Technical Vocabulary: Nature, Theory and Pedagogy

A reference guide for technical vocabulary instruction

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Preface

While doing my MA in Australia and Ph.D in the UK, I was very much interested in knowing more about technical vocabulary. The reason for this interest was not solely theoretical in nature but also linked to the years I spent in teaching English for Technical Purposes (ETP).

Years later, the idea of writing this book was greatly motivated by the scarcity of resources teachers, teacher educators, students, and syllabus designers face when dealing with this type of vocabulary.

This book consists of six chapters and addresses both the theory and practice regarding technical vocabulary instruction. Technical vocabulary teaching strategies (TVTS) is also a genuine topic in this product where I define each strategy and support that by giving some examples from the ESP context in different technical domains. Other relevant less-researched topics

such as who should teach technical words and the scope of collaboration between ESP and content area teachers are also discussed in this book. The last chapter opens windows for further future scrutiny on other overlooked areas in the field of technical vocabulary instruction.

General objectives of the book

- To provide theoretical and applied background for technical vocabulary instruction
- To bridge the gap between ESP teachers and content area teachers in technical vocabulary instruction
- To clearly define technical vocabulary and help trainers identify them
- To raise awareness on the importance of technical vocabulary in acquiring labor-market language
- To introduce a comprehensive understanding of technical vocabulary instruction amongst all stakeholders
- To Introduce the strategies of technical vocabulary instruction
- To introduce the main vocabulary delivery vehicles

- To determine the roles of English for Specific Purposes Teachers (ESPTs) in technical vocabulary instruction
- To determine the roles of the content area teachers in technical vocabulary instruction
- To provide the role of the partners (learners, course designers, departments and institute administration) in technical vocabulary instruction
- To encourage all interested about technical vocabulary studies to conduct further future scrutiny
- To minimize the gap between the language of science and its equivalent in the work sectors

Chapter One

(1) Vocabulary

By the end of this chapter, the trainer should be able to:

- Define vocabulary in general
- Distinguish different types of vocabulary
- Infer the importance of vocabulary

1.1 Vocabulary definition

There has been wide agreement among many experts in the field of vocabulary (e.g. Crystal, 2008; Nation, 2001; Schmitt, 2010) and lexicographers (e.g. Richards & Schmidt, 2002; Scholfield, 1981a) with regard to using the terms 'lexis', 'lexeme', 'lexicon' and 'lexical items' as synonym terms for the commonly-used term 'vocabulary'.

Therefore, Richards & Schmidt (2002), for example, argue that 'lexical items' or 'lexemes' stands for the smallest abstract unit in the meaning system of a language, which can be distinguished from other similar units. 'Lexical items', according to them, can occur in spoken or written sentences and are regarded as the same 'lexeme' when inflected. For example, the verb tenses: write, wrote, written, writing and writes would all belong to the one 'lexical item' or 'lexeme' ‘write’. Following the same trajectory, Jackson and Ze Amvela (2000) argue that a comparison of the

words 'vocabulary', 'lexis' and 'lexicons' would show that the three items are more or less synonymous.

Dictionary compilers have a similar view. For example, *Webster's Collegiate Dictionary* defines the entry 'vocabulary' as 'lexicon' while 'lexeme' in *Longman Dictionary of Language Teaching and Applied Linguistics* is another word for 'vocabulary'. Therefore, the terms ‘English technical vocabulary’ (henceforth, ETV), ‘technical vocabulary items’ or ‘English technical vocabulary items’ will be used interchangeably in this book because they are the common terms used by English for Specific Purposes Teachers (henceforth, ESPTs), Content Area Teachers (henceforth, CATs), students and textbooks at any ESP context.

1.2 Types of vocabulary

Researchers classified vocabulary into different types according to the parts of speech to which they belong, whether they are concrete or abstract, borrowed or native and specialist or

general. Nation (2001) and Coxhead (2006), for example, classify vocabulary into four levels of frequency, namely: high-frequency words, academic words, technical words and low-frequency words.

According to Nation (2001), **high-frequency vocabulary** is the first 2,000 words, which appear in the classical collection, General Service List (GSL) of West (1953, 1986). Some other written and spoken corpus-based vocabulary lists have been introduced since the GSL. Nation (2001) argues that most frequency words include both content and function words. Content words, according to Richards and Schmidt (2002), are words that have meaning when they are used alone like nouns, verbs, adjectives and adverbs. Besides this, high-frequency vocabulary covers all the function words (see Appendix A), which are the words that show grammatical relationships in and between sentences with little meaning on their own, for example, conjunctions like: *about, above* and *after*, also prepositions like

on, *of* and *to* and articles like *the*, *a* and *an* (Richards & Schmidt, 2002). Nation (2001) argues that high-frequency vocabulary covers 80% of academic text and newspapers and around 90% of conversations and novels, and that it includes around 176 word families.[1]

The second type of vocabulary is **academic vocabulary**, which is common to a wide range of academic fields (Nation, 2001). Examples of academic vocabulary are words like: *schedule, abandon, transform* and *principle.* Although this type has been called 'sub-technical vocabulary' (Cowan, 1974) and 'semi-technical vocabulary' (Farrell, 1990), Martin (1976) prefers the term ' academic vocabulary' because it focuses on

[1] Word families comprise the base word plus its inflexions and derivations (Thornbury, 2002). Read (2000) believes that a word family is a set of word forms, sharing a common meaning: thus, he claims that the literal 'loss of fluid' and the more metaphorical 'loss of secret information' are known as word families.

research, analysis and evaluation, which are typical activities that usually characterise academic work. Academic vocabulary covers, on average, 8.5% of academic text, 3.9% of newspapers and less than 2% of the running words of novels (Hwang, 1989). Just as West's GSL covers the first level of vocabulary, i.e. high-frequency vocabulary, Coxhead's (2000) Academic Word List (AWL) with its 750 word families appears to be a reliable source for students with academic goals (Nation, 2001). Regardless of the admiration and prestige that the AWL gained, it was recently criticized and questioned as a reliable vocabulary list for academic study since different lexical items on the list often occur and behave differently across disciplines in terms of range, frequency meaning and collocation (Hyland & Tse, 2007).

Technical vocabulary is the third type of vocabulary, which is central to this book. Nation (2001) defines it as the term that appears frequently in a specialized text or area but does not occur, or only occurs with lower frequency, in other fields of study. This

type of vocabulary covers 5% of the running words in specialized texts (Nation, 2001). Technical vocabulary has been surprisingly neglected in vocabulary studies compared to the two previous types. Examples of technical words are words like *gearbox*, *motherboard* and *compressor*. This chapter will explore this type of vocabulary in detail.

The fourth type of vocabulary is **low-frequency vocabulary**, which covers all the remaining words of English. Typically, this level covers 5% of the running words in texts. Examples of low frequency vocabulary are words like: *pastoral*, *perpetuity* and *aired*. According to Nation (2001), this type of vocabulary:

(I) can be included in the high-frequency vocabulary list according to the nature of the corpus on which the list is based.

(II) usually comprises proper names, i.e. names of people, places etc.

(III) might be viewed as technical or low-frequency vocabulary by some specialists in the field, based on their jobs, interests and specialisations.

(IV) is low-frequency vocabulary because it is rarely used by the speakers of its language.

1.3 Importance of vocabulary

It goes without saying that vocabulary is an essential language element both in language learning and teaching because without vocabulary both written and verbal communication is expected to be poorly understood. This fact has been emphasized by many researchers in the field of L2 vocabulary learning and teaching. For example, Wilkins (1972, p.111-112) believes that "... while without grammar little can be conveyed, without vocabulary nothing can be conveyed". Similarly, Lewis, (1993) argues that vocabulary should be at the center of language teaching, because he believes that language consists of grammatical lexis not

lexicalized grammar. Johansson (1978 cited in Kang & Golden, 1994) found in a survey study that native speakers of English rated lexical errors as more disruptive and serious than any other errors made by learners.

It was also found that vocabulary is a vital language aspect in both receptive (i.e., listening and reading) and productive (i.e., writing and speaking) language skills. For example, some language studies concluded that there is a strong correlation between reading comprehension and vocabulary knowledge (e.g. Fraser, 1999,Matsuoka and Hirsh, 2005, Al-Homoud & Schmitt,2009,Utiyama et al., 2010). In other words, it was agreed that readers with little vocabulary comprehend less compared to their peers with better vocabulary repertoire. Therefore, language teachers were encouraged to deliberately and directly teach vocabulary (i.e. explicit vocabulary instruction) in order to achieve their teaching goals. One of the major outcomes of the L2 explicit vocabulary instruction hypothesis is the emergence of

advice on how to teach L2 vocabulary using certain strategies (Allen, 1983; Gairns and Redman, 1986; Nation, 1990, 2001; Lewis, 1993) which will be addressed in details in chapter four.

Chapter Two

(2) Technical Vocabulary

By the end of this chapter the trainer will be able to:

- Define technical vocabulary
- Identify technical vocabulary
- Distinguish the different types of technical Vocabulary
- Explore the degrees of technicality

As mentioned in the outset of this book, this work is mainly about English technical vocabulary. The following four sections will address some essential topics about the nature of this type of vocabulary which are: the neglect of ETV items, defining ETV items, identifying ETV items, and degree of technicality. These topics will provide a solid base before we move to discuss ETV items instruction and pedagogy in the following chapters.

2.1 The neglect of technical vocabulary

Technical vocabulary is the type of vocabulary that has received little attention in vocabulary and lexicographic studies. Bramki and Williams (1984: 169) believe that "[t]his often-mentioned 'neglect' is, in our view, most apparent in the field of specialist vocabulary".

More specifically, Johnson and Hwang (1983) argue that little research has been conducted to determine what attributes are important to retention, particularly, when the words are technical.

However, almost two decades later, Chung and Nation (2003) re-emphasize that while there is considerable research evidence about the nature and coverage of high-frequency and academic words, there has been little investigation into low-frequency and ETV. It has been argued that one essential reason for this neglect is lacking agreement about what ETV is, on the one hand, and how to count it reliably, on the other (Chung & Nation, 2004).

The often-mentioned 'neglect of technical vocabulary' involves both the vocabulary with pure technical meaning, for example, '*morpheme*' and '*allophone*' in the field of linguistics, and other everyday words, when they carry additional technical meanings, for example, *hydraulic* and *piston* in the field of mechanics, or when they occur in a technical sense such as, '*motherboard*' in the field of computing.

2.2 Defining technical vocabulary

ETV lacks a unified definition. This situation consequently allows different labels (e.g. ‘technical words’, ‘technical terms’, ‘specialized lexis’, ‘specialist vocabulary’, ‘terminological unit’, ‘scientific words’, ‘terminological words’ and ‘technical jargon’ to emerge. However, from the few definitions available, ETV definitions can be said to fall mainly into three categories which are: (i) classical; (ii) frequency and range; and (iii) a mixture of both definitions.

Classical definitions regard ETV as one whose meaning is recognisably specific to a particular topic, discipline or field of knowledge; thus, a certain level of knowledge of the field is required in order to understand it. I term them ‘classical definitions’ because they are the most widespread in the literature.

Typically, experts in the field, i.e. practitioners, specialists and students of various subject areas are considered to be familiar with these words when they are used in a particular area of knowledge. Many researchers (e.g. Martin, 1976; Alkasimi, 1979; Sautarsyah et. al. 1994; Nation, 2001; and Chung and Nation 2003 & 2004) used this classical definition in their studies.

However, in some textual studies, where the occurrence of the technical word is primary, it was found preferable to define ETV according to its frequency and range (Becka, 1972, as cited in Sutarsyah et al., 1994). Frequency stands for the number of occurrences of certain ETV items in a text or corpus whereas range refers to the number of samples and texts in which certain ETV items occur. The major outcomes of this definition are the emergence of both ETV corpus-based lists and the notion of ETV tiers and degrees of technicality (as we shall discuss in Section 2.4).

One of the main differences between this definition and the classical one is that words in the latter can be identified by a computer, while the former requires a panel of experts. Examples of some recent corpus-based studies are the works of Hunston and Francis (2000), Stubbs (2001) and Nesselhauf (2004).

The third definition of ETV is a mixture of the two aforementioned definitions. Salager-Meyer (1985: 6), for example, defines medical ETV items as, "those high frequency, context-bound, or topic-dependent terms particular to a given medical specialty".

Vocabulary researchers and lexicographers usually adopt this definition according to the nature and needs of their studies. For example, the compilers of *the Dictionary of Archaeology* stress that deciding what technical vocabulary to put in or leave out of a scientific dictionary is 'a complicated issue', which greatly depends upon the contributions of the specialists in the field for advice on selecting the technical entries. The compilers of

Longman's Dictionary of Language Teaching and Applied Linguistics and *Dictionary of Accounting* explicitly reveal that technical terms in their work were defined according to frequency of occurrence, on the one hand, and specificity to a particular field of knowledge, on the other.

Although this book is in favour of the mixed definition, which is a holistic approach that encompasses the two other definitions, I need to emphasize that what matters more in this work is the way teachers teach ETV items rather than how they define it.

2.3 Identifying technical vocabulary

The topic of identifying ETV items should not be mixed up with the topic of defining them. As far as the former is concerned, Chung and Nation (2004: 252), argue that identifying ETV helps:

(i) to calculate how large ETV might be.

(II) to find how often, and with what density, the vocabulary occurs in a text.

(III) to determine how teachers and students should deal with it.

This book will focus on this third aspect since its one central aim is to investigate how ESPTs and CATs perceive ETV items teaching at any ESP context. Chung and Nation (2004) continue to stress that ETV items can be identified as:

(I) subject-related;

(II) occurring in a specialist domain; and

(III) part of a system of subject knowledge.

However, because these three aspects involve a great deal of information needed by each ETV research project, and because they rely on the intuition of the experts in the field, I will give some details about each aspect separately.

Identifying ETV as subject-related means that the meanings of the technical words are closely associated with a particular subject area (Farrell, 1990; Sutarsyah et al., 1994; Baker, 1988).

The most efficient way to measure how close a word is to a particular subject, according to (Chung and Nation 2004), is by using a rating scale by which it can be decided whether the individual meanings of words fall into the sphere of specialized meaning or not.

The idea that ETV occurs in a specialist domain implies that the occurrence of ETV in one area is much greater than its occurrences in another area or range of areas. Researchers sometimes use special software or a simple concordance to count frequency. Then, they apply appropriate statistical procedures with which to determine the words that occur distinctively more frequently in the specialist corpus than they are in the general English corpus. Much work has been done using the corpus-based approach, such as Yang (1986), Baker (1988), Ahmad, Davis, Fulford, and Rogers (1994), Fukushige and Noguchi (2000) and Kavanagh (1995).

Finally, ETV is part of a system of subject knowledge, which requires the participation of the specialists in the field of technical/scientific terminology who compile technical dictionaries and/or suggest certain clues to determine whether a word in a context is technical or not.

In addition to the approaches mentioned above, some specialists look at the form of the word as a critical factor by which to decide whether a word is technical or not. In his automatic term collection study, Yang (1986) claims that ETV items can be both single-worded, such as, for example, *software*, *terminal*, etc. or multi-worded, such as, for example, *programming language*, *radio wave transmitter*, *hydraulic power transmission system*, etc. Chung and Nation (2004) believe that as far as ETV form is concerned, words that appear in specialized fields with Greek- and Latin-based forms (e.g. *transmitter*, *hydraulic* etc.) are more technical.

ETV items at any ESP context reach the classroom from different sources (e.g. subject area syllabus, specialized dictionaries etc.) and it can be sometimes difficult to determine precisely how they were identified. Most, if not all, sources even neglect how ETV items were selected. Therefore, I need to re-emphasize what matters most in this book is the way teachers teach and perceive teaching ETV rather than how ETV was identified in the different sources available at their contexts.

2.4 Degree of technicality

Degree of technicality is a notion used to show that some ETV items are more technical than others. This notion has also been called ‘ETV tiers’. Nation (2003) argues that ETV items can be classified into four categories, with the first category being the most technical and the last being the least technical. He uses the criterion of frequency of form and meaning as the basis for the four different categories. These categories are:

(i) **First category**: The form of the word is fully technical and appears rarely, if at all, outside a particular field of study and the ETV here only has a technical meaning. Examples are ETV, such as *anode*, *galvanometer* in the field of electronics.

(ii) **Second category**: The ETV form is used both inside and outside a particular field of knowledge with a different meaning. Examples are words like: *type* and *token* in applied linguistics. According to Nation (2003), words that fall into this category are technical because their broad meaning, when used outside the field of knowledge, does not provide ready access to their technical use.

(iii) **Third category**: The word form here is used outside and inside a particular field of knowledge but the majority of its uses, with a particular meaning, are in this field of knowledge. In addition to that, the specialized meanings that these words have in these fields are readily accessible through their meaning outside their fields of knowledge. Examples for this category are

words like: *offer* and *reconstruction* (of a crime) in the field of law.

(iv) **Fourth category**: The word form in this category is more widespread in a particular field of study than elsewhere. There is minute or no specialization at all of its meaning, which in turn makes it convenient for a knowledgeable person in its field of study to give its meaning. Examples of this category are words like: *icon* and *print* in computing.

Words in the third and fourth categories are less technical because neither the form nor the meaning of these words is unique to a particular field of knowledge (Nation, 2003). Therefore, it will not be easy for a reader to decide to which field of study these words belong when encountering them.

Not far removed from the categories above, Fraser (2006) identified three degrees of the ETV as: fully technical, which is the same as category (i) above; crypotechnical, which consists of

polysemous words like: *transmitter* and *relaxation* "which could be said to be "cryptic" in that they have a hidden technical meaning" (p.68); and lay-technical, which comprises terms that are obviously technical but seem to be known by the layperson – words like: *bacteria* in medicine and *grammar* in linguistics.

This said, it is quite possible to find all these degrees used in the language and subject area textbooks in any ESP domain.

Chapter Three

(3) Who should teach technical vocabulary?

By the end of this chapter the trainer will be able to:

- Decide who should teach ETV items?
- Define the role of ESPTs in teaching technical vocabulary
- Name the challenges ESPTs face in teaching technical vocabulary
- Mention the ways of collaboration between ESPTs and CATs
- Determine the Role of students in teaching technical vocabulary
- Determine the role of the language and subject syllabus

This chapter discusses one of the two debatable issues regarding technical vocabulary instruction which is whose task is to teach

ETV items. The second issue, as we shall address in the following chapter, is how technical vocabulary should be taught.

This chapter will concentrate on the major opinions given by the scholars concerning the role of the ESPTs and CATs in teaching ETV items. The role of other parties in the ESP contexts (i.e. students and syllabus designers and material providers) will be discussed as well.

3.1 Who should teach ETV items?

There has been debate among researchers as to who should teach ETV items, and it is expected that teachers are also divided in opinion on this issue. The question that ignited the debate of how far ESPTs should go when they teach English for specialized content disciplines brought three views to the surface which will be concisely reviewed.

The first view is that an ESPT's role is to gain and teach specialized subject knowledge and content-specific skills

(**specificity**). Proponents of the specificity argument (such as Hyland, 2002, 2006; Fraser, 2005) believe that the ESPT "must go as far as he can" because language cannot be divorced from science (Kennedy, 1980; Koh, 1988; Fraser, 2005). Followers of the **generality** argument (such as Maimon *et al*., 1981 Spack, 1988), on the other hand, believe that ESPTs are responsible for teaching English and general academic skills and principles, while teachers in other disciplines are responsible for their content areas. Finally, the **pragmatic** camp followers view teaching ETV as a joint task between the two parties because they believe that doing so will make each party complements the other (Hutchinson and Waters, 1987; Nation, 1990; Sutarsyah *et al.*, 1994; Dudley-Evans and St. John, 1998; Chung and Nation, 2003).

3.2 The role of ESP teachers in teaching technical vocabulary

Before we delve into the exact role of ESP teachers in teaching ETV items we need to know who is an ESPT. ESPT is the label usually and most commonly attached to the English language teacher in any ESP context. However, the literature provides us with different labels for the person who carries out this task (e.g. ESP practitioner). Harding (2007) defines an ESPT as a practitioner who works out the student language requirements in relation to their specialism. An ESPT is usually defined through their role in the context. In this book, an ESPT is a person who works in the English language centre at any educational institution and provides English courses for engineering and business students.

As far as the role of the ESPT in any ESP context is concerned, Dudley-Evans and St. John (1998), in an extensive coverage, prefer to call an ESPT a ‘practitioner’. They believe that the term

practitioner reflects the five main areas that ESP work involves, which are:

(1) the ESP practitioner as a **teacher** who is willing to listen to students, to provide them with one-to-one advice and tutorials, to feel happy to take risks, to think reciprocally and to respond to events;

(2) the ESP practitioner as a **course designer** who plans the course, chooses suitable published materials and adapts, writes and assesses the material, if that which is published is unsuitable;

(3) the ESP practitioner as **a researcher** who is a qualified observer of their students, capable of carrying out research in order to understand the teaching context and consequently to incorporate its findings in the students‟ context;

(4) the ESP practitioner as **a collaborator** who is eager to work side-by-side with subject specialists (modes and types of

collaboration between ESPTs and CATs will be investigated in detail in section 2.3); and

(5) the ESP practitioner as **an evaluator** who is competent in testing the students and evaluating the teaching material. By and large, similar tasks were also identified as the role of ESPTs by other researchers (Koh, 1988; Schleppegrell and Linda, 1990; Jackson, 1998).

As far as he role of ESPT in teaching ETV items is concerned, Fraser (2005) argues that an ESPT needs to know not only the different categories of lexis, such as technical and non-technical, but also the types of ETV. This requirement, in my opinion, is thoroughly legitimate since it expects an ESPT to deal with linguistic knowledge in a specialised context. Fraser also believes that an ESPT needs to know the subject matter. Unlike the previous requirement, this one, in my opinion, is not a legitimate

requirement since it assumes that an ESPT should engage in the actual, direct teaching of ETV.

In a more balanced view, Chung and Nation's (2003) argue that ESPTs should teach the necessary Vocabulary Learning Strategies (henceforth,VLS) to their students and leave the actual direct teaching to CATs. They believe that if the students learnt the necessary VLS, they will be able to use these strategies to learn many ETV items without the help of their ESPTs. In addition to this, Nation (1990) and Chung and Nation (2003) stress that despite the limitations that ESPTs face in teaching ETV, they should be prepared to help students gain the more general skills of recognizing ETV items, interpreting definitions, relating sense to core meanings and learning ETV word parts. This argument has been widely accepted, and I believe it clearly draws a separating line between the task of the ESPT and that of the CAT.

3.3 Challenges ESP teachers face in teaching technical vocabulary

Many researchers have identified several problems that ESPTs face in the ESP context which can negatively influence their performance, if not hinder it on occasions (Hutchinson and Waters, 1987; Spack, 1988; Dudley-Evans and St. John, 1998; Basturkmen, 2010; Alghamdi, 2011). However, because the challenges ESPTs face seem to be globally similar (mainly lacking the necessary subject knowledge and having too many responsibilities), the following lines will be more regional-oriented by specifically reviewing the challenges that ESPTs face in the Arab world. Khuwaileh (1995: 39) describes the language teacher in the Arab world as "a hostage in the ESP context". These ESPTs are constrained by different factors that complicate their jobs, which are:

1. Lacking the specialised subject knowledge, which is a view that goes in line with Dudley-Evans and St. John (1998), who

argue that the ESPT is not the 'primary Knower' of the carrier content (i.e. the specialised knowledge) but instead, helps through the language of the carrier content.

2. Difficulty of team-teaching, because CATs in the Arab world are often not keen to cooperate with ESPTs.

3. Enormous responsibilities (being a teacher, a course designer, a needs analysis specialist, a student of science and a statistician) without training.

4. Teaching load is high compared to CATs. Adams-Smith (1980), who worked for the Faculty of Medicine in Kuwait University, narrates a similar story. She stresses that among the challenges that hindered cooperation between ESPTs and CATs at that place was the timetable pressure that ESPTs faced.

5. Large ESP classes which exceed 30 students. Khwaileh (1995) considers the ratio of 1:15 to 1:20 as ideal in ESP classes. The issue of how large an ESP class should be has received notable

attention in the literature. Ur (1981) and Jordan (1990) both argue for the usefulness of small classes in the ESP context, which encourage shy students to express their opinions freely. Conversely, it can be argued that large classes cannot be defined numerically and that small classes can also be a problem that needs some adaptation (Bolton, 1988; Coleman, 1988; Dudley-Evans and St. John, 1998. Bolton (1988) suggests combining small classes to overcome this problem.

6. Lacking respect from students, because ESP courses have little or almost no value in the students‟ overall Grand Point Averages (GPAs).

7. Not well paid compared to CATs.

8. Being students in their own classes, because ESPTs are mostly teachers of general English who have been forced to emigrate to the ESP context. This perspective, in my opinion, holds a lot of credibility, yet it can be questioned as to what extent an ESPT

feels like a student in the ESP classroom. Many variables, such as the level of the students, the degree of technicality of ETV items and teachers' specialized pre- or on-job training, play an important role in this matter and determine to what extent an ESPT feels as if he is a student in his own class.

Moreover, Alghamdi (2013), in his study of the ESPTs' and CATs' teachers in a Saudi Arabian industrial college, reported that ESPTs at the college face some challenges when teaching ETV items as follows:

1. Challenges caused by ETV items with a purely technical meaning, which should not be confused with the less technical ones (see section 2.4).

2. Lack of experience in teaching a particular course or from new textbooks. ESPTs talked about the early years in their careers as the most difficult period they faced when teaching ETV items.

3. The nature of the ETV items was also viewed as a source of difficulty by most ESPTs, especially business ESPTs, due to what they described as the rapid change in ETV items. For instance, they believe that there are new business concepts they are not familiar with and these concepts vary between different English-speaking countries.

4. The lack of opportunity for using their preferred Vocabulary Teaching Strategies (henceforth, VTS) and lack of Vocabulary Deliver Vehicles (henceforth, VDV)[2] to explain the meaning of ETV items.

5. Lack of a proper needs analysis, which is an essential aspect in ESP in general and ETV selection and teaching in particular. Almost all the ESPTs reported that no needs analyses were carried out to ascertain the actual ESP needs of the students prior

[2] The terms VTS and VDV will be addressed in details in the following chapter.

to the beginning of the course. They added that they usually teach ETV items without knowing whether they do/do not crop up in the subject classes.

3.4 Collaboration between ESPTs and CATs

There has been little literature written about how ESPTs and CATs could teach ETV items collaboratively. Here, we will look more closely at the pedagogical implications of some of the recommendations of the pragmatic camp (see section 3.1). Johns and Dudley-Evans (1980: 7) believe that collaboration between ESPTs and CATs in overseas ESP contexts is a necessity, not a choice, and argue that:

"…an overseas student's failure to keep pace with his course or with his research is rarely attributed to 'knowledge of the subject' or 'knowledge of the language' alone: most often, these factors are inextricably intertwined…"

Dudley-Evans and St. John (1998) argue that ESPTs and CATs can play the role of collaborators through three stages: cooperation, collaboration and team-teaching.

The cooperation stage stands for the simple phase where the ESPT takes the initiative and enquires into the students' subject areas as well as into the tasks defining their target situation. Collaboration implies mutual interest on the part of both parties for the sake of the students. It usually takes different formats, as CATs provide the topic (the 'real content') to introduce the linguistic side (the 'carrier content'), ESPTs prepare students linguistically to have the necessary competence in academic situations, and CATs guide ESPTs in selecting the topic relevant to the subject matter. Team-teaching is where both types of teachers work jointly and each party focuses on their area.

The many advantages of collaboration between both types of teachers should not make us think that it is always a problem-free task. Sometimes, collaborators face certain inner and outer challenges. Nagano and Koyama (2000) argue that team-teaching faces budgetary and scheduling restrictions. The human factor is even more challenging, since both parties cannot be forced to collaborate and should possess an internal interest to do so. Widdowson (1978) adds that team-teaching is costly in terms of time and is more suitable to the secondary level than the tertiary level. Moreover, I consider that collaboration requires each party reduce the authoritative spirit, and to be prepared and ready to collaborate whenever and wherever needed. Each party also needs to know precisely what course of action should be taken when teaching any ETV item during a classroom-based collaboration, which is usually an inconvenient task for some teachers in any ESP context.

Apart from the challenges that may face ESPTs and CATs in teaching ETV items, we need to emphasize that each party needs to take care of the ETV items from a particular angle. The common advice in this regard is that ESPTs need to be ready to deal with the linguistic aspects of the ETV item while the rich instruction of the meaning and use of these words remain the job of CATs who are equipped with the needed subject-knowledge. The reason why ESPTs should refrain from teaching the specialized technical aspects of the ETV meaning and use is to minimize the risk of slipping into an area where they have little knowledge which consequently could result in delivering inaccurate information.

3.5 The role of students in teaching technical vocabulary

The effective teaching of English within any ESP context is not just restricted to collaboration between ESPTs and CATs. Although Fraser (2005) argues that the assumption that both students and ESPTs share the content understanding is not

warranted, the student remains one of the partners of the ESPT. A similar position has been taken by Moody (1975), who recommends that students should be treated as partners in the ESP context, especially when learning ETV, because they are usually experts in the field and they often know the subject matter better than their ESPTs. However, this conclusion, in my opinion, depends mainly on how experienced the learners are and how well-trained the ESPTs are. In the early stages, students who have little knowledge of their subject, or who study English concurrently with their subject areas, usually need ESPTs more than the advanced ones. The teacher's experience of the subject area can also be an important factor in accepting or rejecting this conclusion.. That said, it can be argued that exploring teachers' beliefs about the role of their students when teaching ETV items will give us a better understanding regarding this sensitive issue.

Inman (1987) claims that there seem to be three strategies that bridge the gap between the ESPTs' ignorance of the subject

knowledge and the students' content knowledge, and advise ESPTs to become familiar with the ESP course material and the language of the subject, and allow students to 'put them right'. Hughes (1999) believes that the student in the ESP class is in the 'driving seat' and that the teacher draws on the student's own knowledge and 'fleshes it out'. This clearly assumes that the student has, in fact, covered the relevant subject material, or perhaps knows the terms in his L1.

3.6 The role of the language and subject syllabus

The language and subject syllabus are quite diverse. Each area of study has its own syllabus, which in turn usually makes the teaching of more than one area by a single ESPT an exhausting task. However, Hutchinson and Waters (1987) argue that an ESPT does not need to learn the subject-matter specialised knowledge, but instead is asked to have knowledge of the fundamental principles of the content and to show awareness of how much they probably already know.

However, two questions seem to be important when designing language and subject syllabus which are how ETV items were selected on the one hand and what sequence should be followed in introducing them on the other. Surprisingly, many studies concluded that ESPTs and CATs are not informed about how the ETV items were selected nor advised about the sequence for delivering them. For instance, Alghamdi (2013) reported that ESPTs and CATs at Yanbu Industrial College (YIC), Saudi Arabia have some textbooks from international publishers and some other information sheets compiled locally from different sources without knowing exactly how these words were selected. Equally, they do not have any formal guidance regarding which words should be taught first by CATs then by ESPTs or vice versa. Other studies (e.g. Kzuborska, 2011a) noted that teachers were free to use materials flexibly and select any text or activities they deem to be important or interesting for their students. However, the mechanism of selecting these ETV items and the

sequence of teaching them were all absent information in these materials.

Chapter Four

(4) How should technical vocabulary be taught?

By the end of this chapter the trainer will be able to:

- Differentiate Technical Vocabulary Learning Strategies (VLS) from Vocabulary Teaching Strategies (VTS)
- Distinguish between Technical Vocabulary Teaching Strategies (TVTS) and Vocabulary Delivery Vehicles (VDV)
- Decide what to teach in a technical word?

- Name the different types of technical vocabulary teaching strategies
- Utilize strategies for presentation
- Use DVT strategies for meaning presentation
- Use DVT strategies for form presentation
- Use DVT strategies for use presentation
- Use DVT strategies for practice
- Use IVT strategies for discovery
- Use IVT strategies for consolidation
- Select alternative and joint strategies
- Use Vocabulary Delivery vehicles

The previous chapter discussed the task of teaching ETV items and whether this is the job of ESPTs, CATs or both and addressed the role of other parties in any ESP context with regard to teaching ETV items.

This chapter completes the other part of the story by focusing on how teachers should teach ETV items. This chapter will start by introducing some key topics about general vocabulary learning/teaching strategies. Then, we will move to discuss the aspects that need to be taught in an ETV item and what techniques should be used to attain this purpose.

4.1 Technical Vocabulary Learning Strategies vs. Vocabulary Teaching Strategies

Teaching ETV is in many ways similar to teaching general English vocabulary (e.g. Kennedy and Bolitho, 1984). Nation (personal communication) argues that the main difference when teaching ETV is that it needs to be done in the subject area

lessons. Beyond that, he thinks it should largely be the same as other vocabulary teaching and learning. Therefore, many of the VTS used in general ELT apply to ETV items.

'Strategy', 'technique' and 'skill' are sometimes used interchangeably in the literature (see Appendix B). Abdel Latif (2006: 18) reports that, in general, strategy is defined as "operations, techniques, steps, processes, behaviours, or thoughts used… to guide, facilitate and solve problems in both language learning and language use". The same can be utilized by the teacher to solve problems in language teaching (in this book, vocabulary form and meaning teaching) and language use (in this book, vocabulary use); therefore, I refer to such strategies as VTS. This book will also use the words 'strategies' and 'techniques', sometimes interchangeably.

Although research is abundant in the area of L2 and FL VLS (e.g. Ahmed, 1989; Sanaoui, 1995; Stoffer, 1995; Gu and Johnson 1996; Lawson and Hogben, 1996; Schmitt, 1997; Fan, 2003; Gu,

2003), lists of VTS tend to come out of the heads of experienced teachers rather than from actual studies of what teachers do in the classroom. The importance of VTS has been emphasized by several authors (Rivers, 1983; Weinstein and Mayer, 1986; Gardener and MacIntyre, 1992) which encouraged researchers to introduce different VTS taxonomies.

4.2 Technical Vocabulary Teaching Strategies vs. Vocabulary Delivery Vehicles

As mentioned in the above section, VTS are defined as "operations, techniques, steps, processes, behaviours, or thoughts used… to guide, facilitate and solve problems in both language learning and language use." (Abdel-Latif, 2006:18).

However, VTS need some vehicles or means to transfer them from the teachers to the learners. These vehicles are known as Vocabulary Delivery Vehicles (VDV) which are not strategies in themselves but rather mediums for transferring these strategies.

Therefore, technology aids, classroom wall charts and flash cards are all examples of VDV which are used as a means for transferring some strategies such as definitions, pictures, collocations and as we shall explain in section (4.6).

4.3 What to teach in a technical word?

One of the major questions in vocabulary teaching studies is what to teach about a word. Nation (2001) argues that form, meaning and use are the three aspects involved in knowing any word and ETV items are no exception (see Table 1).

Table 1 Aspects Involved in Knowing a Word

(P) = Productive knowledge (R) = Receptive knowledge

Form	Spoken	R	What does the word sound like?
		P	How is the word pronounced?
	Written	R	What does the word look like?
		P	How is the word written and spelt?
	Word parts	R	What parts are recognisable in this word?

		P	What word parts are needed to express the meaning?
Meaning	Form and meaning	R P	What meaning does this word form signal? What word form can be used to express this meaning?
	Concept and referents	R P	What is included in the concept? To what items can the concept refer?
	Associations	R P	What other words does this make us think of? What other words could we use instead of this one?
Use	Grammatical functions	R P	In what patterns does the word occur? In what patterns must we use this word?
	Collocations	R P	What words or types of words occur with this one? What words or types of words must we use with this one?
	Constraints on use (register, frequency...)	R P	Where, when & how often would we expect to meet this word? Where, when & how often would we expect to use this word?

Source: Nation (2001).

In Table 2, Nation and Gu (2007) give a practical example of what is involved in knowing the ETV item *transformer*, which occurs within a unit in the generation of electricity.

Table 2 Example of Aspects Involved in Knowing the ETV Item transformer

Form	Spoken	The stress is on the second syllable.
	Written	The spelling is regular.
	Word parts	The word is a derived form of 'transform'
Meaning	Form and meaning	The separate word parts (trans and form and –er) are related to the meaning of the word.
	Concept and referents	A technical word that means 'a device for changing the voltage of an alternating current'.
	Associations	There are various kinds of transformers – step-up and step-down – and they are part of a generating system.
Use	Grammatical functions	A countable noun
	Collocations	Step-up, step-down
	Constraints on use (register, frequency...)	There are no constraints on the use of this word.

Source: Nation and Gu (2007).

Nation's (2001) classification is widely accepted by many specialists in the field (e.g. Folse, 2004; Özturk, 2006; Hedgcock

and Ferris, 2009; Schmitt, 2010) and is also adopted in this study as a basis for instrument development, as will be explained in the methodology chapter.

Although form, meaning and use are three important aspects involved in knowing and teaching a word, the form-meaning relationship has attracted the most discussion in the field. These discussions resulted in the development of form-based VTS and meaning-based ones. They also opened the doors for asking whether form should be taught before the meaning or the reverse (Gairns and Redman, 1986). Finally, they led to one wondering about which aspect is more challenging to the teacher to present, form or meaning (Özturk, 2006). For example, Bracroft (2003), in his study of L2 Spanish learners, proposes that form and meaning should be taught separately, since our mental capacities are limited and cannot attend to both aspects at the same time. Conversely, Hedgcock and Ferris (2009) argue that while knowing the meaning of a word is essential, developing a link

between form and meaning is the minimum specification for knowing a word. All in all, it can be said that the existence of the meaning without the form makes recognising and producing the lexical item an impossible task. Similarly, the presence of the word form without the meaning will make the term of no communicative use.

4.4 Types of technical vocabulary teaching strategies

Based on the literature available and the nature of VTS needed for teaching ETV items in most ESP contexts, I will group the VTS into two broad categories: direct and indirect strategies which will be followed by the relevant VDV.

Table 3 contains a list of VTS that I found in my study of YIC, Saudi Arabia[3].

Table 3 Groups and Individual Vocabulary Teaching Strategies (VTS) and Vocabulary Delivery Vehicles (VDV)

Groups of VTS and VDV	Individual VTS/VDV 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), scales and body actions
DVT strategies for form presentation	Word parts
DVT strategies for use presentation	Associations and collocations
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
IVT strategies for consolidation	Recycling

[3] Alghamdi, A. (2013). Technical vocabulary instruction in a Saudi Arabian industrial college: An investigation of English language and content area practitioners' beliefs and practices. (Unpublished Ph.D. thesis), University of Essex, UK.

VDV	Technology aids, wall charts, flash cards

These strategies which are of direct relevance to ETV items will be defined and discussed immediately after this section. Although the above four categories draw the road map for the VTS review below, some inevitable overlap (which does not affect the validity of the overall organization) may occur between some strategies. For example, associations and collocations strategies can be DVT for meaning and for use. Examples of how some VTS can be used as DVT or IVT, with their definitions and examples, are also listed in Appendix C.

4.4.1 Strategies for presentation

This includes the strategies that teachers normally use to present the meaning, form and use of new ETV items directly

4.4.1.1 DVT strategies for meaning presentation

DVT strategies for meaning presentation involve: translation, definitions, exemplification and attention toregister, pictures, photos, posters and other illustrations, real objects (realia), scales and body actions.

(1) Translation

Translation, as an effective vocabulary teaching strategy, has been widely investigated (Hulstijin, 1993; Jacobs, Dufon and Hong, 1994; Knight, 1994; Chun and Plass, 1996).Translation strategy comprises a whole range of strategies, which includes the following examples of tasks in DVT:

1. Using translation to L1 to present the meaning of a new word. An example of this type, from Technical English I, is translating the ETV item *suspension and steering system* into the Arabic equivalent 'نظام التوجيه والتعليق'

2. Using translation to L1 of examples of word use, or of the context in which the word occurs. For example, the electronics ETV item '*semiconductors'* which occurs in a context such as "A *semiconductor* is a material with electrical conductivity" and can be translated into Arabic as

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3. Asking students to supply the translation of an L2 word into L1, or L1 into L2 as a way of checking they know it. However, asking students to translate ETV items from L2 to L1 by non-Arab teachers is also considered to be an essential type of translation in this study.

4. Getting students to undertake matching exercises of L2 words and L1 translations.

5. Any other vocabulary tasks which could involve translation.

Folse (2004) claims that translation gives students instant information about the essential meaning of the word in L2. Gefen

(1987: 42), however, argues that using translation encourages "lazy minds and so inhibits the transfer of the new item to long-term memory". However, I think translation might have this effect only if nothing else were to be done except giving the meaning in L1. Nation (1982) argues that many students will learn vocabulary faster if they are given the meaning of the word in L1 through translation. Translation is also known for being a very economical technique and a good strategy for dealing with incidental vocabulary (Thornbury, 2002).

Although using translation in the L2 classroom has been seen as advantageous by many specialists in the field, it is attacked and criticized by others. Folse (2004) summarises these counterarguments against translation by saying that translation:

(1) is not suitable since many words in L2 do not have one-to-one equivalents in L1. This disadvantage cannot always be the case with ETV items where most L2 ETV items have an exact

equivalent in L1. The real problem is when students do not know the equivalent translation of the ETV items in their L1;

(2) does not equip the student with enough knowledge to be able to use the translated word. I think the same could be said when providing an L2 definition for the ETV items - that is just saying that receptive information about meaning is not sufficient for productive use; and

(3) does not help with polysemous words (i.e. words that have two or more closely-related meanings). In this case, I think such words just require more than one translation (one for each meaning).

(2) Definitions

Equally important is the definition strategy, which stands for providing and explaining the ETV items‟ meaning and/or use when the teacher presents them. Harmon,Hedrick and Wood (2005) point out that lacking precise definitions in the content

area has the potential to create much more frustration for students than it does in narrative texts, whereas Nagy (2005) emphasises that rich vocabulary instruction cannot be rich without definitional and contextual information. CATs normally define newly-taught ETV items by giving some description about their meaning and use, and accompanying that with exemplifications where needed. In an electrical troubleshooting and maintenance textbook, the ETV concept *short circuit fault* is defined and exemplified as "short circuits are accidental complete circuits that have minimum resistance and maximum current… short circuit fault can be fairly obvious; the smell of burnt insulation, smoke and fire, hot cables or wire…".

Scholfield (1981b) identifies two types of definitions as encyclopaedic or dictionary, which can be substitutable or non-substitutable ones. Substitutable definitions refer to the incident where one or more of the words used to define a particular term can be substituted by other words. For example, to define the verb

expel in a sentence such as “in a *combustion engine* the gas is *expelled* at the fourth stroke”, the teacher can substitute it by saying “in a combustion engine the gas is *ejected or forced out* at the fourth stroke”. However, this is not possible with non-substitutable types of definitions.

Definitions have been encouraged by some researchers because of their many benefits. Hedgcock and Ferris (2009) demonstrate that definition-based exercises and activities are traditional in design, simple to devise, economical, can function as group or individual activities and provide teachers with clues about both the retrieval and observational skills of their students. One example of definition-based exercises is the crossword puzzle, which exists in the language information sheet and the international course books that ESPTs compile at YIC. Although this example entertains all of Hedgecock and Ferris‟ (2009) characteristics that are mentioned above, I do not think crossword puzzles are actually ‘simple to devise’.

(3) Exemplifications

Exemplification strategy is one of the traditional strategies that support other non-visual techniques, such as definitions, synonyms and antonyms. Exemplifications in this explanation are in line with Gairns and Redman‟s (1986) view. They call this strategy an ‘example of the type’ and believe that it should provide some super-ordinates or hyponyms (being a relationship between two words, in which the meaning of one of the words is involved with the other) (Richards and Schmidt, 2002). Therefore, in a technical English textbook, the ETV item *coolants* can be included under the lexical item *auto liquids*. This relationship would come in when a new word is presented and later in practice by ESPTs/CATs.

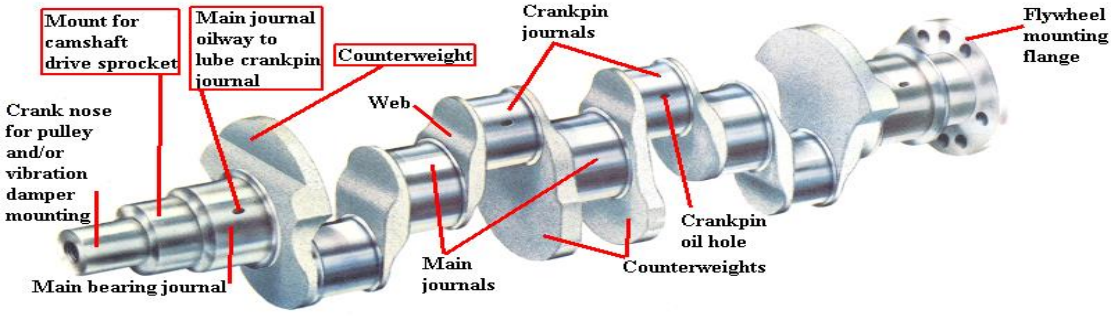
(4) Pictures

Using pictures (see Figure 1) as a strategy to teach ETV items' meaning is mainly a DVT for meaning presentation. ESPTs who teach English for mechanical engineering

students and CATs who teach the mechanical engineering subject may present the

meaning of an ETV item, such as a *crankshaft*, using a picture like this one:

Figure 1 Components of the ETV Item Crankshaft



Source: http://www.ustudy.in/node/4203 (as on, 25- Sep, 2013).

On the other hand, students can also be trained to learn via pictures by ESPTs and CATs.However, in order for the picture to be used for IVT, ESPTs and CATs would have to show their students some sources of the pictures (preferably labelled ones from the Internet) that they could use for self-learning.

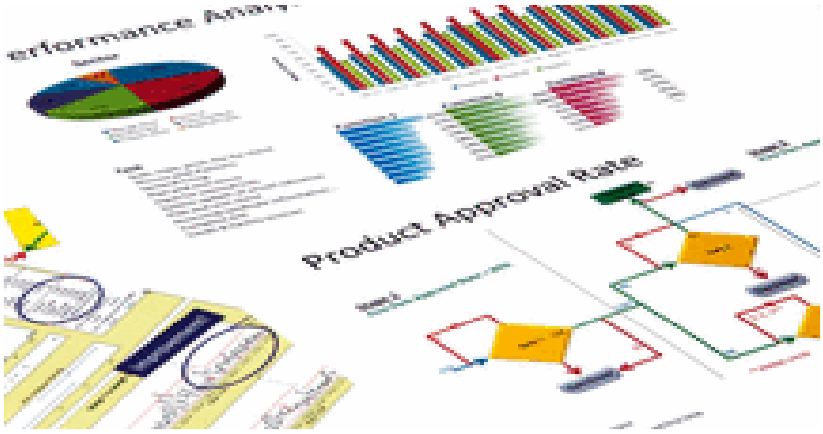
(5) Photos, Posters and Other Illustrations

Photos, posters and illustrations are all types of effective imagery in teaching vocabulary in general, and ETV in particular. Gairns and Redman (1986) believe that instructing vocabulary using these strategies would facilitate the meaning of the words. Equally, the NRP stressed the importance of these strategies in vocabulary direct instruction.

Posters and photos might be graphs in science classes, and displaying them when teaching ETV items usually results in improving the learning of certain words that appear in these

graphs. Figure 2 shows an example of different types of graphs from a Business English textbook.

Figure 2 Posters and Graphs as Vocabulary Teaching Strategy



(6) Real objects (Realia)

Real objects (or 'realia') strategy refers to bringing actual objects into the classroom and displaying them to students to facilitate teaching and learning processes. Gairns and Redman (1986) show that bringing real objects into the classroom enhances the teaching and learning of the meaning of the words. In the ESP context, real objects can be visited rather than brought to the classroom. Therefore, automobile models, machine components

and devices in the college workshops are all regarded as real objects that can promote ETV learning and teaching.

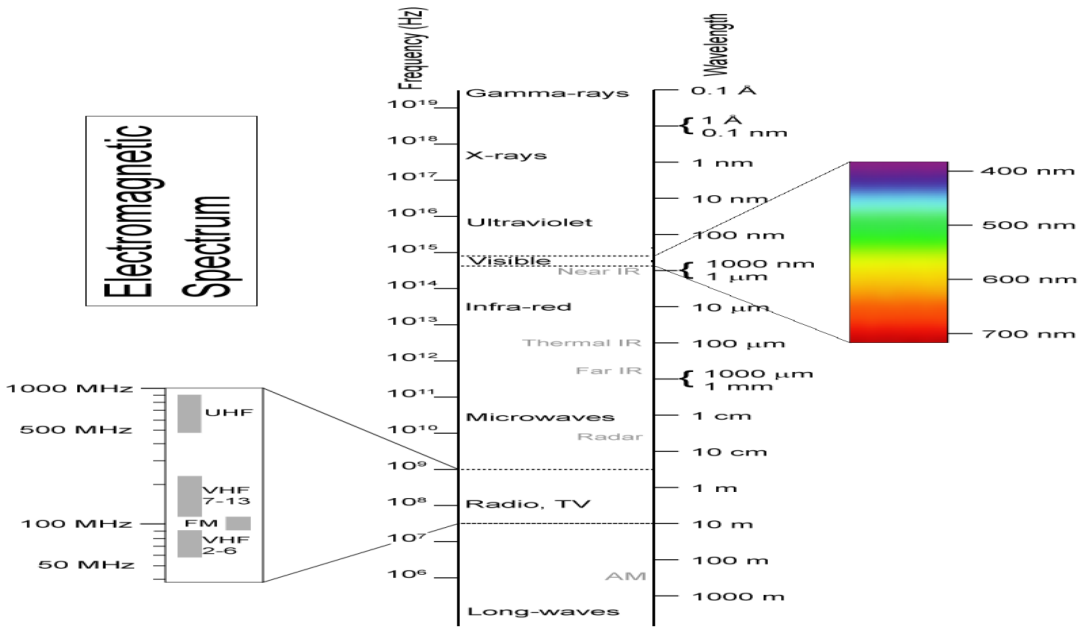
Although realia has been viewed as an excellent strategy in presenting new ETV items, it has been criticised for not always being readily available for all classes, being large in size and sometimes hazardous in the classroom (Jones, The Black River Group *et al.*,1994).

(7) Scales

Scales means the strategy of grading the ETV item under instruction. This strategy basically refers to showing students the different levels of certain words, with each level being taught as a part by itself, on the one hand, and a part within the whole, on the other. Gairns and Redman (1986) argue that if students have learned two contrasting or gradable items, it would be an encouraging step to feed them with new vocabulary items.

In the ESP context, an ETV item scale could be the ETV item *electromagnetic radiation scale* (see Figure 3) through which CATs introduce the different stages of the novel ETV item.

Figure 3 Electromagnetic Radiation Scale



Source: http://en.wikipedia.org/wiki/File: Electromagnetic-Spectrum.png (retrieved, 9/2013)

To the best of my knowledge, no research has been conducted into how the scaling strategy is useful in the contexts of ESP and content areas.

(8) Body Actions

Body action strategy in vocabulary teaching involves using gestures and mimes, or any other physical action, to present a particular lexical item. This strategy has been known for its effectiveness in presenting vocabulary rather than in practising it (Thornbury, 2002). However, because ETV is full of abstract words, it can be taught better through the use of physical actions (Helman, 2009). Gestures are good for abstract ETV items of various movements, such as *rotators*, *acceleration* and *rewinding*, or to describe the movement of a *coil in a transformer* or *magnetic flux*. However, this advantage should not distract our attention from the fact that not all abstract ETV items can be taught by using gestures. For example, the ETV item *ampere* cannot be taught by gesture.

The abstractness of the ETV was clear to the researcher through the large number of ETV items presented and reviewed in the electrical, electronic, mechanical and economic textbooks at YIC. However, the treatment of these abstract ETV items seems to be the job of both ESPTs and CATs, since gestures are very beneficial in presenting new ETV items.

4.4.1.2 DVT strategies for form presentation

This set of strategies includes those that teachers normally use to present the form of new ETV items directly, which are **word parts** or affixations.

The word parts strategy stands for dividing a word into its essential components, which is known as ‘affixation’ (Thornbury, 2002). Other labels have also been used for the word parts strategy, such as ‘word morphology’ (Carter and McCarthy, 1988) and ‘word building’ (Gairns and Redman, 1986).

Nation and Gu (2007) argue that ETV can be learnt easily by using word parts. Chung and Nation (2003) claim that the two major strategies in technical vocabulary teaching are word parts and context guessing. I believe that the word parts strategy can be used for IVT in two ways: as a way of tackling unknown words to guess their meaning, or with words whose meaning is known (maybe already explained by the book or teacher) as a memory strategy to retain it better. It can be taught the same way for both purposes. One of the major reasons for considering the word parts strategy linked to technical vocabulary is the Greek and Latin morphological structure of most of this type of word.

Among other important issues in the word parts strategy is deciding which parts of the word should be taught; more prefixes (i.e. part(s) that precede the root) or suffixes (i.e. part(s) that follow the root) after presenting the word root or stem (see Appendix D for some examples). Prefixes seem to be more

important to many specialists in the field.White, Sowell and Yanagihara (1989) argue that prefixes need to be taught more Since they carry certain pitfalls of which students need to be aware, such as:

(1) most prefixes are not consistent in meaning, as the four main prefixes (*un, re, in* and *dis*) carry more than one meaning. This is actually true of the Latinate ones, not the Greek origin ones, which are straightforward (e.g. *hyper* and *homo*);

(2) false analysis was found to be a difficulty in prefixes - removing the prefix from some words e.g. „intrigue,“ or „invented“ leaves them with no recognisable base; or

(3) if learners only consider word part clues (affixes and roots) when they deal with prefixes, they may be misled about the correct meaning of a word. For example, the word *indelicate* might be understood to mean *not fragile* whilst it actually means *offensive*. Nation (personal communication) believes that word

parts and guessing from context are two strategies that are more likely to be utilised when teaching ETV items.

Suffix (see Appendix D for examples) instruction for some lexical items has been recommended before teaching prefixes. Allen (1983) proposes that teachers should start with common suffixes and combine these with the words students already know. According to Allen, this procedure will encourage students to discover new suffixes for themselves.

4.4.1.3 DVT Strategies for Use Presentation

This includes the strategies that teachers normally use to present the use of new ETV items directly by showing their associations and collocations.

(1) Associations

Schmitt (2010) defines association as the process whereby students are given a word (usually in the practice stage) and asked to produce the first word which comes into their minds. For

example, the word *coil* is associated with (makes us think of) *transformer*. According to Schmitt, doing this strengthens the connection between the new and already learnt word in a person‟s lexicon. Beck *et al.* (2002) believe that the relationship between the known word and the newly-learnt one is not synonymous.

Nation (2001) agrees with Miller and Fellbaum (1991) that associations represent various semantic relationships and can be better understood through the different relationships between the different parts of speech, such as verbs, nouns and adjectives. Therefore, an ETV item such as *current* associates with *flow*, and *magnetic* associates with *flux*, which are, in both examples, two different parts of speech.

Collocation is a semantic relationship within which, when we see one word, we can make a ‘safe bet that the other is in the neighborhood’ (Thornbury, 2002: 7). For example, the word *electro* collocates (normally couples up) with *magnetic*. Carter and McCarthy (1988) demonstrate that one of the characteristics

of collocations is that the meaning of a word has a great deal to do with the word(s) it usually associates with.

The development of a corpora of scientific texts has provided a very useful tool for teaching and researching vocabulary. The lists of collocates that are obtained from these corpora provide an opportunity for the researcher and interested teachers to examine the context in which a technical lexical item occurs or collocates (Scott and Johns, 1993).

Although some specialised corpora exist (e.g. West, 1953; Hindmarsh, 1980; Xue and Nation, 1984; Yang, 1986), I was not able to obtain any literature which specifically addressed the teaching of ETV associations and collocations in ESP and content area contexts[4]. For this reason, ETV items associations and

[4] There is quite a lot of recent work on lexical bundles, which are combinations or strings of two or more words that frequently

collocations will be dealt with like general English vocabulary teaching. However, in addition to Schmitt's (2010) suggestion that learners are prompted to provide their own associations as a practice of new words (DVT practice), another possible DVT is for the teacher to introduce key associations and collocations when a word is presented, along with other strategies such as synonyms, antonyms and exemplifications. The more usual use of wider associations and collocations in vocabulary teaching is in various kinds of practice exercises, such as semantic mapping, writing descriptions and close gap sentence filling tasks.

To give an example of ETV items, the word *accelerator* collocates with *pedal* in the area of mechanical engineering, and

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occur in specialised domains. The "bundles researchers" (Hyland, 2008; Jalali *et al.*, 2008) believe it is more useful to study bundles than collocations in specialised texts.

mother couples up with *board* in computing. Similarly, the word *current* associates with *electricity* in the electrical area and so on. The issue of how this can be employed in practical terms remains open for future research.

4.4.2 DVT Strategies for Practice

This concept refers to the strategies that teachers normally use to practise pre-learnt or already presented ETV items and involves strategies such as memory images, semantic mapping, labels, conversation and dialogue, synonyms and antonyms, repetition, vocabulary tests and games.

(1) Memory images/Key word method

In memory images, which is also known as the "mnemonic" or "key word" method, the teacher helps the learners devise a mental picture for the word in L2 to something in theirL1. Carter and McCarthy (1988) argue that teaching students how to use the key word strategy facilitates learning as well as being valuable for

beginner and advanced levels. This vocabulary teaching strategy can be taught for IVT purposes. The teacher can help students in forming and linking the image to the word, or give suggestions after students have created them. In Arabic, for example, the teacher may help students to link the word ‘ajar’ in its technical sense (when it flashes on the car dashboard as a warning sign) to a picture of the ‘جار’ (neighbour) and link ‘door ajar’ to ‘جار door’ (who opens it for guests).

Gairns and Redman (1986) argue that the more bizarre the image, the easier it will be for a student to recall and remember the word. This „imagery“ is reliable in facilitating the meaning. The NRP identified 21 methods as being effective in teaching vocabulary in general, with the key word method being one of them.

(2) Semantic mapping

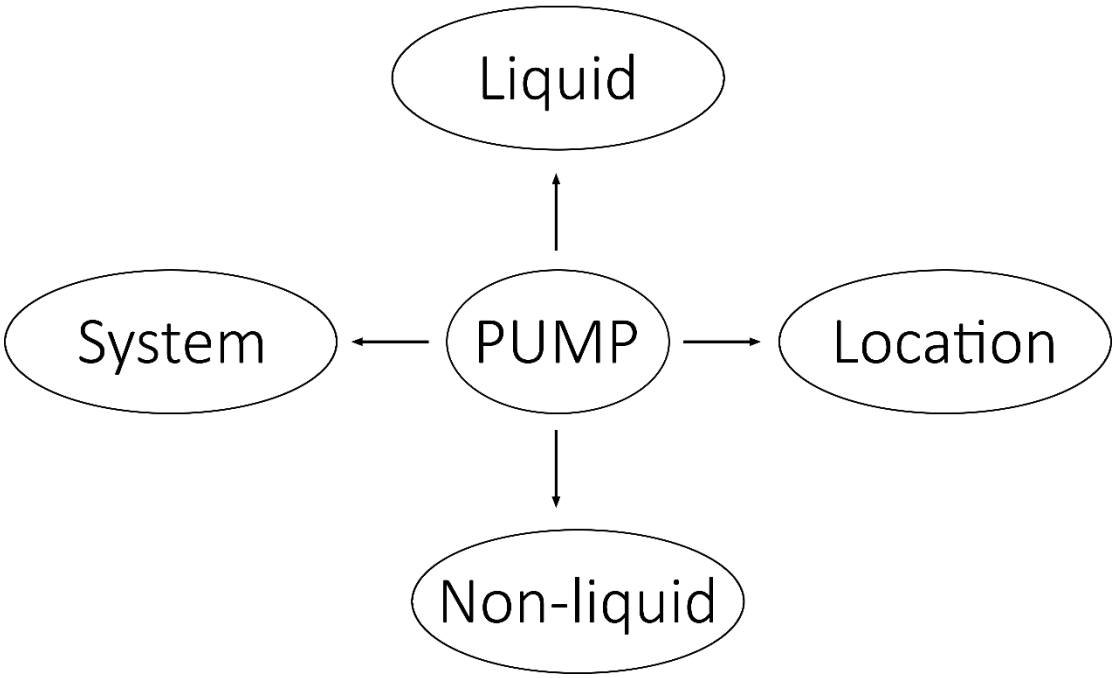
The semantic map strategy from a vocabulary teaching strategy perspective is the graphic procedure that induces students to relate

and integrate new information with old. Stahl and Stahl (2004) state that using the semantic map has a long history in content area instruction. Practically speaking, Stahl and Stahl (2004) describe a semantic mapping lesson as having four parts: (1) brainstorming, which is done by the teacher and the class; (2) mapping, which means drawing a map on the board that includes three or more categories, with the help of the teacher; (3) reading, which is the stage where the teacher and students read a selected topic about the completed map; and (4) completing the map, adding and/or deleting some categories and negotiating learnt lessons from the read topic and drawn map. Hedgcock and Ferris (2009) stress the importance of the student-teacher discussion at every stage, as well as instant decisions, before moving on to the next step in the semantic mapping strategy.

Figure ٤ provides an example of how ESPTs can train students to use semantic mapping in a mechanical engineering ESP class.

The same thing can be done in any mechanical engineering subject.

Figure 4 Semantic Map Used for the ETV Item Pump



(3) Labels

Labelling relates basically to sticking labels onto certain objects, whether inside or outside the classroom, showing the name of the object and/or some brief information about it. Helman (2009) believes that doing so, in an ESP context, creates a word-rich

physical environment for students to learn vocabulary. Thornbury (2002) views labelling as an essential strategy in what he describes as a word storage system.

(4) Conversations and dialogue

Conversations and dialogues, as strategies, refer to teaching students how to speak about a particular situation or function in the language or content lesson. Helman (2009: 134) argues that as students interact through classroom dialogue, they "cement their vocabulary and other language capabilities".

Classroom dialogue has generally been divided into situational and functional (Allen, 1983). In situational dialogue, the teacher asks students to write and then present various kinds of dialogue about different situations (e.g. at the DIY store or garage). In functional dialogue, teachers train students how to write and speak using L2 for functions, such as asking for a favour, making an appointment, arranging for fixing a machine while chatting

with a customer or complaining politely about something. Both types help students to learn vocabulary more effectively (McCarten, 2007).

(5) Synonyms and antonyms

Synonymy and antonymy are two semantic relations of vocabulary presentation/practice which have received noticeable attention from specialists in the field of vocabulary.

Synonyms are words that share a similar meaning but are seldom the same (Thornbury, 2002), while antonyms are words with opposite meanings. Antonyms have different types, such as binary antonyms, converses and gradable antonyms (Gairns and Redman, 1986), which should not be confused with scales (see section 2.2.8.1.7) since the relationships on scales are gradable rather than opposites in antonyms. Binary antonyms are forms of antonyms that represent absolute opposites (*step up*/*step down*), converses represent reciprocal relationships (*above*/*under*),

gradable opposites depend on the subjectivity of the speaker (*tighten*/*loose*) in which *tighten* or *loose* can be represented relatively differently by two or more speakers.

(6) Repetitions

Repetition is the strategy in which a teacher usually asks students to say, write, listen to or read a word on its own (not with a picture or sounds, etc.) silently and/or aloud, chorally and/or individually more than once with the hope of learning different aspects about it and of retaining it in their long-term memory. This strategy has a long history in language learning and teaching and is known as 'rote learning' (Gairns and Redman, 1986). Nation and Gu (2007) demonstrate that repetition is one of the consolidation strategies, and agree with Carter (1987: 153) that "quantities of initial vocabulary can be learned both efficiently and quickly by methods such as rote learning which are not always considered to be respectable. It may be dangerous to underestimate such a capacity".

Repetition and recycling are usually discussed together. Among the important issues is the number of encounters needed to have the word saved in the long-term memory. The issue of when repetition should take place is also discussed. Gairns and Redman (1986) believe that repetition can be more effective in the early stages rather than the advanced ones.

(7) Vocabulary tests

The vocabulary test, as a strategy, should not be confused with the notion of students' language tests. Vocabulary tests refer to the intentional informal process that teachers employ with the hope of developing vocabulary knowledge. Thus, vocabulary tests can be used to motivate students to do more self-learning (by IVT) and also check what needs to be re-taught (by DVT). To this end, ESPTs and CATs at YIC normally tell their students from the early days that they will be tested on the lessons they have covered, with more concentration on the words under instruction. Thornbury (2002) argues that vocabulary exercises and tests have

the advantage of recycling learnt words with only one difference, namely that the latter is scored. Vocabulary tests prompt students to review all their vocabulary knowledge and provide useful feedback to both students and teachers on how to improve their performance.

(8) Games

It is widely accepted that teaching with a fun element incorporated in it has an impressive impact on language learning and teaching. Games, as a generic practice activity, like exercises, contain different activities and tasks and are usually designed to practise, not present, what is already known. In other words, most games cannot be easily played if the words are unknown. Many studies emphasise the influence of games on language and vocabulary, oral and written development, and maintenance (Johnson, Johnson and Schlichting, 2004).

Helman (2009) believes that games provide excitement and curiosity about words. Classic games, such as ‘hangman’ and crossword puzzles, can be used in the ESP context. For example, playing ‘hangman’ practises different things, such as spelling, and it is one of the few games that can be played without knowing the meaning of the ETV item.

Crossword puzzles usually involve definition and spelling, while categories practise knowledge of meaning and co-hyponyms, etc. The key point is that one cannot regard all these as just one vocabulary teaching strategy, since they target different aspects of word knowledge. Moreover, these classic games are normally suitable for practising learned words in a specialised context, since they are suitable for the age level of the students and they can be designed or selected by the ESPTs.

4.4.3 IVT Strategies for Discovery

This refers to the strategies that teachers normally use to discover the meaning, form or use of new ETV items indirectly, and involves strategies such as dictionary use and guessing from the context.

(1) Dictionary use

Training students to use a dictionary as an IVT strategy in general and specialised language classrooms has been recommended by many scholars. Summers (1988: 111) argues that "students can and should be encouraged to avail (themselves) of the substantial information contained in their dictionaries". Gairns and Redman (1986) identify three advantages of training students to use a dictionary: 1) using a dictionary helps students to continue to learn outside of the classroom; 2) the dictionary is a rich resource for ambiguous items in the context of guessing, since it clarifies uncertainty; and 3) the dictionary, if reliable, is considered to be

a great resource to students who look for certain information, such as the word's meaning, spelling, pronunciation or semantic relationships (e.g. synonyms and antonyms, grammatical patterns and many more). In fact, these advantages can be exploited by ESPTs through training students to use both general and specialised dictionaries effectively in the ESP class before they become autonomous learners and independent dictionary users.

The dictionary in L2 teaching refers to two main types, which are monolingual (English- English) and bilingual (English-Arabic). Dictionaries are usually compiled in different areas, such as language students‟ dictionaries, special use dictionaries (such as specialised dictionaries, like a dictionary of mechanical engineering, which is very relevant to this study as it is conducted in an industrial college), phrasal verb dictionaries, picture dictionaries, dictionaries of synonyms and antonyms, dictionaries of idioms and dictionaries of collocations and associations.

(2) Guessing from context

Guessing from context as a vocabulary teaching strategy refers to training the students to find some contextual and textual clues, which help them identify the meaning of other unknown words. Sternberg (1987) argues that guessing from context is not only

important in L2, but even in L1, as most vocabulary growth in L1 or L2 occurs as a result of guesswork. However, guessing cannot usually be effective without providing some contextual or textual clues. Nattinger (1998) demonstrates that these clues can be:

(1) the topic and the social conversation; he believes that even the title of the topic may give a clue; however, there are limits, for example, to how social conversation gives a clue in the ESP topics;

(2) other words in the discourse, such as redundancy, parallelism and anaphora; and

(3) grammatical structures and punctuation that may sometimes carry clues. The types of context are also tackled in the literature. Beck *et al.* (2002) divide context into *natural* and *instructional*. Instructional context is the prebuilt context with the intention of providing strong clues to a word's meaning. They argue that, unlike natural context, instructional context gives no guarantee that students will come to a transparent and clear understanding of the word's meaning(s); however, it could be argued that instructional context, which has been intentionally developed for this purpose, provides better clues than its natural counterpart. For example, in an electrical technology textbook, which presents some electrical troubleshooting, the textbook builds a definition of the word *transformers* as "Transformers have the effect of increasing or decreasing the voltage in a circuit. We may want to increase it – using a step up transformer...". This text, in effect, includes within it a slightly hidden definition of the new term '*step up transformer'* (making it clear that it is one that increases

voltage). Therefore, ESPTs and/or CATs can train students to spot and exploit these in-text definitions to find the meaning of the unknown ETV items.

Guessing from context, as is the case with some strategies, can be accompanied by other strategies, like definitions and dictionary use (see section 2.2.9). Guessing work also carries certain advantages. Firstly, it can be taught and implemented easily, as demonstrated in the aforementioned example of instructional context, and secondly it is easily acquired by students, both inside and outside the classroom, and is a technique that is used in both source (L1) and target (L2) language (Thornbury, 2002). However, Nation (personal communication) believes that guessing from context can be more effective in a specialized context than in general language learning and teaching. In my opinion, it is more effective in a specialised context, since a specialised context includes more diagrams and pictures from which to guess.

By contrast, guessing work can also be criticized for being tricky and containing inappropriate information for deriving the meaning(s). Schatz and Baldwin (1986) conducted a study on the effectiveness of guessing work and clues. They argue that clues given in the context are likely to confuse students; besides which, they believe that this strategy might be of little help with low-frequency words.

4.4.4 IVT Strategies for Consolidation

This refers to the strategies teachers normally use to indirectly consolidate the meaning, form or use of new ETV items and involves strategies such as recycling.

The recycling strategy means creating opportunities to meet the word that needs to be learnt more than once during and/or after the teaching time. Among the labels given to this strategy are ‘multiple encounters’ (Beck *et al.,* 2002), ‘vocabulary visits’

(Blachowicz and Obrochta, 2009) and ‘spacing’ and ‘distributed practice’ (Thornbury,2002).

The literature has always linked recycling and repetition strategies to memory strategies that enhance learning when used effectively by the teacher. McCarten (2007: 21) argues that “Learning vocabulary is largely about remembering, and students generally need to see, say and write newly learned words many times before they can be said to have learned them”. The issue of the number of encounters needed before the word is learnt is also important. Rott (1999) and Nation (1990) suggest a number of encounters ranging from five to up to twenty are required before learning takes place.

4.5 Alternative and joint strategies

It is unrealistic to think that the VTS reviewed in the previous sections are used in isolation and independently of each other. Normally, two or more VTS (for presentation and then for

practice) combine to achieve the vocabulary teaching and learning goals. Folse (2004) argues that no single vocabulary teaching strategy is better than another. In my review of the strategies above, I noted more than once how some strategies and techniques couple up to improve the quality of vocabulary teaching. Equally, without doubt, the relationship between strategies sometimes makes some of them compensate for others for different reasons. For example, in the mechanical equipment maintenance module, presenting the meaning of an ETV item such as *transmission equipment* may involve defining this term as "machines, whose purpose is to transmit mechanical energy from an engine to a driven machine". This definition is then followed by exemplifications of *transmission equipment*, such as *gearboxes, differentials and variable speed drives.*

As far as the joint use of VTS is concerned, Rasekh and Ranjbary's (2003) study advised that teachers should use a combination of strategies in teaching vocabulary. Baumannand

Kameénui (2004) studied the effectiveness of using the word parts strategy to expand reading vocabulary in middle-grade students and mentioned, in their conclusion, that different instructional goals require multi- and different strategies. The NRP warned that dependence upon a single vocabulary teaching strategy would not result in optimal learning.

The number of studies conducted and the amount of advice given in teaching different vocabulary knowledge aspects, is massive. Because there is only limited space in this book, I will only mention certain studies with their recommendations on the types of VTS that can be used jointly. One can recommend using definitions with memory images or key words (Pressley, Levin and Delaney, 1982), key words with semantic strategies (Brown and Perry, 1991), dictionary use with exemplifications, translations and collocations (Folse, 2004), guessing from the context with definitions and synonyms and antonyms (Stahl, 2009), joint use of labels, visuals and technological visuals, charts

and dictionary use (Helman, 2009), definitions with guessing from context and repetitions (Brett, Rothlein and Hurley, 1996) word parts with memory images, and collocations with memorising and guessing from context (Nattinger, 1998), repetition with recycling, pictures and visuals with memory images, all visuals with non-visuals, attention to register with pictures, board drawing, body actions and guessing with dictionary (Thornbury, 2002), and finally, labelling, memory images and recycling jointly (Gairns and Redman, 1986).

On the other hand, some studies recommend certain preferred (alternative) strategies either in the absence of one technique or because one should substitute for the other.

Thornbury (2002), for example, argues that the direct method (using realia, pictures or mimes) can substitute for the use of translation. Similarly, attention to register can be substituted by exemplification, and guessing from context instead of translation.

4.6 Vocabulary Delivery vehicles

There is no doubt that some VTS require vehicles (materials) for delivering them. These vehicles include technology aids, which have gained popularity in modern classrooms, and the more classic wall charts and flash cards.

(1) Technology aids

The term ‘technology aids’ refers to the use of different technology tools and devices such as overhead projector (OHP) transparencies, PowerPoint applications, slides, smart boards and any other technological means for presenting and practising visuals by ESPTs and CATs.

The importance of using technology aids in teaching vocabulary in general, and in ESP contexts in particular, has been highlighted by many authors. Helman (2009) shows that displaying content area vocabulary with matching visuals provides a word-rich physical environment for students to learn new vocabulary.

Visuals are known to be a useful vehicle for vocabulary delivery that facilitates teaching both concrete and abstract ETV items, such as *current* in electricity and *interest* in business. Thornbury (2002) demonstrates that the teacher‟s use of technology aids, such as OHP or PowerPoint slides, with which to present concrete ETV items, is also useful.

(2) Wall charts

‘Wall charts’ refers to the different displays in the classroom or other teaching settings. Wall charts can be used for a range of strategies, such as translations, semantic mapping, opportunity for recycling, pictures and websites. Helman (2009) argues that having such charts is of great benefit to developing students‟ writing in science classes.

(3) Flash cards

The flash cards strategy is another classic VDV used in language and vocabulary classrooms (Gairns and Redman, 1986). This

vehicle simply stands for writing new words on a big card and showing it to the class in both stages of presentation and practice. Sometimes the card can be more advanced and contain some additional information about the new word (written on the back of the card), such as a simple definition, phonemic transcription, antonyms or translation spelling. The vocabulary knowledge that can be learnt from flash cards is vast and basically involves the vocabulary form rather than the meaning. However, meaning might also be learnt if the word flashed is associated with an image. Flash cards can be applied in teaching ETV items as effectively as in general English classes.

Chapter Five

(5) Common Claims in Technical Vocabulary Instructions

By the end of this chapter the trainer will be able to:

- Provide more tasks in technical vocabulary instruction by ESPTs
- Provide more tasks in technical vocabulary instruction by CATs
- Name some more tasks in technical vocabulary instruction by learners
- Determine the tasks of the administration in technical vocabulary instruction
- List the tasks of syllabus designers and course compilers in technical vocabulary instruction

In chapter two of this book we talked about the task of teaching ETV items and we reached to the conclusion that it is a collaborative job in which ESPTs, CATs, students, and syllabus designers need to work jointly and systematically to accurately achieve this task.

However, we need to admit that the nature of the ESP context which puts massive burden on the shoulders of all parties causes some challenges and difficulties for the stakeholders. These challenges are occasionally expressed in the form of claims and complaints by each party. In this chapter, I will list these common claims and will employ the available theoretical framework which I addressed in the previous chapters as well as the author's teaching experience to validate their accuracy.

5.1 Excuse me ESP teacher, it is your job!

Some studies stressed that ESPTs believe that:

(1) ESPTs should not teach ETV items because they are language teachers.

The term ‘teaching’ is an umbrella term which stands for more than one action when it is used as ‘technical vocabulary teaching’. It means presenting the meaning, form and use of the novel ETV items as well as practising the already learntS ones. It also stands for selecting and testing these types of words.

Apart from the issues of selecting ETV items and testing them which are not within the scope of this book, ESPTs need to remember that they have particular job in presenting ETV items and practicing them. As we discussed in section (3.2), ESPTs are not asked to involve in the actual deep teaching of the ETV items’ meaning and use because this task deliberately requires specialized subject knowledge.

Instead, ESPTs need to focus on instructing the surface meaning of the word by, for instance, defining it generally and leaving the

specific details for CATs. As far as form is concerned, ESPTs are asked to put some effort by, for example, introducing the ETV item's spelling, pronunciation, different affixations of the word, and linking the word form in L2 to its L1 cognates.

ESPTs, as Chung and Nation (2003) recommended, also need to train their students to use the appropriate VLS to learn more about the ETV items under instruction.

(2) ETV items are very difficult.

Teaching ETV items is more or less like teaching any type of vocabulary. As I mentioned in different places of this book Nation (personal communication) believes that some strategies such as word parts and guessing from the context are the two strategies that need to be used more frequently when teaching ETV items than any other strategies.

That said, I advise ESPTs to exploit chapter four of this book by selecting the available VTS and VDV available in their contexts

and to utilize them in teaching novel and already learnt ETV items. I also need to remind ESPTs that the VTS taxonomy suggested in this book is not 'cast in a stone' but, instead, ESPTs are encouraged to see other taxonomies[5] which involve more strategies and techniques.

(3) Long ETV items are difficult to teach.

Pronouncing long ETV items is not an easy task even, at times, for CATs as some studies concluded (e.g. Alghamdi, 2011).

Therefore, I urge ESPTs to familiarize themselves with the pronunciation of these long ETV items by visiting some online dictionaries which have the voice features prior to delivering these words to their students. However, if ESPTs struggled to find some ETV items in these e-sources, I would then advise them to employ their linguistic knowledge in this regard through use of

[5]

the phonemic transcriptions[6] which follow each ETV item in the typical paper dictionaries.

(4) Students are not motivated to learning ETV items.

Students' lacking motivation to learning ETV items is a big topic which can be attributed to different factors. Nevertheless, I need to remind ESPTs that one of the common reasons for lacking motivation by both students and ESPTs was found to do with 'lacking the proper needs analysis'(see e.g., Alghamdi, 2013).

As I mentioned in section (3.3) of this book, ESPTs complain about having too many responsibilities and one of these responsibilities, as the literature revealed, is that they are asked to conduct needs analysis for their students. However, I need to remind ESPTs that this is the nature of the ESP context which

[6]

requires ESP ‘teachers’ to be ESP ‘practitioners’ as suggested by Dudley-Evans and St. John (1998).

The good news, in my opinion, is that ESPTs do not need to carry out detailed and deep needs analysis survey to understand every single aspect for the ESP environment and how it influences the students’ acquisition of science language. I, alternatively, believe that if ESPTs invested their spare time in taking some notes about the progress of their students in learning ETV items, they will achieve some good results. These notes could simply concentrate, for instance, on the reasons why some words are learnt more easily than some others, what VTS are aspect for more by the learners, why students believe some words are more important than some others and the like.

Despite the fact that this procedure may not completely make the students motivated it will definitely be a reliable step by ESPTs towards solving the problem or at least minimizing its negative impact.

(5) ESPTs know little about VTS and do not have the needed VDVs.

It goes without saying that VTS strategies are of different categories and the difficulty does not exist in the strategies themselves but rather in applying them in the teaching context.

This book reviewed (26) strategies under a suggested taxonomy and I don't think that teaching an ETV item by asking the students to look it up in their dictionaries or giving its equivalent L1 meaning is a tough task.

However, I find it inevitable here to remind ESPTs that word parts and guessing from the context are the two strategies they might need more than other strategies. Luckily, both strategies can be linguistically utilized. So, In the case of the word parts strategy which deals mainly with the form of the word, ESPT can show the spelling, part of speech the word belongs to, the pronunciation, and the meaning(s) of the suffixes, root, and

prefixes which are all ordinary tasks for an ESPT who holds a first degree in language and linguistics. Guessing from the context is a bit controversial since it is employed to get the meaning of the word not the form. Nevertheless, ESPTs are reminded, as I noted in no.1 above, that they are only responsible for the providing the surface meaning of the ETV item without delving into the precise details which is the job of CATs. So, they can employ this guessing strategy to show the general links between the words, identifying the available clues, showing which grammatical aspects and punctuations in the context can be highlighted to figure the meaning out.

5.2 Excuse me content area teacher, it is your job!

It is also unrealistic to think that because CATs have the required subject- knowledge, they do not have their own problems in teaching ETV items. The available literature as well as the practical experience of skilled teachers in the ESP context uncovered that CATs believe that:

(1) CATs should not teach ETV items because they are subject teachers.

The literature has emphasized that CATs are not responsible for teaching the linguistic aspects of the ETV items for the same reason that ESPTs are told not to involve in the actual teaching of the deep meaning of the same type of words; each party has their own qualifications and consequently doing their designated task(s).

Therefore, I would remind CATs that they are not asked to teach what part of the speech does the ETV items belong to, how to spell it, what each part of the word stands for, which order should it follow in the sentence since all these tasks normally require specialized linguistic knowledge.

Like ESPTs, CATs are argued to teach general linguistic aspects of the ETV items which do not interfere with their job as subject specialists. For example, CATs could use repetitions strategy to

make the student master the pronunciation of the ETV items. They may also write the ETV items under instruction on the board or display them to show the students how they are written and so on.

(2) CATs are more superior than ESPTs.

One of the repeated and unpleasent ESP studies' findings (see e.g. Khuwailed, 1995) is that CATs view themselves as 'primary knowers' of the subject knowledge and therefore should be viewed more important than their ESPT colleagues. This claim by some CATs actually generated what can be described as 'CATs' authoritative attitude'.

The fact that CATs and ESPTs are doing joint task implies that the notion of optimality of one party over the other when teaching ETV items is not possible. In other words, CATs should understand that optimality and partnership are conflicting concepts (see section 3.4).

To me, the negative impact of spreading the culture of *who is more important than who* within any ESP context is greatly dangerous since it might lead to hindering the spirit of cooperation which is a vital factor in the success of teaching ETV items.

(3) CATs have too many responsibilities.

Many studies (e.g. Khuwailed, 1995, Alghamdi, 2013, Issa, 2010). found that CATs complain from having too many things to do and teaching ETV items is an additional burden put on their shoulders. This complain actually goes in line with the same complain expressed by many ESPTs. Therefore, I would say again that the nature of the ESPT context imposes this kind of responsibilities and a smart CAT is the practitioner who knows how to exploit his time wisely and arrange the responsibilities according to their priorities. To give an advice about how CAT could teach an ETV item while suffering from a tight work schedule, I recommend the CATs to create list of the important

ETV items and start teaching them before the less important ones. They could also seek real cooperation with ESPTs and students in which they divide tasks between them based on the work load of each party.

5.3 Excuse me my student, it is your Job!

The students as partners in teaching ETV items also believe that:

(1) They know the subject-knowledge more than their ESPTs.

There is no doubt that students in most ESP contexts are basically science (with its different branches) students who study language to learn about the language of science. Therefore, it is normal to find students who know more about the subject matter than their ESPTs. This fact has been emphasized in the available literature (e.g., Moody, 1975, Hughes, 1999, Fraser, 2005) as we pointed out in section (3.5).

That said, it is not unusual to find many students put their teachers right when it comes to the specialized subject knowledge. The

lack of the specialized subject knowledge by some ESPTs is exactly like the lack of the specialized linguistic knowledge by some students. This condition does not imply that ESPTs are ignorant or unknowledgeable but rather reflects the borders which they need to abide by when teaching ETV items.

The recommendation here, as we discussed in section (3.5), is that high achieving students should cooperate in teaching ETV items by enriching their ESPTs' scientific knowledge and by explaining difficult ETV items to other students when ESPTs become unsuccessful in this mission.

(2) students study too many ETV items.

Earlier in this book we introduced the different definitions of technical vocabulary and we reached to the conclusion that an ETV item is a word which belongs to a particular discipline and occurs in that field more than its occurrence in any other fields or topics.

This definition implies, for example, that students of mechanics or business need to know as much as they can about mechanical engineering or business terminologies. This is important because students are going to be specialists and experts in these areas on the one hand and because these words are not many compared to other core vocabulary (i.e., high frequency vocabulary). Moreover, ETV items are considered very essential in the workplace and without enough ETV items repertoire students are expected to face real challenges in communicating with their colleagues and seniors.

However, the key point which I need to stress here is not the number of the words that need to be taught and then learnt. Instead, it is the relevance of these words to the actual needs of the students and the suitability of these ETV items to the context where it is introduced.

5.4 Excuse me our seniors, it is your job!

ESP administration is an important partner in teaching ETV items. Seniors in ESP contexts, in turn, claim that:

(1) ESPTs are not cooperating satisfactorily with the administration

We have established earlier that ESPTs should adapt to the nature of the ESP context which requires them to be teachers, evaluators, researchers, course designers, and collaborators. However, the last task as collaborators extends beyond collaboration with CATs to involve cooperation with the institution administration.

However, the principle of cooperation between ESPTs and their seniors is not questionable but the nature of this cooperation, in my opinion, deserves some discussion. It is really important the officials within ESP institutions think about the difficulties and challenges ESPTs face in the ESP context which are quite diverse. To mention a few, ESPTs are usually general English teachers in

scientific domain, teach changing ETV items which is not an easy task, cooperate with more than one party to successfully obtain their ETV items teaching objective, and finally, perform the rest of the tasks that an ordinary teacher needs to do.

That said, administration officials are invited to relieve teachers of administrative tasks which, when done, would help ESPTs spend more time on their already tight work schedules.

(2) ESPTs use some VDV that damage the institution facilities.

The regulations put by some administrations prevent ESPTs from hanging illustrations, posters, wall charts and stickers on the walls of the classrooms (see e.g. Alghamdi, 2013) without paying attention to the many advantages associated with using these strategies (See chapter four).

The common reason provided by the administration officials is that these charts and posters damage the walls and cost the

institution a lot of money to redecorate them. They also believe that other techniques could compensate for these costly strategies.

The administration is actually advised to reconsider their position about allowing teachers to use these useful strategies for different reasons. For instance, these strategies fall under the visual strategies and help students learn new ETV items properly. Secondly, these strategies help students practise and remember these words accurately. Thirdly, these strategies help ESPTs as well as they can be quick reference for loads of information about ETV items.

ESPTs, on the other hand / in contrast, are asked to use suitable gluing and hanging materials which can be easily removed at the end of the year or after finishing the course period.

(3) ESP/CAT formal meetings are not necessary.

I can confidently claim that holding formal meetings about teaching ETV items between ESPTs and CATs under the

supervision of the administration save both time and effort and provide significant teaching and learning outcomes.

Let me remind the administration officials that both ESPTs and CATs have something missing when it comes to teaching ETV items. ESPTs need subject knowledge and CATs lack the proper linguistic ability. This gap can be nicely bridged by organizing formal meeting in which both parties sit around one table to, for instance, discuss the best methods for teaching ETV items, divide roles, prepare and set up future team-teaching plans, and exchange ideas about the priorities in teaching these words.

The administration is advised to play the supervisory role and to launch initiatives which, when done properly, will create an appropriate educational environment and minimize the CATs' authoritative attitude (see no. 2 in section 5.2) and strengthen the concept of integration in ETV items instruction.

5.5 Excuse me syllabus designers and material providers, it is your Job!

There has been very little literature written about what ETV items should be included when designing courses in ESP contexts (see section 3.6). This scarcity influenced the delivery of some ETV items if not hinder it at times. Course designers claim that:

(1) They do not know which ETV items should be included in ESP courses.

It is quite accepted that one of the roles of ESPTs is to be a course designer (Dudley-Evans and St. John, 1998) who plans the course, chooses suitable published materials and adapts, writes and assesses the material, if that which is published is unsuitable. However, this does not mean that ESPTs should do this task alone but rather should work jointly (as collaborators) with course designers.

We all agree that ESPTs are basically teachers who are responsible for teaching language including ETV items. Similarly, we need to remind course designers that their main task is to design suitable ETV materials for the ESPTs to help them perform their job accurately. The task of designing ESP courses in general and ETV items in particular imposes mutual consultation between ESPTs and course designers.

Therefore, the course designers should be prepared to visit the institution(s) to which they intend to design a course in order to have a clear picture about the actual needs of that context. For example, I recommend course designers to carry out extensive learners' needs analysis, exchange ideas with ESPTs about ETV items needed, discuss cultural constraints, familiarize themselves with the institution regulations, and see available VTS and VDV. These activities are really vital if the course designers want to produce constructive context-tailored courses.

I have been always against using international courses which are designed in isolation of the context where ETV items will be taught. I have reached this decision because I noticed how ESPTs struggle with these courses in terms of lacking information on how ETV items were selected, presented, arranged (which follows what), and tested. These shortcomings encouraged many ESPTs to convert towards locally-produced or compiled materials or change textbooks very frequently during the academic year (Alghamdi, 2013).

(2) We are blamed for including too many ETV items in our courses.

One of the misconceptions in teaching ETV items is that including a large number of words is the best way to achieve optimal vocabulary learning. Many course designers believe that they should not be blamed for putting a wide range of ETV items

because students in ESP contexts need to learn all these words about their specialism.

It is important to emphasized here that the quality of the chosen words is more important than their quantity. In other words, students may be exposed to 500 novel ETV items during the period allocated for the whole course with only 200 words appropriate for their learning and contextual needs.

Therefore, ESP course designers are asked again to open doors for real collaboration with ESPTs and students to see exactly what ETV items the recipients actually need and to get rid of the unnecessary and surplus words. Once this understanding is established, I have little doubts that students will continue to claim that they have too many ETV items to learn (see no. 2, section 5.3).

Chapter Six

(6) The future of technical vocabulary research

By the end of this chapter the trainer will be able to:

- Discuss current shortcomings in technical vocabulary research
- Suggest future research in technical vocabulary instruction

The previous five chapters addressed ETV nature and pedagogy from different dimensions. The last chapter of this book shows the current situation of ETV items instruction in ESP contexts and suggest future scrutiny for pushing the wheel of this field forward.

6.1 Current shortcomings in technical vocabulary research

It is apparent that ETV items learning and teaching are under-researched and neglected topics in the field of L2 lexicon studies. The available literature about ETV items, to the best of my knowledge, is not more than a few pages in general service vocabulary handbooks or a few articles in some journals which all in all revolve briefly around these topics:

(i) Defining ETV items

(ii) ETV items and corpora

(iii) Frequency and range of ETV items

(iv) Technical vocabulary instruction (usually addressed with academic and high-frequency vocabulary research or in beliefs and practices studies).

These shortcomings are the central motive for writing this book as I noted in its outset. The field of ETV items also suffers from the paucity of the empirical studies which heavily employ participants' interviews and classroom observations. The next section will provide some suggestions and ideas for future scrutiny in the area of ETV items.

6.2 Future research in technical vocabulary instruction

There is always a scope for any future scrutiny about ETV items because it has been and still overlooked in the literature.

For the sake of simplicity and systematicity, the topics which I will suggest for future researchers will adhere to the sequence of the chapters I addressed in this book. Thus, the future research

will include: research about the nature of ETV items, research about who should teach ETV items, research about how ETV items should be taught, and finally, research about integration in ETV items' instruction.

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Appendices

Appendix A Function words as they appears in (Nation, 2001).

Adverbial particles

Again ago almost already also always anywhere back else even ever everywhere far **hence** here *hither* how however near nearby nearly never not now nowhere often only quite rather sometimes somewhere soon still than thence therefore *thither* thus today tomorrow too underneath very when *whence* where *whither* why yes yesterday yet

Auxiliary verbs (including contractions)

Am are aren't be been being can can't could couldn't did didn't do does doesn't doing done don't get gets getting got had hadn't has

hasn't have haven't having he'd he'll he's I'd I'll I'm is I've isn't it's may might must mustn't ought oughtn't shall shan't she'd she'll she's should shouldn't that's they'd they'll they're was wasn't we'd we'll were we're weren't we've will won't would wouldn't you'd you'll you're you've weren't we've will won't would wouldn't you'd you'll you're you've

Prepositions/ conjunctions (one category since there is some overlap)

About above after along although among and around as at before below beneath beside between beyond but by down during except for from if in into near nor of off or out over round since so than that though through till to towards under unless until up **whereas** while with within without

Determiners/ pronouns (omitting archaic thou, thee, etc.)

A all an another any anybody anything both each either enough every everybody everyone everything few fewer he her hers

herself him himself his I it its itself less many me mine more most much my myself neither no nobody non no-one nothing other others our ours ourselves she some somebody someone something such that the their theirs them themselves these they this those us we what which who whom whose you your yours yourself yosurselves

Numbers

Billion billionth eight eighteen eighteenth eighth eightieth eighty eleven eleventh fifteen fifteenth fifth fiftieth fifty first five fortieth forty four fourteen fourteenth fourth hundred hundredth last million millionth next nine nineteenth ninetieth ninety ninth once one second seven seventeen seventeenth seventh seventieth seventy six sixteen sixteenth sixtieth sixty ten tenth third thirteen thirteenth thirtieth thirty thousand thousandth three *thrice* twelfth twelve twentieth twenty twice two

Total = 320 word types

Words in **bold** appear in the Academic Word List (Coxhead, 1998)

Words in *italics* are not in the General Service List (West's, 1953) or The Academic Word list

Appendix B Definition(s) of a strategy

1. '…operations used by the learner to aid the acquisition, storage and retrieval of information' (Rigney, 1978).

2. '…behaviours or thoughts that a learner engages in during learning that are intended to influence the learners' encoding process' (Weinstein and Mayer, 1986: 315).

3. '…techniques which students use to comprehend, store, and remember new information and skills' (Chamot and Kupper, 1989: 13).

4. '… special thought or behaviours that individuals use to comprehend learning or retain new information' (O'Malley and Chamot, 1990: 1)

5. '…measures taken by language learners to facilitate their own learning. They are tactics employed by an individual in attacking particular problems in particular contexts' (Morley, 1993: 118).

6. '…actions, behaviours, steps or techniques students use, often unconsciously, to improve their progress in comprehending, internalizing and using L2' (Oxford, 1994: 1).

7. '…mental steps or operations that learners use to learn a new language and to regulate their efforts to do so' (Wenden, 1998: 18).

8. '…the steps or actions selected consciously by learners either to improve the learning of a second language or the use of it or both' (Cohen, 1998: 5).

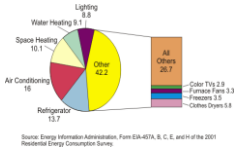
9. '…operations employed by the learner to aid the acquisition, storage, retrieval and use of information; specific actions taken by the learner to make learning easier, faster, more enjoyable, more self-directed, more efficient, and more transferable to new situations' (Oxford, 2001: 166).

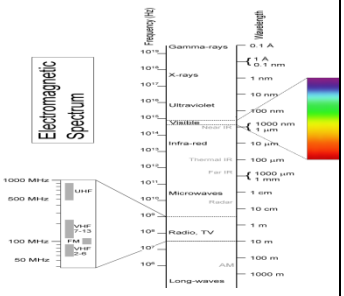
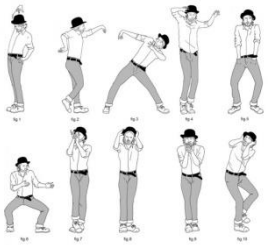
10. '…the ways in which learners attempt to work out the meanings and uses, grammatical rules, and the aspects of the language they are learning' (Richards and Schmidt, 2002: 301).

11. '…a series of actions a learner takes to facilitate completion of a learning task' (Gu, 2003: 41).

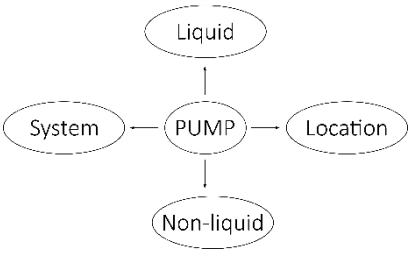
Appendix C Strategies with their definitions and examples

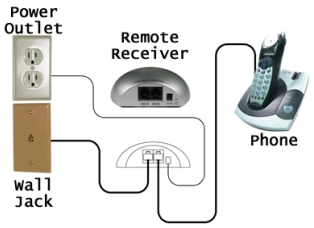
Groups of VTS and VDV	Strategy	Definition	Example from ESP field
	Translation	Giving the meaning of the word in L1.	*Semiconductors* means أشباه الموصلات

(A) DVT strategies for meaning presentation	Definitions	Providing and explaining the ETV items' meaning and/or use when the teacher presents them.	*Short circuits* are accidental complete circuits that have minimum resistance and maximum current.
	Exemplifications or attention to register	Providing some super-ordinates or hyponyms between two words.	*Coolants* can be included under the lexical item *auto liquids*.
	Pictures	Using visual image to present the meaning of a word.	Gearbox oil pump 
	Photographs, posters and other illustrations	Other types of imagery other than pictures.	Electric energy efficiency graph 
	Real objects (realia)	Bringing actual objects into the classroom and displaying them to students to facilitate	----------

		teaching and learning processes.	
	Scales	Showing students the different levels of certain words, with each level being taught as a part by itself and a part within the whole.	Electro-magnetic Scale 
	Body actions	Using gestures and mimes, or other physical action, to present a particular ETV item.	

(B) DVT strategies for form presentation	Word parts	Dividing a word into its essential components.	*Electromagnetic* is: elctro + magnetic
(C) DVT strategies for	Associations	The process whereby students are given a word and asked to produce the	*Coil* associates with *transformer*

use presentation		first word which comes into their minds.	
	Collocations	A semantic relationship within which, when we see one word, we can make a 'safe bet that the other is in the neighbourhood'.	*Electro* collocates with *magnetic*
(D) DVT Strategies for practice	Memory images	Devising a mental picture for the word in L2 to something in students' L1.	Linking the English word *ajar*, in its technical sense (when it flashes on the car dashboard as a warning sign), to a picture of the Arabic word 'جار' (neighbour) and link 'door ajar' to 'جار door' (who opens it for guests).
	Semantic mapping	The graphic procedure that induces students to relate and integrate new information with old.	water, fuel, oil  cooling, heat bonnet, boot,

			air
	Labels	Writing or sticking labels onto certain objects, whether inside or outside the classroom, showing the name of the object and/or some brief information about it.	
	Conversations and dialogue	Teaching students how to speak about a particular situation or function in the language or content lesson.	Training students to arrange for fixing a machine while chatting with a customer or complaining politely about something.

	Synonyms and antonyms	Synonyms are words that share a similar meaning but are seldom the same, while antonyms are words with opposite meanings.	*Current* is a synonym of electricity. Transformer *step up* is the opposite of transformer *step down.*

	Repetitions	Saying, writing, listening to or reading a word on its own (not with a picture or sounds, etc.) silently and/or aloud, chorally and/or individually more than once with the hope of learning different aspects about it and of retaining it in students' long-term memory.	Asking students to repeat newly learnt business word such as *microeconomics* or electronic one such as *transistor*.
	Vocabulary tests	The intentional informal process that teachers employ with the hope of	ETV items matching tasks and filling gaps.

		developing vocabulary knowledge.	
	Games	Learning already taught words by excitement.	Using crossword puzzles, scavenger game or hangman rope to practice some learnt ETV items.
(E) IVT strategies for discovery	Dictionary use	Training students to look up new ETV items in a dictionary to learn different information.	Teaching or encouraging students to look up ETV item such as *resistant* both in a general English dictionary and/or a dictionary of electricity.
	Guessing from context	Training the students to find some contextual and textual clues, which help them identify the meaning of other unknown words.	"Transformers have the effect of increasing or decreasing the voltage in a circuit. We may want to increase it - using a step up transformer...". This text, in effect, includes within it a slightly hidden definition of the new term '*step up transformer'*

			(making it clear that it is one that increases voltage).
(F) IVT strategies for consolidation	Recycling	Creating opportunities to meet the word that needs to be learnt more than once during and/or after the teaching time.	Introducing ETV item such as *crankshaft* early in the lesson, then giving an exercise that necessitates the use it at the end of the lesson, and finally asking students about the same word during other lessons on different days.

(G) Vocabulary delivery vehicles (VDV)	Technology aids	Using different technology tools and devices such as overhead projector (OHP) transparencies, PowerPoint applications, slides, smart boards and any other technological means for presenting and practising visuals by ESPTs and CATs.	Introducing new or already learnt ETV items via the use of one of the different devices or technology tools.
	Wall charts	The different displays in the classroom or other teaching settings such as workshops and language labs.	

	Flash cards	Writing new ETV items on a big card and showing it to the class in both stages of presentation and practice.	

Appendix D Most common prefixes and suffixes in order of frequency.

Source: Essential readings in vocabulary instruction. Graves, 2009.

Highest frequency	High frequency	Medium frequency
PREFIXES		
un- (not, opposite of) re- (again)	over- (too much) mis- (wrongly)	trans- (across) super- (above)

in-, im-, ir, il- (not) dis- (not, opposite of) en-, em- (cause of) non- (not) under- (too little) in-, im-, (in or into)	sub- (under) pre- (before) inter- (between, among)	semi- (half) anti- (against) mid- (middle)
SUFFIXES		
-s (plurals) -ed (past tense) -ing- (present tense)	-ly (characteristic of) -er, -or (person) -ion, tion (act, process) -ible, -able (can be done)	-al, -ial (having characteristic of) -y (characterized by) -ness (state of, condition of) -ity, -ty (state of) -ment (action or process) -ic (having characteristic of)

		-ous, -eous, -ious (processing the qualities of) -en (made of) -ive, -ative, -itive (adjective form of a noun) -ful (full of) -less (without)