The next commonly used strategy by students is; item 16, "I *write the new word many times*" with a mean value (2.53)with a medium mean compared to the other strategies in this group ,and item 14"*Keep with me a note book to write new words that I want to remember*." (M=1.80) is the least used one. As results show, the students are medium strategies users of cognitive strategies.

V. Metacognitive Strategies

Item N°	Statement	Mean	SD	Rank
18.	I listen to English lectures, recorded conversations or audio books.	3.60	1.033	4
19.	I use computer programs	3.85	1.145	2
20.	I watch English TV/YouTube channels (e.g. shows, movies, and podcasts)	4.30	0.883	1
21.	I skip unfamiliar words, when I can comprehend the whole meaning of the sentence or the passage.	3.63	0.925	3
22.	I surf on the net (e.g. I join Facebook or What'sApp groups, Skype to practice the new learned words)	3.45	1.108	5
Total Mean		**3,77**	**1,008**	--

Table 14: Means and Standard Deviations of Metacognitive Strategies

According to table 14, metacognitive strategies' users are utilizing this group of strategies under the overall (M=3.77). The item 20 "I *watch English TV/YouTube channels (e.g. shows, movies, and podcasts)*." considered as the most used strategy with the mean of (4.30), "*I use computer programs*" nineteenth item, which is another highly used strategy (M=3.85). Furthermore ,item 21 "*I skip unfamiliar words, when I can comprehend the whole meaning of the sentence or the passage*." approximate to item 18 "*I listen to English lectures, recorded conversations or audio books*." , they took the mean values (3.63 and 3.60),respectively. Besides to the least used one in this group was" *I surf on the net (e.g. I join Facebook or what'sApp groups, Skype to practice the new learned words)*" with the mean of (3.45).

3.3.2 Teachers' Questionnaire

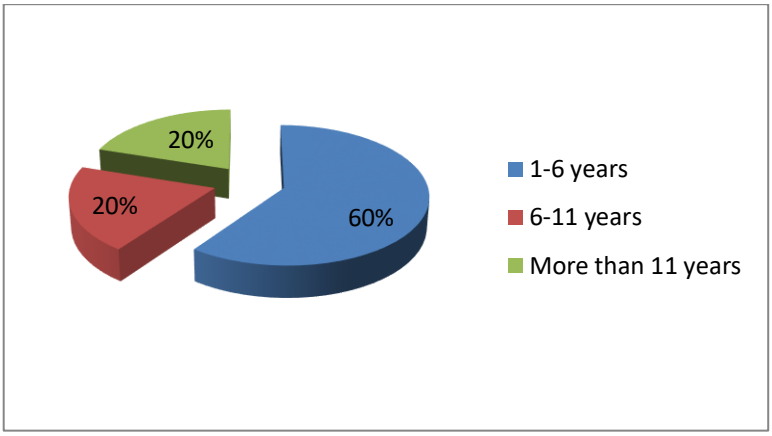
3.3.2.1 Section one: On Teachers' Background Information

Q01: "*How long have you been teaching ESP courses?"*

This question was designed to have information about the teachers' experience in teaching ESP courses. As it is appeared in the above table , the plurality of teachers (60%) have less than six years of experience, two of them (20%) have more than six and less than eleven years in teaching, likewise two teachers have more than eleven (20%) of experience in teaching ESP courses. This implies that teachers' varying experiences lead to the implementation of a diverse strategies when teaching ETV.

Options	Rate	%
1-6 years	6	60
6-11 years	2	20
More than 11 years	2	20
Total	10	100

Table 15: On Teachers' Experience



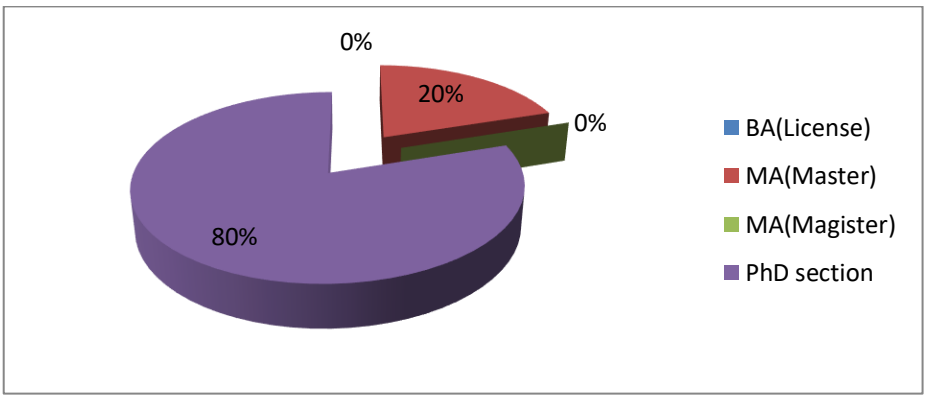
Graph 04: Teachers' Experience in Teaching ESP Courses

Q02: "*What is your study degree?"*

"What is your study degree" was a question posed to teachers in order to investigate whether this factor has any influence on their instructional practices in teaching ETV. The outcomes of this question showed that most of teachers (80 %) have a PhD degree. Whereas, (20%) possess a Master degree and none of them have a Magister degree or License degree. This indicates that most of teachers' qualifications are advanced since a PhD is categorized as a high significant degree.

Options	Rate	%
BA(License)	**0**	**0**
MA(Master)	**2**	**20**
MA(Magister)	**0**	**0**
PhD section	**8**	**80**
Total	**10**	**100**

Table 16: On Teachers' Academic Degree



Graph 05: Teachers' Academic Degree

The findings from (Q1 and Q2) show that the sample is composed of different degrees in terms of experience and academic degree; their experiences in teaching is varied from less than 6 to more than 11 years and their academic degree from master to PhD .This would be the cause of having different TVTSs.

3.3.2.2 Section Two Technical Vocabulary Teaching Strategies

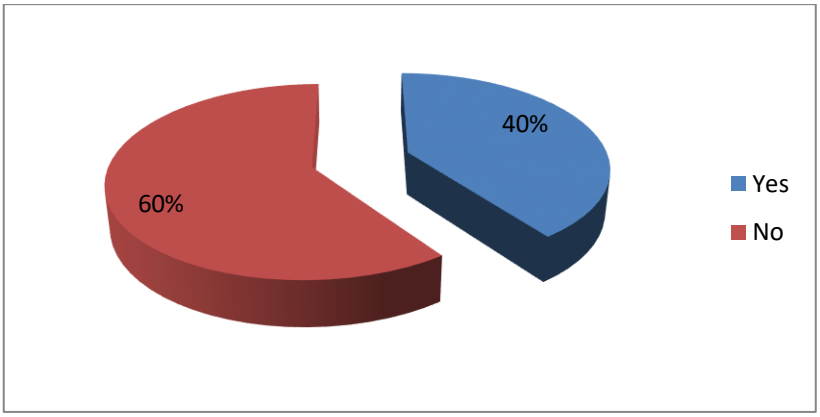
Part One: Technical Vocabulary Teaching Strategies

Q03: "*Have you been trained to teach ESP vocabulary in general and technical vocabulary in particular*?"

The table below represents the findings of teachers' training in teaching ESP or technical vocabulary. The majority of teachers had no training, whereas minority of them had practices in presenting new terminologies in ESP context. These show (40%) of teachers use effective teaching strategies in teaching such specialized words more than (60%) of them.

Options	N°	%
Yes	**4**	**40**
No	**6**	**60**
Total	**10**	**100**

Table 17: Teachers' Training in Teaching ESP or Technical Vocabulary



Graph06: Teachers' Training in Teaching ESP or Technical Vocabulary

Q04: "*How often do you present new technical words***?"**

The results display that most of teachers (60%) said that they present new technical words in every session to enhance and expand their students' lexical repertoire. Whilst only one teacher (10%) presents new technical words in every two sessions, on the other hand, three of the whole population (30%) who choose to present new technical vocabulary when needed.

Options	N°	%
In every session	**6**	**60**
Every two sessions	**1**	**10**
When needed	**3**	**30**
Total	**10**	**100**

Table 18: On Teachers Presentation

Q05: "*When you use technical vocabulary teaching strategies, how do you observe students?*"

Table 19 indicates that two teachers stated their students are very interested (20%) when they use TVTSs, and they experienced a sense of enjoyment and fulfilment when engaging with these strategies, which means that they encourage them so as to develop their terminology knowledge competence. On the other hand, most teachers (60%) said that when using TVTSs, students seemed somewhat interested in learning and understanding the specialized terminology associated with a particular subject or field. However, (20%) of teachers indicated that their students are not interested.

Options	N°	%
Very Interested	**2**	**20**
Somewhat Interested	**6**	**60**
Not Interested	**2**	**20**
Total	**10**	**100**

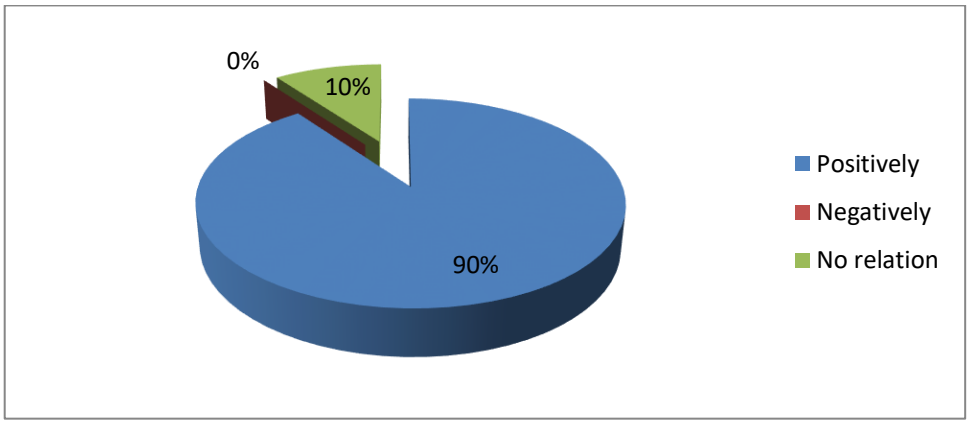
Table 19: Students' interest towards TVTSs use

Q06: "*The use of technical vocabulary teaching strategies affect students' "technical vocabulary competency***"**

As shown below the use of effective teaching strategies has a positive impact (90%) on students' technical vocabulary competency while (10%) has no effect in enhancing students' ability to understand, acquire, and utilize a wide range of technical vocabulary.

Options	N°	%
Positively	**9**	**90**
Negatively	**0**	**0**
No relation	**1**	**10**
Total	**10**	**100**

Table 20: The Effectiveness of Using Teaching Strategies on Students' Technical Vocabulary Competency.



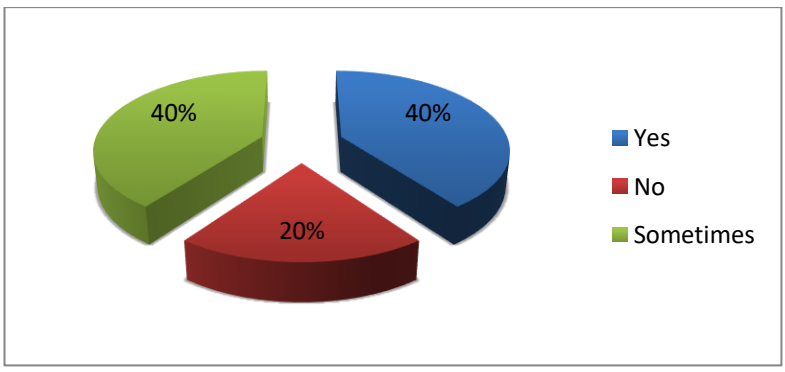
Graph07:TheEffectiveness of Using TVTSs

Q07: "*Do you give explicit instruction on certain strategy***?"**

The number of the teachers who indicated that they give explicit instruction on certain strategy is equal to the number of teachers who provided it sometimes (40%). Furthermore, (20%) of teachers who claimed that they do not introduce any instructions. This shows that (40%) of them consistently employ explicit instruction, as they make a regular practice to provide clear and detailed guidance, breaking down the steps and components of the strategy to ensure students' understanding and competence in applying it. The same number of teachers on the other hand considers themselves as a less consistent application of explicit instruction compared to the first group.

Options	N°	%
Yes	**4**	**40**
No	**2**	**20**
Sometimes	**4**	**40**
Total	**10**	**100**

Table 21: Explicit Instruction's Provision



Graph08:Explicit Instruction' Provision

Part Two: Teachers' TVTSs Use

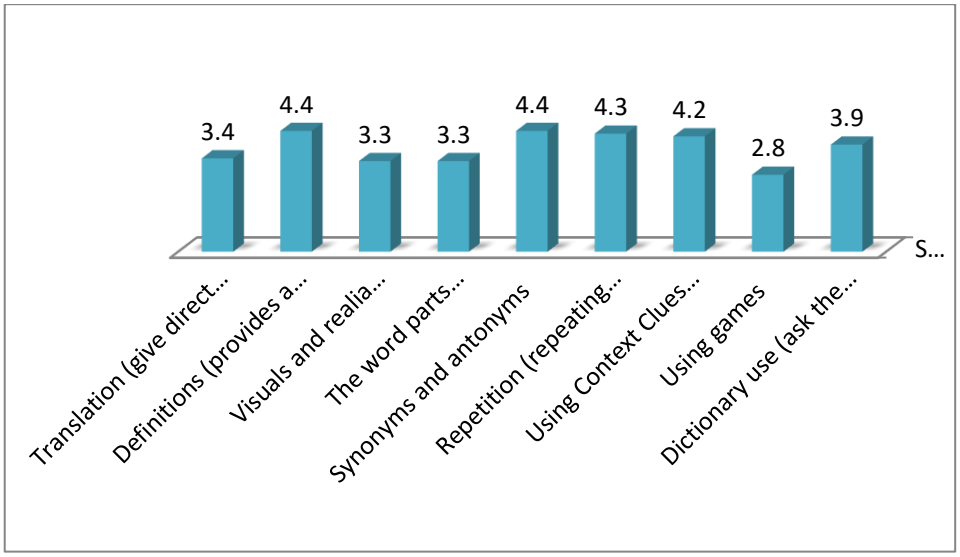
Data Analysis for Research Question four

Q08:"*When teaching new technical vocabulary, what are the strategies do you use*?"

Regarding the teacher strategies (table22), item 2 and 5, which are *"Definitions (provides a sentence that contains the meaning)"* and *"Synonyms and antonyms"* respectively, are the most commonly used strategies by the teachers (M =4.4). *"Repetition(repeating the word during the session)"* is another strategy preferred by the participants (M= 4.3). Next is item number 7 *"Using Context Clues (Word in context)"*with mean value (4.2). Item 9, which is *"Dictionary use (ask the student to use their electronic or print dictionary)"* is also reported as one of the main used strategies in teaching ETV (M=3.9). Item 1, which is *"Translation (give direct L1 translation of the word)"* is also reported as one of the main used strategies in teaching ETV (M=3.4). Both items3 and 4 with the mean of (3.3) where used sometimes by the teachers .On the other hand, item 8*"Using games "*with the mean of (2.8) correspond to the ninth as the least favoured used TVTSs by the participants.

Item N°	Statement	Mean	SD	Rank
1.	Translation (give direct L1 translation of the word)	3.4	1.505	6
2.	Definitions(provides a sentence that contains the meaning)	4.4	0.516	1
3.	Visuals and realia (Analysing any available pictures or use gestures)	3.3	1.567	7
4.	The word parts (Analysing affixes and roots)	3.3	1.567	8
5.	Synonyms and antonyms	4.4	1.074	2
6.	Repetition(repeating the word during the session)	4.3	0.823	3
7.	Using Context Clues (Word in context)	4.2	0.918	4
8.	Using games	2.8	1.619	9
9.	Dictionary use (ask the student to use their electronic or print dictionary)	3.9	0.737	5
	Total mean	**3.77**	**1.147**	///

Table 22: Teachers' TVTSs Use

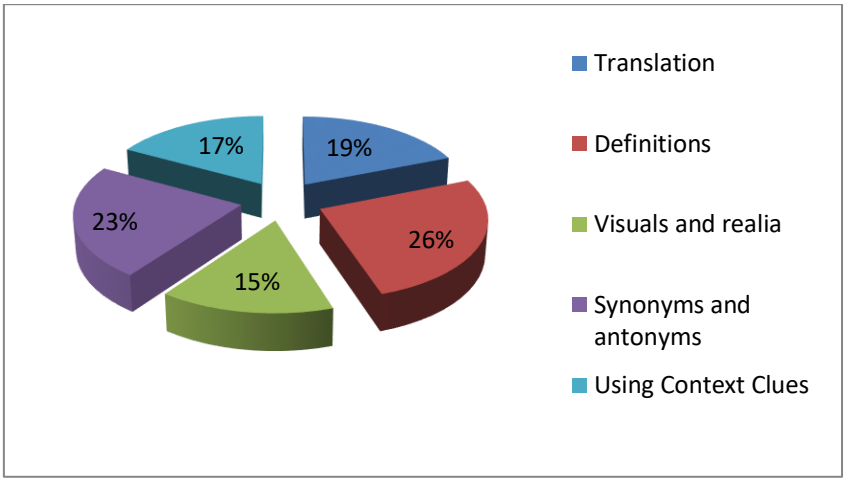


Graph09:Teachers' TVTSs Use

Q09: "*According to you, which ones work more effectively with your students? Arrange the following strategies from 1 (most effective) to 5 (least effective)*"

This question was asked to find out the most effective strategy that works better with students.

As it is plainly displayed in the pie-chart 06 below ,most of the teachers (26%) agreed that the best strategy that helps in the acquisition and improvement of the students' knowledge of ETV is" Definitions" because it helps learners to comprehend the meaning more easily with providing a full understanding of unknown words. The second common strategy as many teachers (23%) stated is "Synonyms/ Antonyms", it plays an important role in expanding students' lexical knowledge by establishing direct connections to known words. "Translation" comes next (19%), which provides words' equivalence of the mother tongue to students with a low level of English. Moreover, "Using context clues" (17%) is a strategy helps the students to improve their abilities in comprehending texts effectively. Finally, (15%) of the teachers stated "Visual and realia" as the least strategy because of the implementations' requirements of this strategy.



Graph10: The Order of the effective TVTSs

Q10:"*What challenges have you encountered when implementing different strategies?*"

This question was formulated to have insight about the teachers' difficulties in implementing different strategies, refereeing to the subsequent teachers' comments; "*Students' general level in English*", "*The unavailability of technological tools*","*Lack of effective communication* ","*Staying up to date with learning technology*" and "*Creating engaging lesson plans that fit the curriculum*." ,most of the teachers agreed that they often face difficulties owing to English proficiency level of their students. This makes it challenging to select the appropriate ETV activities and materials that satisfy the needs of students. Accordingly, teachers have to limit their TVTSs to meet their students' needs.

Additionally, access limitations to the necessary technological tools will hinder implementing certain technology-based strategies. Thus, this condition leads teachers to rely on traditional teaching methods and resources, which could narrow the variety and interactivity of vocabulary activities.

Furthermore, effective communication is fundamental for implementing TVLSs successfully. The language barriers will constrain the understanding and implementation of vocabulary activities between the teacher and students or among students themselves.

On the other hand, teachers need to stay informed about the latest advancements in educational technology for implementing TVTSs effectively; this includes understanding of how to control technology and utilizing certain vocabulary apps, online resources, or interactive multimedia tools. However, the challenge lies in keeping up with these developments, which requires continuous exploration of new tools and platforms.

Moreover, design engaging lesson plans that consist with the curriculum can be difficult when implementing TVTSs. Teachers must consider the objectives of the curriculum, which influence the adaptation of certain TVTSs. In addition to the limited time ESP courses had.

3.4. Discussion and Interpretation

3.4.1. Discussion of the Students' Questionnaire Results

3.4.1.1. Discussion of the First and second Research Question

The findings of students' questionnaire as it was presented indicate that students are not fully aware of the significance of TVLSs strategies; however, they are medium strategy users. The results indicate that students use some strategies without recognising them, because these strategies had not been presented to them. In details, (52.5%) of computer science students mentioned that TVLSs are slightly useful, they are somewhat interested in acquiring new specialized words , although they use learning strategies in a medium level (Table 09). This percentage is exactly the same with those who have strong ETV knowledge. While nine of them (22.5%) responded negatively by saying that they are not useful at all, this result approximately related to both groups with those who have insufficient ETV knowledge where their number is 7 students and present (17.5%),and 3 students (7.5%) who have weak ETV. Nowkolo (2020), argues that students need to recognize the importance of language learning strategies and receive appropriate training to effectively acquire new vocabulary, both in general English and technical vocabulary within ESP. In addition, 10 (25%) students responded positively by saying that they were useful; this percentage is closely related with those who have sufficient ETV (22.5%). Hence, the dissection of the above questions show that the first two research questions are answered as follow: computer science students are not fully aware of the importance of TVLSs, and they are medium strategy users which confirm the first and second hypotheses "*M1 computer science students may not be fully aware of the importance of TVLSs*" and "*M1 computer science students at Mohamed Boudiaf University are medium TVLS users*".

3.4.1.2. Discussion of the third Research Question

Concerning the third research question, metacognitive and memory strategies emerge as the most commonly used categories followed by determination strategies, while social and cognitive come least employed strategies among computer science students.

Utilizing metacognitive strategies more frequently indicate that they are actively engaged in their own learning process. Similar findings were achieved by Duong's (2022) study .He found that metacognitive strategies are the favoured to the other categories , and

concluded that one possible reason is the students' satisfaction from utilizing strategies that they are consciously familiar with .

Furthermore, the reason of these results is that the students have a low level of English. They prefer to employ strategies classified under memory category such as *"I memorize the pronunciation of the new learned word.", "I memorize the spelling of the new learned word." "I utter the new learned word out loud.", "I set words in groups in a way that it makes me remember them well."* and "*I draw image of the word in my mind to remember it*". The extensive utilization of these types of strategies shows a preference of traditional process for vocabulary learning strategies that are straightforward, because it seems easy to achieve short-term objectives such as passing exams or doing certain tasks.

Moreover, in determination category students tend to use more traditional ways in acquiring terms; "*I use dictionary to check words (electronic or print dictionary*", "*I check new words in English-Arabic dictionary*" and "*I guess the meaning of the word depending on the context*." and for low strategies use "*I divide the new word into root and affixes.*" and "*I check new words in English-English dictionary*."

Employing "*I guess the meaning of the word depending on the context*" strategy seems contradictory to other strategies since this strategy must be used when the student reach a certain level in English, but it can be a successful strategy if the contextual clues come with a variety of sources as pictures and diagrams .Additionally, the mastery of the subject matter by the students helps indicating the meaning from the context (Schmitt, 1997). This finding is consistent with the results of a study done by Seddigh and Shokrpur (2012). They found that dictionary and guessing strategies were also common employed VLSs among medical students (as cited in Wanpen et al, 2013). The data gathered of the current study is approximate to Duong's study (2022); memory comes as a second and determination as a third used strategies among the most frequently used strategies in learning ESP vocabulary.

From the obtained findings, it appears that social strategies and cognitive strategies are considered as the least practical categories. To illustrate, social strategies were found to be among the least favoured category referring to the following "*I ask my classmates for the meaning of the unfamiliar word*." and "*I find out the meaning of the word when I cooperate with others doing a given task*.", which were most preferred than "*I ask the teacher to help me (e.g. I ask for translation to the Arabic, ask for paraphrase or synonym of the new word).".*The findings obtained are in line with the results of Duong's (2022) study, where his results indicated that the participants showed a greater tendency to employ social strategies that involved their peers, rather than relying on their teachers. On the other hand, "I utter the

new word many times, in order to remember it", *"I form sentences by myself using words I lately learned*" and "*I utter the new word many times, in order to remember it*" are group of strategies used under cognitive category. Its findings were similar to Duong's results (2022), except for keeping an ESP vocabulary notebook which was the most frequently used in his study. In contrast to this research' findings showed that "*I keep with me a note book to write new words that I want to remember*" found to be the least used strategy among all the other strategies. Azmimurad' and Osman' results (2019), indicated that this strategy is least preferred by students to the possibility of the inconvenience caused by this strategy. Inconvenience in their context refers to the necessity of carrying vocabulary notebooks at all times has become outdated, as one can conveniently record newly learned vocabulary on a mobile phone instead of using a pen and a notebook for the same purpose.

Overall, students in the current study have a diversity of learning styles, which appear in their learning strategies use within each category .These findings are supported by Wanpen et al. (2013), who found that Engineering Students in vocational stream use TVLSs differently. As it is discussed so far both third and fourth research hypotheses which claimed that "*Teachers andM1 computer science students at Mohamed Boudiaf University use strategies to teach/learn vocabulary.*" and "*Teachers andM1 computer science students at Mohamed Boudiaf University deploy some technical vocabulary learning strategies more than other ones.*" are confirmed.

To sum up, drawn from the results , M1 computer science students are not fully aware of the importance of TVLSs ,however they still use TVLSs in a moderate level,it reveals that they unconscious of the existence of some strategies.

3.4.2. Discussion of the teachers' Questionnaire Results

3.4.2.1. Discussion of the fourth Research Question

The data collected from the following questions (Q3, Q4, Q5, Q6 and Q7) indicate that most of the participants had received no training in teaching ESP vocabulary; hence, teachers had to find their way in getting appropriate training to implement successful TVTSs. Regarding the importance of ETV, the results have shown that all the teachers are aware of its crucial role in responding to their students' needs. Therefore, most of them present new lexical item to them in every session. Also, the results point that students seemed to be interested when implementing TVTSs, despite of the extreme necessary of using TVTSs in enhancing students' ETV competency. Furthermore, some of the targeted teachers give regularly instruction on certain strategies, while others give explicit instructions infrequently. More importantly, teachers need to explore methods to develop their students' engagement

with these strategies by establishing a learning environment that helps in teaching ETV and raise their perceptions. In addition, previous studies have proved that "strategy instruction has an impact on strategy use and promotes learners' vocabulary learning" (Ghalebi et al., 2020, p.10)

As far as TVTSs are concerned, this questionnaire provided us with valuable information of the used strategies; "Definitions (provides a sentence that contains the meaning)" and "Synonyms and antonyms", that support teachers to convey the meaning of difficult words and make them easier to be remembered .Thus, learners store new words in their memory and enlarge their vocabulary package. "Repetition (repeating the word during the session)" is often used strategy, due to its advantages; it assist to remember the word with its pronunciation and meaning more effectively as it contributes to long-term retention. Moreover, "Using Context Clues (Word in context)" is a well-known commonly used strategy; it attempts to help the students increase their vocabulary knowledge as well as to develop their language skills. Followed by "Dictionary use (ask the student to use their electronic or print dictionary)"which refers to the traditional way of acquiring and translating new words, this process is considered as a major strategy teachers rely on when presenting new technical words. On the other hand "Translation (give direct L1 translation of the word)" facilitates enhancing technical vocabulary. "*Visuals and realia (Analysing any available pictures or use gestures)"* and "*The word parts (Analysing affixes and roots)*" are used strategies in teaching ETV. , "*Using games*" was the least preferred used TVTSs by the participants of the study, due to the absences of the required sources and materials.

Some of the outcomes of the current study seem to be in agreement with the findings of Alghamidi (2023), where he found definitions, synonyms and antonyms, use pictures are the most used strategies to present the meaning of ETV item directly, he supported his findings drawing on research by Beck et al (2002), Nagy (2005) and Folse (2004), where they argue that without the inclusion of definitions, rich (direct) vocabulary instruction cannot be achieved. Secondly, his findings also show that both strategies; context guessing and use dictionaries are reported to be used for teaching ETV indirectly. Interestingly, his study shows that strategies are used in combination with each other. For instance, definitions employed alongside with synonyms and antonyms, translations, or any combination of these strategies.

In conclusion, the last research question "*What are the strategies teachers use to teach/explain technical vocabulary?*" is answered as follow: teachers often use the following strategies: definitions, synonyms and antonyms, repetition, context clues, dictionary use. As they sometimes go for strategies such as; translation, visuals and realia, the word parts. While,

some strategies were the least used as; using games. Thus, these two formulated hypotheses "*Teachers and M1 computer science students at Mohamed Boudiaf University use strategies to teach/learn vocabulary*." and "*Teachers and M1 computer science students at Mohamed Boudiaf University deploy some technical vocabulary learning strategies more than other ones.*" are confirmed.

3.5. Summary of the Findings

The findings of this study are as follow:

From students' questionnaire:

- ✓ Not all M1 computer science students at M'sila University are fully aware of the importance of using TVLSs.
- ✓ M1 computer science students use TVLSs in medium level, However, they use strategies without recognize their presence.
- ✓ They tend to use metacognitive, memory strategies the most, next determination strategies .While the social and cognitive strategies are the least used ones.
- ✓ They deploy certain strategies more than other ones.
- ✓ M1 computer science students' learning styles differ from one to another

From teachers' questionnaire:

- ✓ Teachers at M'sila University are aware of the importance of ETV and the majority of them present it in every session.
- ✓ Teachers at M'sila University use TVTSs:
  - They often use "Definitions" "Synonyms and antonyms" "Repetition" "Using Context Clues" and "Dictionary use".
  - They sometimes tend to use "Translation" "Visuals and realia" and "The word parts".
  - "Using games" was the least used strategy according to them.
- ✓ Teachers at M'sila University struggle with some challenges in implementing effective TVTSs, such as "students' level of English", "The unavailability of technological tools"," Lack of effective communication" and "Creating engaging lesson plans that fit the curriculum."

3.6. Conclusion

This last chapter states the analysis and the interpretations of the data gathered from varied research's parts. The analysis of students' questionnaire reported the value perception of using strategies in learning technical vocabulary among M1 computer science students at M'sila University. After analysing questionnaire's answers, it showed that the students are not conscious of TVLSs' significance since they share different attitudes towards the use of TVLSs. Thought they are medium strategy users, it is discovered that they do not recognize some TVLSs. Additionally, metacognitive strategies were the most used strategies by computer science students, whereas cognitive strategies were the least used. In the other hand, the results of teachers' questionnaire determined the used TVTSs. They said that they had no training to teach ESP vocabulary in general and technical vocabulary in particular. Despite of the positive impact of using teaching strategies on students' technical vocabulary competency, they stated that some students are somewhat interested. Finally, definitions, synonyms and antonyms, and repetitions were the most preferred used strategies according to teachers. In general, the obtained outcomes presented the answers of research questions, certain suggested pedagogical implications and recommendation.

General Conclusion

The present research aimed at investigating the students' and teachers' use of TVLSs and TVTSs in learning/teaching technical vocabulary respectively by M1 computer science students and teachers at M'sila University. In this respect, the present study has two dimensions for students and for teachers.

For students, at first, this study tried to shed light on students' general knowledge about ETV and explore their awareness about the use of TVLSs. The current study principally focuses on the TVLSs, thus it examines the students' use of the TVLSs and figures out the most used group of the five main categories by the participants of the study. Also, it seeks to give an insight into the most and least employed TVLSs in the process of learning such terminologies.

For teachers, initially, this study aimed to provide insights into teachers' attitudes towards teaching ETV in general and using TVTSs in particular and how their students perceive them. Therefore, the main emphasis of the present study is to describe the TVTSs used by the teachers to introduce and teach technical items.

To achieve the study purposes and answer the research questions, a descriptive study were conducted, and the gathered data from both students' and teachers' questionnaires were analysed quantitatively and qualitatively. The informants were 40 M1 computer science students and 10 teachers from different faculties in M'sila University.

First, the data gathered from the students' questionnaire, indicate that M1 computer science students at University of M'sila have a strong ETV knowledge however still not sufficient .Moreover, the most of them state that TVLSs are slightly useful which indicates that they have some awareness concerning the TVLSs but still not fully aware of its importance. Furthermore, the data analysis of the students' questionnaire, show that the students occasionally use TVLSs in the process of acquiring ETV which make them medium strategy users. However, they use some strategies without consciousness of their presence. In addition, they use certain category more than others and within each category they use certain item more frequently than the rest of items, more specifically, students preferred metacognitive strategies to other categories, followed by memory strategies, determination strategies, social strategies and the least were cognitive strategies.

Second, the data collected from the teachers' questionnaire, shows that teachers do significantly use TVLSs with range of preferences. Particularly, they use definitions,

synonyms and antonyms, repetition, context clues, dictionary use, translation, visuals and realia, the word parts and using games, despite the fact that the majority had no training in teaching ETV.

After the analysis of gathered data from both questionnaires, the four hypotheses were confirmed. This means that; First, M1 computer science students at University of M'sila are not fully aware of the importance of TVLSs. Second, M1 computer science students at University of M'sila are medium strategy users. Thirdly, both teachers and students use TVTSs/TVLSs to teach/learn ETV. Finally, their use of TVTSs/TVLSs statistically differs from one strategy to another.

Pedagogical Implications

Educational Policy:

- ✓ The Ministry of Higher Education and Scientific Research should adopt a policy of training teachers to teach ESP vocabulary in general and ETV in particular.
- ✓ The Ministry of Higher Education and Scientific Research have to adopt a policy of a continuous training for ESP teachers to use moderate technology.
- ✓ It is advisable that the Ministry of Higher Education and Scientific Research provide detailed and developed ESP materials.
- ✓ The Ministry of Higher Education and Scientific Research appoint teachers.

For syllabus designers:

- ✓ University's departments ought to extend sessions time in order to provide more occasions for teachers to achieve students' needs.
- ✓ Adopting strategies in teaching technical vocabulary.

For Teachers:

- ✓ Provide opportunities for students to develop their ETV repertoire
- ✓ Supply the students with explicit instruction and training on certain TVLSs to ensure their understanding.

For Students

- ✓ The need to raise their awareness regarding the significance of terminologies in their fields and various TVLSs.
- ✓ Start exploring and implementing different TVLSs that is more suitable for students in order to enhance their self-directed learning.
- ✓ Work on improving their English level in general and lexical competence in particular to raise their proficiency level.

Limitations of the Study

To have this work accomplished, we encountered a number of limitations:

- ✓ Time constraints are the biggest obstacle we face as this study works for both students and teachers, having more time would be helpful, even though the study could be completed by the predetermined deadline.
- ✓ Obtaining the necessary resources were difficult, because the needed books require payment.
- ✓ Some of the answers may not be valid, because some questions have been answered quickly.
- ✓ Concerning teachers' sample, M'sila University face a huge problem with the lack of ESP teachers, as this study was intended to work only with MI faculty however they had only one teacher. This being the case, it was necessary to extend the teacher sample to other faculties. Moreover, we face a challenge in reaching the targeted teachers because some of them were busy with the second semester exams.

Recommendation for further researches

It is suggested for future researchers to:

- ✓ Examine the successful and unsuccessful students' use of TVLSs.
- ✓ Investigate the effects of TVLSs' awareness on motivating students to learn new technical items.
- ✓ Explorethe effectiveness of strategy training on students' ETV lexical achievements.
- ✓ Examine the combination of TVTSs' effect.

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Appendices

Appendix 01: Students' Questionnaire

Dear students,

It would be grateful to take part in this investigation by completing this questionnaire to express your attitudes towards technical vocabulary learning strategies. Your answers are very important for the validity of the research we are undertaking. Thank you for your cooperation.

أعزائي الطلبة

سعدنا بمشاركتكم في هذه الدراسة من خلال اجابتكم على هذا الاستبيان للتعبير عن آرائكم إزاء استراتيجيات تعلم المفردات التقنية. إجاباتكم مهمة جدًا لصحة ومصداقية الدرسة التي نقوم بيها .شكرا لتعاونكم.

Section One: Background Information القسم الأول: معلومات عامة

1-What is your Gender?؟ ماهو جنسك

- ◯ Male ذكر
- ◯ Female أنثى

2- What is your age? ما هي فئتك العمرية

- ◯ 21 - 25 Years old سنة25-21
- ◯ 26 - 29 Years old سنة29-26
- ◯ More than 30 أكثر من 30 سنة

Section Two: Technical Vocabulary Learning Strategies.

القسم الثاني: استراتجيات تعلم المفردات التقنية

Part One: Students' Awareness of the Importance TVLSs Use

3- How do you assess your technical vocabulary knowledge?

كيف تقّيم معرفتك للمفردات التقنية ؟

- ◯ غير Sufficient كافية
- ◯ Insufficient كافية
- ◯ Strong قوية
- ◯ Weak ضعيفة

4-Technical Vocabulary learning strategiesare :

استراتجيات تعلم المفردات التقنية :

Useful	مفيدة
Slightly	مفيدة قليلا
Not at all	ليست مفيدة على الإطلاق

Part Two: TVLSs' Use

5- What are the TVLSs do you use **ما هي الاستراتجيات التي تستعملها في تعلم المفردات التقنية ؟**

-To learn the meaning of new technical words: لمعرفة معاني المفردات الجديدة

	Always دائما	often غالبا	sometimes أحيانا	rarely نادرا	never أبدا
1. I divide the new word into root and affixes. أقسم الكلمة الجديدة إلى جذور ولواصق.					
2. I use dictionary to check words (electronic or print dictionary). استخدم القاموس للتحقق من معاني الكلمات (قاموس إلكتروني أو مطبوع)					
3. I check new words in English-Arabic dictionary. أتحقق من الكلمات الجديدة باستعمال قاموس انجليزي –عربي.					
4. I check new words in English-English dictionary. أتحقق من الكلمات الجديدة باستعمال قاموس انجليزي- انجليزي.					
5. I guess the meaning of the word depending on the context. اخمن معنى الكلمة بناءاً على السياق.					

6. I ask the teacher to help me (e.g. I ask for translation to the Arabic, ask for paraphrase or synonym of the new word).
أطلب من المعلم مساعدتي (مثلاً ، أطلب الترجمة إلى اللغة العربية ، أطلب إعادة صياغة أو مرادف للكلمة الجديدة.

7. I ask my classmates for the meaning of the unfamiliar.
اسأل زملائي عن معنى الكلمة الغير مألوف.

8. I find out the meaning of the Word when I cooperate with others doing given task.
أكتشف معنى الكلمة عندما أتعاون مع الآخرين للقيام بمهمة محددة.

-To remember new words: لتذكر الكلمات الجديدة

	Always often دائما	sometimes غالبا	rarely أحيانا	never نادرا	ابدا
9. I Draw image of the word in my mind to remember it. ارسم صورة للكلمة في ذهني لأتذكره.					
10.I set words in groups in a way that it makes me remember them well. (E.g. SYSTEM, DATA, SOFTWARE will be set in the same group). اصنف الكلمات في مجموعات بطريقة تجعلني أتذكرها جيداً.					
11.I utter the new learned word out loud.					

انطق الكلمة الجديدة التي تعلمتها بصوت عالٍ.

---

12. I memorize the spelling of the new learned word.
احفظ تهجئة الكلمة الجديدة التي تعلمتها.

---

13. I memorize the pronunciation of the new learned word.
احفظ نطق الكلمة الجديدة التي تعلمتها.

---

14. I keep with me a note book to write new words that I want to remember.
احمل دفترا معي لكتابة الكلمات الجديدة المراد تذكرها

---

15. I utter the new word many times, in order to remember it.
اكرر نطق الكلمة الجديدة عدة مرات لاتذكرها.

---

16. I write the new word many times.
اكتب الكلمة الجديدة عدة مرات.

17.I form sentences by myself using words I lately learned.
اشكل جمل باستخدام الكلمات التي تعلمتها مؤخراً.

---

18. I listen to English lectures, recorded conversations or audio books or audio books.
استمع إلى محاضرات باللغة الإنجليزية
أو محادثات مسجلة أو كتب صوتية.

19.I use computer programs.
أستخدم برامج الكمبيوتر.

---

20. I watch English TV/YouTube channels (e.g. shows, movies, and podcasts).
اشاهد القنوات الإنجليزية على التلفزيون أو عبر موقع يوتيوب (مثل البرامج التلفزيونية والأفلام والبودكاست).

21. I skip unfamiliar words, when I can comprehend the whole meaning of the sentence or the passage.
اتخطى الكلمات غير المألوفة، عندما يمكنني فهم المعنى الكامل للجملة أو المقطع.

22. I surf on the net (e.g. I join Facebook or What's App groups, Skype to practice the new learned words).
اتصفح الإنترنت (مثل الانضمام Skype، WhatsApp إلى مجموعات على فيسبوك أو واتساب، أو استخدام سكايب لممارسة استخدام الكلمات الجديدة).

Appendix 02: Teachers'Questionnaire

The following questionnaire seeks to collect data about the used strategies by teachers when teaching technical vocabulary in ESP context. Your responses are highly valued and your cooperation is appreciated. All information you provide will only serve this particular research and will remain confidential. So, please feel free to share your opinions and report frankly your real situation when answering the following questions. Thank you very much for your cooperation.

Section One: Background Information

1-How long have you been teaching ESP courses?

- 1-6years
- 6-11years
- More than 11years

2-What is your study degree?

- BA (License)
- MA (Master)
- MA (Magister)
- PhD Section

Section Two: Technical Vocabulary Teaching Strategies

Part One: Technical Vocabulary Teaching Strategies

3-Have you been trained to teach ESP vocabulary on general and technical vocabulary in particular ?

- Yes
- No

4-Do you present new technical words in every session ?

- In every session
- Every two sessions
- When needed

5-Whenyouuse technical vocabulary teaching strategies, how do you observe the students?

- Very Interested
- Somewhat Interested

Not at all

6-Do you think that the use of technical vocabulary teaching strategies will affect student' technical vocabulary competency?

Positively

Negatively

No relation

7-Do you try to give explicit instruction on certain strategy ?

Yes

No

Sometimes

PartTwo:Teachers' TVTSs Use

8-Whenyouteachnewtechnicalvocabulary, what are the strategies do you use :

	Always	**Often**	**Sometimes**	**Rarely**	**Never**
1. Translation (give direct L1 translation of the word)					
2.Definitions (provides a sentence that contains the meaning)					
3. Visuals and realia (analyzing anyavailable pictures or use gestures)					
4. Thewordparts (Analysing affixes and roots)					
5. Synonyms andantonyms					
6. Repetition (repeating the word during the session					

7.Using Context Clues
(Word in context)

8. Using Games

9. Dictionary use (ask the student to use their electronic or print dictionary)

Others: please, specify

……..……..……..……..……
……..……..……..……..……..……
……

9- According to you, which one works effectively with your students?

Arrange the following list from one (most effective) to nine (the least effective):

	1	2	3	4	5	6	7	8	9
1. Translation (give direct L1 translation of the word)									
2. Definitions (provides a sentence that contains the meaning)									
3. Visuals and realia (Analysing any available pictures or use gestures)									
4. The word parts (Analysing affixes and roots)									

5. Synonyms and antonyms	⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭
6.Repetition (repeating the word during the session)	⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭
7. Using Context Clues (Word in context))	⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭
8. Using Games	⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭
9. Dictionary use (ask the student to use their electronic or print dictionary)	⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭ ⬭

Others: please, specify

……..……..……..……..……
……..……..……..……..……..……
……

10-What challenges have you encountered when implementing different strategies?

……..……..……..……..……
……..……..……..……..……..……
……..……..……..……..……
……..……..……..……..……
……..……..……
……..

Appendix03. Distribution of the target population according to the use of TVLSs, N=40

Items	Always		Often		Sometimes		Rarely		Never		Mean	SD	Rank
Determination strategies	N	%	N	%	N	%	N	%	N	%			
1. Divide the new word into root and affixes.	0	0%	3	7.5%	8	20 %	13	32.5 %	16	40%	1.95	0.959	4
2. Use dictionary to check words (electronic or print dictionary).	14	35%	14	35%	10	25%	2	5%	0	0%	4,00	0,906	1
3. Check new words in English-Arabic dictionary.	9	22.5 %	14	35%	10	25%	6	15%	1	2.5 %	3,60	1,081	2
4. Check new words in English-English dictionary.	0	0%	3	7.5%	5	12.5 %	16	40%	16	40%	1.88	0.911	5
5. Guess the meaning of the word depending on the context.	8	20%	11	27.5 %	13	32.5 %	6	15%	2	5%	3,43	1.129	3
Total mean	2,97												
Standard Deviation	0.997												

Social strategies	---	-----	----	-----	-----	-----	---	-----	---	-----	-----	-----	-----
6. Ask the teacher to help me (e.g. I ask for translation to the Arabic, ask for paraphrase or synonym of the new word).	**3**	**7.5%**	**5**	**12.5 %**	**14**	**35%**	**7**	**17.5 %**	**11**	**27.5 %**	**2,55**	**1.239**	**3**
7. Ask my classmates for the meaning of the unfamiliar word.	**8**	**20%**	**16**	**40%**	**11**	**27.5 %**	**3**	**7.5%**	**2**	**5%**	**3,63**	**1,055**	**1**
8. Find out the meaning of the word when I cooperate with others doing a given task.	**3**	**7.5%**	**6**	**15%**	**14**	**35%**	**6**	**15%**	**11**	**27.5 %**	**2,6**	**1.256**	**2**
Total mean	**2,93**												
StandardDeviation	**1.183**												
Memory strategies													
9. Draw image of the word in my mind to remember it.	**3**	**7.5 %**	**5**	**12.5 %**	**13**	**32.5 %**	**7**	**17.5 %**	**12**	**30%**	**2,50**	**1.260**	**4**

10. Set words in groups in a way that it makes me remember them well. (E.g. SYSTEM, DATA, SOFTWARE will be set in the same group).	**6**	**15%**	**12**	**30%**	**15**	**37.5 %**	**3**	**7.5 %**	**4**	**10%**	**3,33**	**1,141**	**5**
11. Utter the new learned word out loud.	**13**	**32.5 %**	**16**	**40%**	**4**	**10%**	**2**	**5%**	**5**	**12.5 %**	**3,75**	**1,316**	**3**
12. Memorize the spelling of the new learned word.	**17**	**42.5 %**	**9**	**22.5 %**	**7**	**17.5 %**	**5**	**12.5 %**	**2**	**5%**	**3,85**	**1,252**	**2**
13. Memorize the pronunciation of the new learned word.	**21**	**52.5 %**	**12**	**30%**	**2**	**5%**	**3**	**7.5%**	**2**	**5%**	**4,18**	**1,152**	**1**
Total mean	**3,52**												
Standard Deviation	**1,224**												
Cognitive strategies	**---**	**-----**	**----**	**-----**	**-----**	**-----**	**---**	**-----**	**---**	**-----**	**-----**	**-----**	**-----**
14. Keep with me a note book to write new words that I want to remember.	**1**	**2.5%**	**2**	**5%**	**8**	**20%**	**6**	**15%**	**23**	**57.5 %**	**1,80**	**1.090**	**4**

15. Utter the new word many times, in order to remember it.	**18**	**45%**	**12**	**30%**	**6**	**15%**	**2**	**5%**	**2**	**5%**	**4,05**	**1,131**	**1**
16. Write the new word many times.	**4**	**10%**	**6**	**15%**	**9**	**22.5 %**	**9**	**22.5 %**	**12**	**30%**	**2,53**	**1,305**	**3**
17. Form sentences by myself using words I lately learned.	**6**	**15%**	**13**	**32.5 %**	**12**	**30%**	**3**	**7.5%**	**6**	**15%**	**3,25**	**1.255**	**2**
Total Mean	**2,91**												
Standard Deviation	**1.195**												
Metacognitive strategies													
18. Listen to English lectures, recorded conversations or audio books.	**11**	**27.5 %**	**7**	**17.5 %**	**17**	**42.5 %**	**5**	**12.5 %**	**0**	**0%**	**3,60**	**1,033**	**4**
19. Using computer programs.	**15**	**37.5 %**	**11**	**27.5%**	**8**	**20%**	**5**	**12.5 %**	**1**	**2.5 %**	**3,85**	**1,145**	**2**

20. Watch English TV/YouTube channels (e.g. shows, movies, and podcasts).	**22**	**55%**	**9**	**22.5 %**	**8**	**20%**	**1**	**2.5 %**	**0**	**0%**	**4,30**	**0,883**	**1**
21. Skip unfamiliar words, when I can comprehend the whole meaning of the sentence or the passage.	**8**	**20%**	**13**	**32.5 %**	**15**	**37.5 %**	**4**	**10%**	**0**	**0%**	**3,63**	**0,925**	**3**
22. Surf on the net (e.g. I join Facebook or WhatsApp groups, Skype to practice the new learned words).	**9**	**22.5 %**	**9**	**22.5 %**	**14**	**35%**	**7**	**17.5 %**	**1**	**2.5 %**	**3,45**	**1,108**	**5**
Total mean	**3,77**												
Standard Deviation	**1.008**												

Appendix04. Distribution of the target population according to the use of TVTSs, N=10

Items	**Always**		**Often**		**Sometimes**		**Rarely**		**Never**		**Mean**	**SD**	**Rank**
Determination strategies	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**			
1. Translation (give direct L1 translation of the word)	**2**	**20 %**	**4**	**40%**	**2**	**20%**	**1**	**10 %**	**1**	**10 %**	**3,4**	**1,505**	**6**
2. Definitions (provides a sentence that contains the meaning)	**4**	**40 %**	**6**	**60%**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**4,4**	**0,516**	**1**
3. Visuals and realia (Analysing any available pictures or use gestures)	**2**	**20 %**	**4**	**40%**	**1**	**10%**	**2**	**20 %**	**1**	**10 %**	**3,3**	**1,567**	**7**
4. The word parts (Analysing affixes and roots)	**3**	**30 %**	**1**	**10%**	**4**	**40 %**	**1**	**10 %**	**1**	**10 %**	**3,3**	**1,567**	**8**
5. Synonyms andantonyms	**7**	**70 %**	**1**	**10 %**	**1**	**10 %**	**1**	**10 %**	**0**	**0%**	**4,4**	**1,074**	**2**
6. Repetition (repeating the word during the session)	**5**	**50%**	**3**	**30%**	**2**	**20%**	**0**	**0%**	**0**	**0%**	**4,3**	**0,823**	**3**
7. Using Context Clues (Word in context)	**5**	**50%**	**2**	**20%**	**3**	**30%**	**0**	**0%**	**0**	**0%**	**4,2**	**0,918**	**4**
8.Using Games	**1**	**10%**	**2**	**20%**	**5**	**50%**	**0**	**0%**	**2**	**20%**	**2,8**	**1,619**	**9**
9.Dictionary use (ask the student to use their electronic or print dictionary)	**2**	**20%**	**5**	**50%**	**3**	**30%**	**0**	**0%**	**0**	**0%**	**3,9**	**0,737**	**5**

Total mean	**3,77**
StandardDeviation	**1,147**

ملخص

موضوع هذا البحث هو " استراتيجيات تعليم وتعلم المفردات التقنية " كما تحاول هذه الدراسة فحص الاستراتيجيات الشائعة المستخدمة بين طلاب سنة أولى ماستر لقسم الإعلام الآلي والمدرسين في جامعة المسيلة ، بالإضافة إلى التحقيق من مدى وعي الطلاب في استخدام هذه الاستراتجيات المستعملة و كيفية أداء المدرسين. في هذه الدراسة الوصفية ، تم جمع البيانات من خلال استبيانين ؛ تم إجراء الاستبيان الأول على 40 طالبًا من قسم الإعلام الآلي والذي يتضمن خمس فئات بناءً على تصنيف سكميت (1997) . والثاني تم إرساله إلى 10 مدرسين من كليات مختلفة. ثم تحليل هذه البيانات المتحصل عليها باستخدام برنامج الإحصاء الإحصائي للعلوم الاجتماعية إصداره 26 وأظهرت النتائج أن طلاب سنة أولى ماستر لقسم الإعلام الآلي ليسوا على دراية كاملة بأهمية استخدام استراتجيات تعلم المفردات التقنية و أنهم يستخدمونها بمستوى متوسط. لأنهم يفتقرون إلى معرفة بعض الاستراتيجيات. والأهم من ذلك، فإنهم يميلون إلى استخدامها وفقًا لتفضيلات مختلفة؛ فقد كانت الاستراتيجيات وراء المعرفية هي الأكثر استخدامًا، في حين كانت الاستراتيجيات الإدراكية أقل تفضيلا كما يوجد في كل مجموعة إستراتيجية أكثر استخداما من الأخرى من نفس المجموعة . من ناحية أخرى، أفاد المدرسون بأنهم يستخدمون استراتيجيات تعليم المفردات التقنية مع تنوع تفضيلاتهم.