REPUBLIC OF TURKEY
ÇUKUROVA UNIVERSITY
INSTITUTE OF SOCIAL STUDIES
ENGLISH LANGUAGE TEACHING DEPARTMENT

A CORPUS-BASED APPROACH ON THE DESIGN AND IMPLEMENTATION OF A LEXICAL SYLLABUS FOR ELECTRICAL AND ELECTRONICS ENGINEERING STUDENTS

Necmettin KÜRTÜL

MASTER OF ARTS

ADANA / 2016

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Supervisor: Prof. Dr. Yasemin KIRKGÖZ

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ÖZET

ELEKTRİK VE ELEKTRONİK MÜHENDİSLİĞİ ÖĞRENCİLERİ İÇİN SÖZCÜKSEL İZLENCE HAZIRLANMASI ÜZERİNE DERLEME DAYALI BİR YAKLAŞIM

Necmettin KÜRTÜL

Yüksek Lisans Tezi, İngiliz Dili Eğitimi Anabilim Dalı
Danışman: Prof. Dr. Yasemin KIRKGÖZ
Temmuz, 2016, 137 Sayfa

Derleme dayalı yaklaşım gerçekçi ve güvenilir kaynaklar sağladığı için, ESP (Özel Amaca Yönelik İngilizce) alanında derleme dayalı yaklaşım üzerine son zamanlarda çeşitli çalışmalar yapılmıştır. Bu çalışmalar, hem ESP öğretmenleri hem de öğrencileri için ESP materyallerinin geliştirilmesine yönelik ihtiyaçların karşılanmasını amaçlar.

Bu çalışmada, eğitim dili İngilizce olan Niğde Üniversitesi, Mühendislik Fakültesi, Elektrik ve Elektronik mühendisliği bölümünde okutulan ders kitaplarından elde edilen gerçek verilere dayalı etkin ve gerçekçi bir sözcüksel izlence hazırlanması hedeflenmiştir. Ardından elde edilen veriler AntConc, AntWordfinder ve RANGE programları vasıtasıyla analiz edilebilmesi bilgisayar ortamına aktarılmıştır.

Ardından, derleme dayalı yaklaşımla elde edilen verilerle sözcüksel izlence hazırlanmıştır. Daha sonra Elektrik ve Elektronik Mühendisliği (EEM) bölümündeki hem öğrenciler hem de akademisyenlere mülakat uygulanmıştır. Bundan sonra öğrencilerle bir anket çalışması yapılmıştır ve sonuçlar öğrencilerin İngilizce dil ihtiyaçlarıyla ilgili algılarını ortaya çıkartmak üzere değerlendirilmiştir. 94 öğrencinin mevcut dil seviyelerini görmek amacıyla bir ön-test uygulanmıştır. Öğrenciler; deney ve kontrol gurubu olmak üzere iki guruba ayrılmıştır. Öğrencilerin kendi alanlarını kapsayan kelimelerde ne açıdan bir ilerleme sağlayabileceklerini görmek amacıyla, sadece dört yetiye dayalı geleneksel İngilizce program birinci guruba, sözcüksel program ise ikinci guruba uygulanmıştır. 12 haftalık uygulamanın sonunda, iki gurup arasındaki farkı görebilmek için son test uygulanmıştır. Sonuçlar uygulama gurubunun lehine anlamlı bir fark olduğunu ortaya koymuştur.

Çalışmanın sonucu Niğde Üniversitesi EEM bölümündeki öğrencilerin teknik kelime kapasitesini artırma konusunda son derece istekli olduklarını ortaya koymuştur. Ayrıca, öğrencilerin çoğu, hem mevcut materyallerin hem de dersin içeriğinin yeniden gözden geçirilmesi konusunda hem fikir oldukları tespit edilmiştir.

Anahtar kelimeler: Derleme dayalı yaklaşım, özel amaca yönelik ingilizce, sözcüksel izlence

ABSTRACT

A CORPUS-BASED APPROACH ON THE DESIGN OF A LEXICAL SYLLABUS FOR ELECTRICAL AND ELECTRONICS ENGINEERING STUDENTS

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In recent years, there have been various studies on the corpus-based approach in the field of English for Specific Purposes (ESP) since the corpus-based approach provides the field with authentic and reliable sources. These studies aim to meet the needs for the development of ESP materials for both ESP practitioners and learners.

In the current study, the aim was to design an effective corpus-based lexical syllabus based on authentic data which were gathered through materials such as textbooks, lecture notes and online resources at the Engineering Faculty, at the department of Electrical & Electronics Engineering (EEE) at Nigde University, where the majors are in English. Then, the collected data were converted into machine readable form to be analysed by means of AntConc, AntWordfinder and RANGE programmes.

With the data obtained through a corpus based approach, a lexical syllabus was designed. After that, both the lectures and students at the department of EEE were interviewed. Then, a questionnaire survey was conducted with the students and the results were analyzed in order to find out their perceptions related to their English language needs. A pre-test was conducted with 94 students at the department in order to see the students' current levels of English. Then, the students were divided into two groups, one of which was the experimental group and the other of which was the control group. The conventional General English syllabus, which is purely based on four skills, was applied in the former, whereas the lexical syllabus for students was applied in the latter in order to see to what extent the students could improve their vocabulary capacity in terms of their specialty subject. At the end of the 12-week treatment for the

experimental group, a post test was conducted to see the differences between two groups. The results indicated a significant difference favouring the experimental group.

The results of the study indicate that the students at department of Electrical and Electronics Engineering (EEE) at Nigde University are eager to improve their technical vocabulary capacity. Moreover, the majority of the students are of the opinion that both the materials and the content of the course should be improved in terms of the lexical items it contains.

Keywords: Corpus-based approach, ESP, needs analysis, lexical syllabus

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LIST OF ABBREVIATIONS

ESP: English for Specific Purposes

EEE: Electrical & Electronics Engineering

EAP: English for Academic purposes

CA: Corpus-based Approach

LA: Lexical Approach

ELT: English Language Teaching

EEEC: Electrical & Electronics Engineering Corpus

EEEWL: Electrical & Electronics Engineering Word List

DDL: Data Driven Learning

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CHAPTER I

INTRODUCTION

1.1. Background of the Study

For the last few decades, corpus linguistics have acted in line with language teaching in terms of recognizing the importance of language corpora as a basis for recognising facts about the language to be learned; an idea that shares a broader, ‘‘chunkier’’ view of language (Johns, 1991; McEnery & Wilson, 1997; Murison-Bowie, 1996). Since language corpora are available to both language learners and teachers, they provide precious opportunities to enhance one’s vocabulary during the process of learning a language; moreover, they help learners perform language analyses on their own through such computer programs as concordancing that specialize in identifying collocations, or partnership of words, in which certain words co-occur in authentic texts with more than random frequency.

According to McEnery & Wilson (2001), corpus linguistics is a methodology which can be defined as a study of natural language on examples of real life language use by means of a corpus, identified as a body of text representative of a particular variety of language which is stored on a computer. All in all, since language corpora are available to both language learners and teachers, they can provide a real dimension to the criteria for success in the language learning process.

In Johns (1991) definition of ‘data-driven learning’, the data are primary, teachers have new roles as research coordinators, and their learners are designated as research workers in terms of controlling their learning process. Particularly, concordancing programs created for computerized text analysis can be utilized in a productive fashion in and outside of the ESP classroom. According to Sinclair (1991), a concordance is “a collection of the occurrences of a word-form, each in its textual environment” (p. 32). Concordancers are beneficial for language teachers since they can assist them in designing lexical activities to help language learners to be conscious of the partnership of words.

In a similar fashion, the lexical approach to language teaching and learning (Lewis, 1993; Nattinger & De Carrico, 1992; Willis, 1990; overview in Moudraia, 2001) is focused on collocations, which makes a particular qualification between

vocabulary items in a given text. The lexical approach is likewise viewed as a majority of individual words with altered implications. In addition, both single words and word combinations are stored in mental vocabulary and are accessible to be used.

A lexical approach in language teaching stems from the conviction that the building pieces of language learning and communication are not grammar, functions, notions or some other unit of arranging and teaching but lexis: that is, words and their combinations. Besides, language consists of multi word language units or 'chunks' which are learned and used as single items. In this context, several scholars have put forward different ideas as to the existence and significance of formulaic multi-word units. For example, in Bolinger's definition (1976) it refers to as ''the prefabs of language''. Sinclair (1987, 1991) suggested the idea of the idiom principle, which claims that words do not occur randomly in a text. Instead, ''a language user has available to him or her large number of semi-preconstructed phrases that constitute single choices, even though they might appear to be analyzable into segments'' (Sinclair, 1991, p. 110). Basically, keywords are those which occur most extraordinarily (or outstandingly, in Scott's (1997) terms) frequently in a text compared with their frequency in a reference corpus.

According to McEnery & Wilson (2001), ESP as a specialised area within language teaching and learning claims that

> corpora can be used to provide several different kinds of domain-specific material for language learning, as well as quantitative accounts of vocabulary and usage which meet students' specific needs of a particular domain more directly than those taken from more general language corpora (p. 121).

Depending on the needs of the profession, researchers design different kinds of corpora, although the majority of them are of limited size. Then, another assumption appeared which originated the idea that a finite limit on a corpus was an unnecessary restriction. For some uses, it is essential to achieve a steady corpus size and constitution, but this is easy to devise within a large and constantly moving collection. The question that arose was how to manage the large quantities of data that were foreseen for what are known as '*monitor corpora'*, which consist of open-ended collections of texts. That is to say, as Sinclair (1991) states, newly available texts are being constantly added until

the corpora get too large for any practicable handling and can be effectively discarded (p. 25).

On the one hand, there are large current professional corpora, one of which is called the Corpus of Professional English (http://www.perc21.org/cpe_ project/index.html), which is being collaboratively developed by the Professional English Research Consortium (PERC), Japan, and Lancaster University, UK. When completed, a 100-million-word database of English used by professionals in science, engineering, technology and other fields will be available in the corpus. Besides this, a monitor engineering corpus consisting of millions of words in English, which are used by engineers in over 355 professional engineering organizations, was gradually created at the University of Aizu in Japan (Orr & Takahashi, 2002). On the other hand, smaller corpora seem to be more beneficial for language teaching and learning, since they are created to represent the specific part of the language under investigation. Besides, they are needed to address the aspects of the language in accordance with learners' needs. Furthermore, smaller corpora are more manageable, and provide researchers with faster access to language data. There are smaller technical corpora created for language learners such as Peter Roe's Corpus of Scientific English, comprising 280,000 running words, or 'tokens', (cited in Yang, 1986), the 400,000-token Guangzhou Petroleum English Corpus or GPEC (Qi-bo, 1989), the Jiaotong Daxue English of Science and Technology (JDEST) Corpus (Yang, 1985a, 1985b, 1986) and the Hong Kong University of Science and Technology (HKUST) Computer Science Corpus (James, Davidson, Heung-yeung, & Deerwester, 1994) of 1,000,000 tokens each, and finally the Student Engineering English Corpus (SEEC) of nearly 2,000,000 tokens (Moudraia, 1999, 2003, 2004).

The difference between technical and non-technical vocabulary is not evident in the selection and differentiation of the vocabulary in an ESP course. Strictly technical words are defined only by imprecise synonyms, and they are resistant to semantic change, as well as having a very narrow range (e.g., words such as butane, or oscillator).

In order to design a lexical syllabus, there should be some considerations regarding language learning. Learning a language means to learn to comprehend and produce lexical phrases as unanalyzed wholes or chunks, which are raw data for learners to begin to perceive grammar. The methodology associated with the lexical syllabus allows learners to experience language items in natural contexts and to learn

from their experience. The lexis or chunks selected are the most common ones according to the frequency in the language corpus.

The lexical syllabus was first proposed by John Sinclair (1988) in 'The Lexical Syllabus for Language Learning' and one of its most seminal texts was Dave Willis' (1990) *The Lexical Syllabus: a New Approach to Language Teaching*. The most commonly known course book to apply the lexical syllabus is the Collins COBUILD English Course by Willis & Willis (1988). According to Lewis (2002) "Language consists of grammaticalized lexis, not lexicalized grammar." The main components of a lexical syllabus consist of a list of lexis, chunks, collocations or short sentences to be learned, which are selected according to their frequency in the language corpus. Furthermore, they are ordered according to simplicity. Thus, a list of vocabulary items and related tasks and activities can be created from a lexical syllabus for enhancing students' leaning capacity.

However, using a lexical syllabus also has some drawbacks; for example, a lexical syllabus only offers a pre-set list of lexis which has some restrictive effect on the choice of topics (Sinclair, 1988). Besides this, a lexical syllabus aims to use authentic or spontaneously-produced texts. Although it is based on lexicon, in a lexical syllabus, some grammar points are taught in a lexical way.

As designing a lexical syllabus is based on the frequency of words depending on the data gathered through corpus based studies, words of high frequencies are usually low in information and content, such as 'the', 'of' and 'as' etc. Moreover, the commonest chunks are only appropriate for low level learners.

1.2. Statements of Problem

In recent years, various studies have been conducted on curriculum development, course design and syllabus design (Kirkgöz, 1996, 2006, and 2009; Yalden, 1987; Sinclair 1988); however, there is still a shortage of obtainable data on engineering students' basic needs in learning English lexical items. Besides, there are also several studies on determining the basic needs of students so that the syllabus or the curriculum will achieve success. In the current literature, a number of studies can be found on needs analysis such as Benesch (1996), Mackay (1978), Cowling (2007) and Coleman (1988). According to Strevens (1988), ESP is designed to meet learners' needs by choosing content from particular disciplines and using activities, syntax, text and

discourse suitable to such activities. He further adds that ESP may not use any prescriptive, pre-planned instructional methodology. Dudley-Evans and St. John (1988) reshaped Strevens' definition. Although they agreed with most of his claims, they added the stipulations that

- ESP may be related to specific subjects
- It may use teaching methods and situations different from General English
- It may be designed for intermediate or advanced learners (pp.4-5)

However, the methodology and programme of the Department of EEE at Niğde University are based on General English teaching. In fact, all the students at the department already participated in a General English programme for one year in order to study in their own department, and they all passed required tests with satisfactory scores. But learners' needs and wants specific to the EEE course material are largely ignored. In fact, English for Specific Purposes (ESP) is a course which is oriented to learners' specific needs as well as purposes.

Hutchinson and Waters (1987) defined ESP more broadly as "an approach to language teaching in which all decisions as to content and methods are based on learners' need for learning" (p.19). Learners' specific needs are the foundation of ESP.

For this study, teaching materials both textbooks and lectures are in English. Therefore, in order to build a representative corpus of Electrical & Electronics Engineering English, disciplinary textbooks used as teaching materials at Niğde University will be selected, whose contents are filled with basic electrical & electronics technical English; that is to say, the disciplines are compulsory for all electrical & electronics engineering students. There are a good number of publications on ESP studies; however, there has been little research exploring teaching and learning electrical & electronics technical English by means of a corpus-based approach (such as concordances and collocations). To help remedy this situation and offer some relevant contribution to the area, this study investigates the effectiveness of the use of Corpus-based approach in the design of a lexical syllabus for undergraduate electrical & electronics engineering students studying English as a foreign language.

An ESP course is generally based on lexical items used specifically within its own genre since lexical knowledge has a critical role in learning all language skills in the related area. Without sufficient knowledge of vocabulary, communicating in a

language would hardly be possible. Therefore, it can be assumed that individuals can communicate through writing and speaking when they have an adequate amount of lexical knowledge, without producing grammatically acceptable sentences. In fact, this does not necessarily mean that grammar is not important at all, it only shows that knowledge of words and lexicons in all languages is significantly superior to knowledge of grammar.

Problems in learning English concern not only the learners' lack of knowledge of the terms in line with their occupation or field of study (Wang et al., 2007 Martinez et al., 2009 Ward, 2009) Tangpjaikul, 2014, Dehgani, 2014), but also their lack of awareness of which terms are related to their fields. Therefore, both the determination of what is field-related vocabulary and its compilation has a significant role in designing a lexicon-based ESP syllabus.

Moreover, a study conducted by Kirkgöz (2005) revealed a lack of lexical knowledge among students studying at the department of Economics at Çukurova University, since the teaching materials used were not related to their field. The current study will contribute to our knowledge of the lexical shortcomings of EEE learners in Niğde University. Besides, with the data obtained after designing a corpus based approach on the disciplinary materials which Electrical & Electronics Engineering students must read at Niğde University, the students at the department will have a better chance to be able to learn more of the common vocabulary terms for items used in their discipline. All in all, the materials prepared will be beneficial for those who study at the department, where the majors are taken in English. This study will also contribute to designing materials from which both ESP teachers and students can benefit.

1.3. The Aim and Scope of the Study

This study aims to investigate how a corpus-based methodology will contribute to designing a lexical syllabus based on English for Specific Purposes (ESP) as well as meeting a group of ESP students' needs; namely, the students of Electrical & Electronics Engineering at Niğde University.

The specific point here is to reveal how a technical student can benefit from the data-driven lexical approach. The examples were taken from the corpora prepared from the disciplinary textbooks used by the lecturers at Niğde University, as the disciplinary materials which are written in English. This corpus was built with the aim of

establishing a representative corpus of Electrical & Electronics Engineering English that reflects the lexis encountered in compulsory disciplinary materials in the field of Electrical & Electronics Engineering (henceforth EEE).

Moreover, in designing a lexical syllabus based on corpora for electrical & electronics engineering at Niğde University, the study will help meet the needs of ESP teachers, as they need teaching materials in English for EEE. The study would thus provide relevant materials not only for students but also for ESP teachers at Niğde University as well as other universities in Turkey. Therefore, the current study attempts to answer the following research questions:

1. To what extent will a corpus-based approach help ESP teachers to develop ESP materials?
2. What are the advantages of using the Corpus Linguistic approach to produce ESP materials for engineering students studying English?
3. What are the positive effects of designing a corpus-based lexical syllabus for learning technical vocabulary?

1.4. Limitations of the Study

The main limitation of the study is that it was conducted with 94 students and 3 academicians within only one context, which is the department of Electrical & Electronics Engineering at Niğde University. The study could be improved if the English needs of EEE students studying at other English medium universities could be investigated. Moreover, the study could also be broadened to include an examination of the English needs of the other departments of English medium universities.

The other limitation of the study is that the English needs of graduate Electrical & Electronics Engineers working in professional environments might be investigated so that it could be possible to develop a more accurate assessment of such needs. As a final limitation, the study could have made use of more research instruments. This study used one questionnaire, interviews with students and academicians, a 12-week treatment of the designed syllabus, and a technical vocabulary test. However, despite the study's limitations, it was still able to gather effective information on its subject matter and make cogent recommendations for future teaching.

1.5. Operational Definitions

English for Specific Purposes:

An approach to language teaching in which all decisions as to content are based the learners' reasons for learning, and which is directed by specific and apparent reasons for learning.

(Hutchinson & Waters, 1987, p.19)

Needs Analysis:

The systematic collection and analysis of all subjective and objective information necessary to define and validate defensible curriculum purposes that satisfy the language learning requirements of students within the context of the particular institutions that influence the learning and teaching situation.

(Hutchinson & Waters, 1987, p.102)

Lexical Syllabus:

A lexical syllabus is a form of the propositional paradigm that takes 'word' as the unit of analysis and content for syllabus design. (Sinclair & Renouf 1988).

Technical Vocabulary:

Technical vocabulary refers to a word or a group of words in the form of a noun phrase used as a technical lexical unit in a specific field with specific meaning to the field (Nation, 2001).

CHAPTER II

LITERATURE REVIEW

2.1. Introduction

The objective of this chapter is to survey and evaluate relevant research in Engineering English. It will chronologically analyse the literature on Engineering English and English for Specific Purposes (henceforth ESP) and the major areas of theory they develop: needs analysis, corpus studies, technical word lists.

2.1.1. The Development of ESP

This part begins with a brief overview of the development of English for Specific Purposes. This review is meant to be informative and simply to serve as a background for the rest of the chapter. There has been much discussion in the literature as to the origins of ESP. Dudley-Evans & St John (1998, p. 1) noted that the origins of Language for Specific Purposes (LSP), in fact, can be traced as far back as the Greek and Roman Empires. Strevens (1978), in an article in which he discusses 'Special-Purpose Language Teaching' (SP-LT) (1978, p 150) says that SP-LT can be seen in basically two forms: the traveler's language course - which he says goes back to the 16th century - and what he calls the 'German for science students' type of course. Perhaps more interestingly, he continues by saying that the Second World War promoted the need for specialist language courses where students only needed a very limited competence in a language in order to fulfill pre-delineated tasks. He gives the example of Royal Air Force personnel being trained to listen to Japanese fighter aircraft radio dialogue. The personnel were trained only in listening skills and with a very limited amount of lexical input. Accordingly, the stage was set for the boom in this area that was to follow the Second World War.

2.1.2. Needs Analysis

The idea of the large scale of analysis of students' needs was begun largely with Richterich's (1971) pioneering work for the Council of Europe, though the phrase 'analysis of needs' was used as early as the 1920s by Michael West when teaching Indian civil servants. Approaches to needs analysis have changed, as views on language

and communicative competence have changed. The first main theoretical movement in the field, Target Situation Analysis, grew up alongside the functional/notional work of Wilkins (1976). Wilkins' work, widely regarded as heralding in the age of 'communicative' language teaching, argued that language was made up of functions-the purposes for which language is used, and notions-concepts expressed by language. This resulted in a search to find those situations where students would need language and subsequently an attempt to define the language needed in those situations.

According to Dudley & Evans (1998) "a needs analysis includes all the activities used to collect information about students' learning needs, wants, wishes, desires, etc." (p.61) Moreover, Hutchinson & Waters (1987) put forward an idea that 'target needs' and 'learning needs' should be handled in a different way since 'target needs' refer to what the learners needs to do in the target situation and 'learning needs' refers to what the learner needs to do in order to learn (p. 54). Besides, the target needs are categorized as (1) necessities: what the learner has to know in order to function effectively in the target situation; (2) lacks: the discrepancy between necessities and what the learner already knows; and (3) wants: what the learner actually wants to learn or what they feel they need to learn. The learner's "wants" might conform to whatever is perceived by the teachers or course designers as necessary (pp. 55-57). All in all, the learning need is treated as a guide for the construction of the curriculum.

A needs analysis is applied for various purposes, such as Target Situation Analysis, Lacks Analysis (deficiency analysis), Learning Needs Analysis (strategy analysis), Wants Analysis (subjective needs analysis) and so on. First of all in order to provide a guide for the researcher, some of the analysis should be performed. These are, what language to teach, participants' background knowledge in English, what language they lack and what the participants think they want to learn. Some of resources for conducting a needs analysis may include surveys and questionnaires, test scores, and interviews. In the current study, the researcher decided to use questionnaires to determine participants' needs before preparing a syllabus specially designed for EEE students.

2.1.3. Later Developments in Needs Analysis

As views of language changed towards the end of the 1970s and early 1980s, so did approaches to needs analysis. Canale & Swain's (1980) additional sociolinguistic

definition of communicative competence, allied with points of dissatisfaction with Munby's work, led to a flurry of activity. Needs were no longer defined simply in terms of terminal situation language functions, but in turn in terms of means, lacks and learning strategies. Needs analysis is now viewed as 'a required step' to be taken prior to designing and developing an ESP course; that's to say, it is necessary to design a foreign language course which is as relevant and efficient as possible for the target group. On the other hand, it is also utilized for general purposes to gather 'information both on individuals and groups of individuals who are to learn a new language and on the use which they are expected to make of it when they have learnt it' (Richtericht 1983, p.2) or solely as 'a procedure for establishing the specific needs for learners' (Ellis 2003, p.345-45).

Mountfound (1981) suggests that there are three sets of methodological problems in relation to needs analysis: (I) the problem of perception (whose needs), (ii) the problem of principle (the content in the needs analysis), and (iii) the problem of practice (how the needs analysis is undertaken). Since the concept is not clear enough, Van Hest and Oud-de Glas (1990) put forward the idea that such a concept is to be defined before any foreign language needs are identified. They relate needs anlaysis to the subject of needs, the user, the character of needs (use, lack, key asset) and the object of needs (language, skills situations and linguistic content). Brown (2006) views needs analysis from an educational point of view and suggest that it is

> the systematic collection and analysis of all subjective and objective information necessary to define and validate defensible curriculum purposes that satisfy the language learning requirements of students within the context of the particular institutions that influence the learning and teaching situation (p.102) .

However, Hyland (2003) looks at needs analysis from the utilization perspective and states that different methodologies to evaluate the findings of needs analysis must be used prior to the language course, during the course and eventually after the course.

When this view is taken into consideration, needs analysis is also called needs assessment, which is used to gather information for curriculum development for a particular group of learners. Its main aim is to fill the 'gap' of what language programmes 'lacks' (Brown 1995; Songhori 2008). According to Richards (2001) needs analysis is considered a procedure 'used to collect information about learners' needs'

(p.51). On one hand, needs analysis is used to gather and analyse data so that that learners' 'wants' and 'needs' to learn will be determined and recorded. In order to determine what learners are to know and what learners feel they need to know, Hutchinson and Waters (1992) identifies needs anlaysis on the basis of 'necessities' and 'wants'. The basic aim here is to fill the learners' 'gap' and attain the necessary proficiency in the target situation. From this point of view, Witkin and Altschuld (1995) define needs analysis as determining the 'gap' between 'what is' and 'what should be', concentrating on the current state of matters and the desired state of matters. All such definitions come together around concepts such as 'necessities', 'lacks', 'wants' and 'gaps'. The learning refers to a process or a product, whereas needs refers to a target situation or goal situation.

Brindley (1984) identifies needs analysis as subjective or objective, and Vandermeeren (2005) classifies language needs under the sub categories of subjective needs, unconscious needs, subjective unmet needs and objective unmet needs. The 'subjective need' is defined as a situation where a need is perceived but not practically necessary; for example, when an employee finds it necessary to learn a foreign language but has not yet encountered a real work situation where it is needed. An unconscious need may emerge when a boss claims that there is no need to learn a foreign language in the company, but some people in the company deal with customers speaking that language. Moreover, an employee mentioning the difficulties faced with a coworker in a report might be signs of subjective unmet needs. However, an objective unmet need could be defined if a company enters a new market and does not have any employees speaking that language.

Dudley-Evans and St. John (1998) summarise the content of needs analysis:

i. Professional information about the learners in relation to the target situation and the objective needs
ii. personal information about the learners in relation to their wants, means and subjective needs as well as factors affecting their language such as learning experience and cultural information
iii. Target situation information about the learners to analyse their present situation
iv. The gap between (i) and (iii) to understand what the learners lacks

v. Language learning information to identify the learners' learning needs and how they can learn effectively
vi. Professional communication information about the target situation by conducting linguistic analysis, discourse analysis, and genre analysis
vii. Learner preferences such as what participants want from the course
viii. Information about the environment in which the course will be run by conducting means analysis

Besides the components mentioned above, objective needs also require the needs of the company, the professional field along with the social situation.

All in all, needs analysis includes compiling relevant material in a curriculum that will satisfy the needs of an individual group of students. The needs of this group are considered in the creation of the tests, materials, teaching activities and evaluation strategies, the analysis, and measures of effectiveness; that is to say, a conclusive programme is designed to meet those learners' needs. What these components are to a large extent depends on the views of those teachers, learners, administrators, and employers.

As a conclusion, it is necessary that needs analysis frameworks in ESP context not be rigid. It is necessary for some considerations such as ideas, opinions as well as views of different people (learners, sponsors, subject specialists, English language instructors and ESP practitioners) to be taken into account regarding comprehensive ESP needs investigation. Since such considerations would have an effect on the implementation of research, the development of courses and syllabi, methodologies as well as training programmes cannot be ignored when it comes to conducting needs analysis. The existing development in the areas of needs analysis in the ESP context requires the emergence of revised and much more flexible theoretical frameworks in the discipline.

2.1.4. Research in ESP Today

The general opinion in the literature at present, (West 1997 and Dudley-Evans & St John 1998) is that little has happened in ESP since Hutchinson & Waters' work in 1987. Dudley-Evans & St John, however, discuss the rise of genre analysis and its importance in the analysis of ESP situations, but they state that it cannot be seen as a

major movement such as register analysis; needs analysis and the learning-centred approach, for example.

As a *lingua franca*, English is the dominant universal language in different kinds of business as well as an important tool in education and communication all around the world. In addition, ESP has become a significant ELT component in English speaking countries where English for occupational purposes for new immigrant populations and for academic purposes for non-native-speaking students are offered. On the other hand, the current trend is directing ESP into non-native English speaking countries, where English is taught as either a second language or a foreign language. Johns (2001) suggests that ESP has become more common in English as a Foreign Language (EFL) contexts, in which a great number of adult learners are enthusiastic about learning business English or academic English, so that they will be able to pursue their career or study in English medium educational institutions. Therefore, various researches in ESP contexts have been conducted all around the world.

It is generally suggested that research employing a discourse analysis methodology on English for Specific Purposes (ESP) has dominated in second and foreign language studies since its early years. Since then, genre-based studies have become an indispensable part of ESP research, and such studies have been conducted by several researchers (Johns, 2009; Johns, Bawarshi, Coe, Hyland, Paltridge, Reiff & Tardy, 2006; Tardy, 2006; Tardy, 2011; Mudraya 2004; Mudraya 2006).

Further development in ESP research is the use of computers to conduct studies of specific purpose language use. Belcher (2006) points out the potential of corpus based studies for ESP research to provide an "empirically better understanding of language used for specific purposes" (p.142). Biber (2006, p. 178) also suggests that corpus based-studies have helped us to get a better idea of the nature of specific purpose language use, which is often surprising and contrary to popular expectations. Corpus studies have provided a convincing reply to Hutchinson and Water's (1987) claim that there are no specific structures, functions or discourse structures that might be associated with specific purpose language use (Flowerdew, 2011).

There have also been several related studies published on the developments in ESP genre studies. Bhatia (2004) argues for analyses that consider both typical characteristics of professional genres and the nature of professional practices. Hyon (2008) examines what Swales (1996) has called an "out of sight", or occluded genre. The study examines tenure reports that are written for faculty in US universities,

locating these reports within the context of the university's retention promotion and tenure "genre chain". Samraj and Monk (2008) examine what they term a 'semi-occluded' genre—the statement of purpose that students need to write for admission to graduate school in the US. They focus on both the discourse structures of the texts, in terms of moves and steps, as well as disciplinary variation within the texts. In a study conducted by Giannoni (2008), it is suggested that a corpus-based genre study that shows the value of this approach can provide an understanding the linguistic features of particular genre. In his 2008 study, Dressen-Hammouda sees the new rhetoric as well as ESP genre studies to examine the ways in which students acquire genre mastery as they come from being novices to disciplinary experts in their areas of study.

2.1.5. ESP and Corpus Studies

In the past few years, the increase in the number of corpus studies has provided ESP researchers with important new resources. These include the Michigan Corpus of Academic Spoken English (MICABASE) (http://www2.warwick.ac.uk/fac/soc/al/ reseacrh/collect/base/), the British Academic Written English /BAWE Plus) corpus (http://www2.warwick.ac.uk/fac/soc/al/ /research/collect/bawe) and the TOEFL Spoken and Written Academic Corpus (Biber, 2006; Biber and Conrad, 2009). The MICABASE is an open access corpus that contains data from wide range of spoken academic genres as well as information on speaker attributes and characteristics of the speech events contained in the data. The BASE Plus corpus includes recordings of conference presentations, lectures and seminars with academic staff, as well as research purposes (Casanave & Vandrick, 2003; Hyland, 2009) and second language thesis and dissertation writing (Casanave & Li 2008; Swales, 1990, 2004; Paltridge & Starfield, 2007) both of which present major challenges to second language writers.

However, perhaps there have not been major changes to implement as such, it can be noted that practitioners are taking advantage of all previous facets of ESP in order to present students with a mixture to fit their particular situation.

2.1.6. Engineering English in an ESP Context

It is likely that ESP teachers will feel intimidated when faced with the prospect of teaching Engineering English, since they are concerned about their possible inadequate experience or knowledge in engineering. They will be exposed to an

unknown content; therefore, they might feel inadequate to handle the possible issues that might arise. But teaching ESP for Engineering does not involve a teacher's presenting engineering concepts to the learners or instructing them in the engineering field, but only to provide such learners with sufficient development in their language skills within an engineering context. First of all, teachers of Engineering English are teachers of English. The point at which teaching Engineering English differs from teaching General English will normally be in the choice of contexts for listening and reading texts as well as in the choice of lexis in grammar and vocabulary exercises.

2.1.7. Technical Word List

The aim of the current study is to investigate the benefits of a technical word list for the Electrical & Electronics Engineering discipline. This Electrical & Electronics Engineering word list (EEEWL henceforth) was created to act as the main source of the lexical material. The purpose was to make it available for an L2 learner of English studying this discipline in an English medium and thus making use of the list as a pedagogical tool.

In the literature there are various studies conducted on technical vocabulary by different researchers and ESP practitioners in different genres. In a study conducted by Konstatntakis (2010), the researcher created a Business word list consisting of 686 words. In another study conducted by Aichah (2012), the researcher built a Law word list including 139 specialised lexis in law. In another study carried out by Minshall (2013), the researcher made a word list containing 229 specialised lexis for the computer sciences.

2.1.8. Definition and Categorisation of words

According to Milton (2009), one of the major research problems involved in investigating vocabulary is that, as a unit of measurement, it can be difficult to define and count words.

An empirical study, specifically a quantitative study requires clearly countable units of measurement. Nevertheless, in order to count words there are various methods, which, when applied, can result in colossal variations in numbers. For instance, take Webster's Third International Dictionary designed by Nation (2001a) and Schmitt (2000), who counted 54,000 and 114,000 words respectively. Such level of

disagreement requires certain kinds of criteria of the way in which words can be counted to be established.

It is likely that a simple count of words in a text is limited to tokens and types. On one hand, tokens are the number of running words in a text; on the other, types are the unique occurrence of each word in any text. Such measurements will typically lead to various values for each owing to the re-occurrence of common function words such as in the sentence '*After she had a shower, she left home immediately.'* There are 9 tokens here, yet only 8 types because of re-occurrence of the word *she*.

Tokens are significant for corpora-based research (e.g. Coxhead, 2000; Konstantakis, 2010), since they are the unit through which the size of the corpora is to be counted. As for types, they are relevant to technical word lists since they are the morphemes of a headword which are included in its growth.

Words may be written in several lexical forms; therefore, they become increasingly hard to count given their various inflections and derivations. Inflections have an effect on a word's grammatical properties, frequently for the purposes of either verb agreement or plural meaning; however, they do not change the part of speech, such as with *fast* and *fastest*. Such words which are counted this way are designated as '*lemmas'*. Derivations are affixes to a base word which can change its function, such as *former* to *formerly*. Groups of words like this, along with their derivations and inflections, are called word families. There are previous studies related to the technical word list (e.g. Coxhead, 2000; Coxhead & Hirsch, 2007; Konstantakis, 2007; Wang et al, 2008; Misnhall, 2013), which have employed word families in order to create fully expanded forms of the headword entries in their lists.

The 'word families' concept denotes that words like *explicable*, *inexplicable* and *explanation* belong to the same word family, which enables decreases in the number of words in the English language. This is done with the purpose of reducing the burden on English language learning, provided that a non-native speaker knows the grammatical rules with respect to the inflections and derivations of a word (Nation, 2001a).

On the other hand, not all inflections and derivations of a word can be derived from the grammatical rules owing to irregularities. These can also result in overestimating the vocabulary size of a student (Laufer, 1990). Therefore, Nation and Bauer (1993) created a list of 7 levels across which word families could be organised, in view of the frequency and regularity of their affixes. They considered level 7 words as those that have traditional roots and affixes; words which they believe both native and

non-native speakers ought to learn independently. These word families contain a headword with an expanded list of types of the same headword. For example, the headword *resist* contains the words *resists*, *resisted*, *resisting*, but not *resistor* as the *-or* affix is not within the level 6 expansion. Along with such a restricting factor on how a lexical type may be considered part of a word family, Coxhead (2000) decided upon level 6 expansions for headwords within the Academic Word List (AWL). Additional studies on the AWL, have agreed upon such level of expansion (e.g. Coxhead & Hirsch, 2007; Konstantakis, 2007; Wang et al, (2008). Table 1 illustrates how a word may be expanded as far as level 6.

Table 1

Word Family Levels

Level 1
A different form is a different word. Capitalization is ignored.
Level 2
Regularly inflected words are part of the same family. The inflectional categories are -plural; third person singular present tense; past tense; past participle; -ing; comparative; superlative; possessive.
Level 3
-able, -er, -ish, -less, -ly, -ness, -th, -y, non-, un-, all with restricted uses.
Level 4
-al, -ation, -ess, -ful, -ism, -ist, -ity, -ize, -ment, -ous, in-, all with restricted uses.
Level 5
-age (leakage), -al (arrival), -ally (idiotically), -an (American), -ance (clearance), -ant (consultant), -ary (revolutionary), -atory (confirmatory), -dom (kingdom; officialdom), -eer (black marketeer), -en (wooden), -en (widen), -ence (emergence), -ent (absorbent), -ery (bakery; trickery), -ese (Japanese; officialese), -esque (picturesque), -ette (usherette; roomette), -hood (childhood), -i (Israeli), -ian (phonetician; Johnsonian), -ite (Paisleyite; also chemical meaning), -let (coverlet),
-ling (duckling), -ly (leisurely), -most (topmost), -ory (contradictory), -ship (studentship), -ward (homeward), -ways (crossways), -wise (endwise; discussion-wise), anti- (anti-inflation), ante- (anteroom), arch- (archbishop), bi- (biplane), circum- (circumnavigate), counter- (counter-attack), en- (encage; enslave), ex- (ex-president), fore- (forename), hyper- (hyperactive), inter- (inter-African, interweave), mid- (mid-week), mis- (misfit), neo- (neo-colonialism), post- (post-date), pro- (pro-British), semi- (semi-automatic), sub- (subclassify; subterranean), un- (untie; unburden).
Level 6
-able, -ee, -ic, -ify, -ion, -ist, -ition, -ive, -th, -y, pre-, re-.

Source**:** Nation, 2012

As can be clearly seen in Table 1 above, there are precise ways in which a word may be counted. Comprehension of the definition of tokens, types and word families (expanded to level 6) is core of any technical word list study.

2.1.9. Frequency, Vocabulary Size, Coverage and Comprehension

It can commonly be defined that the frequency of a word is the number of occurrences (as a word family) per token of a text. It is still a general opinion that the frequency of a word influences its ability to be learnt and there is solid supporting proof for this case.

Milton (2006) found a statistically significant correlation between frequency bands and vocabulary size scores by means of an ANOVA ($F=93.727$, $p<0.001$) on a study conducted with 227 L2 English learners in a school in Greece. These frequency bands were created by means of frequency-based corpora research by different researchers (e.g Nation & Heatley, 2002). These is a way of showing how common a word is by sorting them together in 1,000-word bands. To illustrate, the 1k frequency band contains the commonest 1,000-words in a language; in a similar fashion, the 2k frequency band contains the second commonest 1,000 words and bands continue similarly. It is likely that high frequency words should be learnt by learners. That's to say, the more frequent a word is, the more likely it is to reoccur in a text. Besides, the more frequent a word is, the more likely it is to be comprehended by the learner and thus leading to the concept of coverage, which is the percentage of tokens in a text that an L2 reader is supposed to recognize.

The idea of 'lexical threshold' is the level of vocabulary items in terms of their frequency; it is also shown as a percentage. In addition, it represents the coverage required for sufficient understanding of a given discourse. Laufer (1989) conducted a study with 100 L2 learners of English at the University of Haifa, Israel. During the study, the learners were handed a reading comprehension exercise and, while reading, the researcher asked them to mark the vocabulary they understood. The students who had a lexical coverage of a minimum of 95% of the text performed significantly better than those who did not, which prompted Laufer to consider this figure as a minimal threshold for comprehension.

Hu and Nation (2000) conducted a study with 66 L2 learners of English, studying at university level; their performance was good on a Vocabulary Levels Test (Nation, 1983) in a reading activity. These tests are specifically created to evaluate L2 learners' vocabulary size by sampling their understanding of words from increasingly less common frequency bands. Their results suggested an expected correlation between comprehension and unknown word density. Accordingly, they found that 90-95% coverage was adequate for some of their subjects to perform sufficiently, whereas at 98% coverage they obtained far better results. Their findings were parallel with an earlier study conducted by Hirsch and Nation (1992), which investigated the correlation between lexical coverage and known & unknown vocabulary. They found a non-linear correlation between these 2 factors; such that there was a sudden decrease in word density known at the 98% mark. A more recent study conducted by Schmitt, Jiang &

Grabe (2011) demonstrated a linear correlation between coverage and comprehension in the reading comprehension ability of 611 L2 learners of English. They noticed that there was no threshold value revealed by a sudden increase in comprehension at any level of coverage, but in fact they agreed that 98% coverage was a reliable target.

The current study suggests that in order to comprehend any text optimally there should be a threshold of coverage between 95-98%. Yet, this is not considered as an absolute value. This figure is ideal, and the researcher is likely to obtain sufficient comprehension of a text with lower threshold coverage. The reason for fixing the threshold at 98% is that after this point, students will start to experience diminishing returns. There is no a linear relation between coverage and known words (Hirsch & Nation, 1992). As coverage demands increase, vocabulary sizes become higher to address them. Therefore, nearly all studies that look at technical word lists have considered 95% as a better threshold value (e.g. Coxhead, 2000; Coxhead & Hirsch, 2007; Konstantakis, 2007, 2010; Wang et al, 2008; Minshall, 2013). Besides, none of the studies which demonstrated a 98% lexical threshold (Hirsch & Nation, 1992; Hu and Nation, 2000; Schmitt, Jiang & Grabe, 2011) used technical corpora to calculate this figure. The most technical one used was in Schmitt, Jiang and Grabe's study (2011) in which they utilized an article from an EFL textbook and from *The Economist*. Others used works of popular fiction.

The General Service List (henceforth GSL) is a list including 2,000 words which provides approximately 80% coverage of general English texts (Coxhead, 2000). In fact, this 2,000 word benchmark is frequently cited as a requirement for a basic understanding of the English language (Nation, 2001a), yet a more recent study asks this to be increased up to the 3,000 word mark (Schmitt & Schmitt, 2012). However, the GSL provides only about 75% coverage of academic texts (Coxhead, 2000). Having only 570 word families, the academic word list AWL provides a further 10% coverage on average in several different academic domains (Coxhead, 2011), making a total of 85% coverage with the combination of the GSL. This is highly lower than any acceptable lexical threshold, but nonetheless was obtained with only roughly 2,570 word families. The majority of other relevant studies regarding technical word lists have attempted to close this gap between the amount of tokens represented by a combination of the GSL and AWL with the lexical thresholds suggested for comprehension. One exception to this was Ward (1999), who created an engineering corpus with 1 million words from which he made an engineering word list. He concluded that only 2,000

words were required to obtain 95% coverage in specialized engineering texts for the first graders at engineering faculties. He did not prefer to use the GSL or AWL, as he aimed to increase the efficiency of vocabulary teaching by removing any words from the GSL and AWL that his corpus data showed to be absent from engineering texts. However, at only 1 million words, it is likely that his sample size was insufficient to make such claims. However, it revealed how specialist corpus studies can establish word lists with a reduced vocabulary burden for ESP students with a level of efficiency far more effective than learning the first 8-9k frequency bands (Nation, 2006). This also applies to building a supplementary specialist word list. All in all, vocabulary size efficiency is critical to achieving threshold coverage.

2.1.10. Word Technicality

It has already been discussed how words occur in the English language with varying frequency; some of those included in the GSL are among the most frequently used. According to Nation (2001a), there is a differentiation between four different categories of words based on frequency behaviour: high frequency, academic, technical and low-frequency words. The purpose of identifying words in such a manner is based on pedagogical concerns. There should be a cost/benefit analysis involved in the decision to teach vocabulary items; there would obviously be a greater benefit in teaching high-frequency items (Nation, 2001b). Therefore, a teacher should focus on teaching high-frequency words in English as students most likely to encounter them. Besides, less time may be allocated to teaching the low-frequency words, since they are encountered less commonly in language.

Technical vocabulary, as Nation (2001a) estimates, accounts for approximately 5% of words in a specialist text; these words' meaning as well as frequency are obviously subject-dependent. It can be highly practical for ESP students to utilize such vocabulary in their studies. The AWL consists of a list of the most common 570 academic headwords; however it only represents 10% of coverage in the majority of academic texts. Therefore, there is a need for specialist lists to be built within each academic discipline so that identification of the subject specific technical vocabulary an ESP student is to learn can be established. Moreover, corpus analysis provides one of the most accurate tools for identifying this lexis (Chung & Nation, 2003). Moreover,

they concluded that when combined with a specialist dictionary, even greater levels of certainty regarding the technicality of a word list may be obtained.

2.1.11. Multi-Word Units

In the current literature, it is evident that one of the most important results obtained from studies conducted on corpus is that language consists of both single words and multi-word units (Martinez & Schmitt, 2012). Such multi-word units, frequently recognized as ‘formulaic language’ (Wray, 2002, 2008), are not semantically transparent chunks of language. In other words, such words contain a separate and distinct meaning from the sum of the individual words from which they are comprised, a phenomenon known as compositionality. It is evident that L2 learners acquire, process, store and produce these multi-word units in a similar fashion to individual words; besides, they seem to be an unavoidable part of language use (e.g. Schmitt, 2010; Wray, 2008). According to Martinez and Schmitt (2012),

> Phrasal expressions seem to be everywhere; their meanings and functions are frequently expressed by multi-word units; formulaic language possesses processing advantages; and they improve the impression of L2 learners’ language capability.

2.3.1. Syllabus Design

In the Longman Dictionary of Language Teaching and Applied Linguistics, a syllabus can be defined as ‘a description of the contents of a course of instruction and the order in which they are to be taught’ (Richards et al. 1992, p. 368). This definition is in line with the one proposed by Thornbury (1999, 8), Brown (1995, 51), and Stern (1992, 19), who even suggest defining objectives, determining content, and indicating some sort of sequence or progression to be ‘the essential minimum of what is meant by “curriculum”’. Yet they regard the language syllabus only as one of four syllabuses which together constitute a ‘general language education syllabus’ (Stern 1992, p. 266). White (1988, 44ff.) groups such syllabuses 'based on objectives to be achieved and content to be learned' under what he calls ‘type A’ syllabuses, may they be structural, functional or skills based. He contrasts this type of syllabus with a different group labelled ‘type B’ which emphasises methods ('how?') rather than objectives ('what?').

This second type is then subdivided into 'process' and 'procedural' syllabuses. According to White (1988, 96), an important feature of process syllabuses is that they are organised around learners' learning preferences. This is complemented by Richards and Rogers' (1986, p. 21) suggestion that 'considerations of language content are often secondary in process-based methods'.

Procedural syllabuses are linked to task-based approaches to language learning where a 'linguistically graded syllabus is rejected in favour of a task-based one, in which the tasks are selected and graded in terms of cognitive complexity' (White 1988, p 104). Willis (1990) proposes a 'lexical syllabus' as a starting point for task-based teaching, on which basis he develops the concept of a syllabus as a 'pedagogic corpus' (Willis, 1990) which might be seen as a possible solution to the problem of integrating linguistic syllabus content into a task-based approach to foreign language teaching.

2.3.2. Lexical Syllabus Design

The selection of terms in a specialized corpus has received much scholarly attention recently. To illustrate this, Flowerdew (1991) designed a lexical syllabus including 2000 words based on a specialized Biology corpus, which he claims it is very realistic as well as authentic. More recently, Xiang and Chen (2012) designed a lexical syllabus for science and technology students at University of Science and Technology in China; their results suggest that Data Driven Learning (DDL) made invaluable contributions to both teachers and learners to achieve the core lexis of ESP in the professional domain. Another study was conducted by Brook (2013), in which he designed a course designed for specific target language community at a workplace. In the syllabus created for the course, he made use of 2,000 word text related to the professional needs of the ESP learners. He concluded that the needs of learners at the work place should not be underestimated. Another study conducted by Krarzia (2013) was related to undergraduate students studying Economics at the University of Mentouri, Serbia. The results of the study revealed that ESP learners studying economics could benefit from a specifically designed lexical syllabus. Otanjac (2014) designed a syllabus for the students studying special education and rehabilitation at the University of Belgrade, Serbia, which focused on professional vocabulary, the results of which showed that the syllabus designed fulfills the main aims of an ESP course. Tebban (2014) conducted a study on a lexical syllabus for student employees within a

training programme at Samsung Company in Algeria. His results emphasise that the needs of learners should be addressed in the workplace, since the language they will use in the future will, in most cases, be purely related to their profession.

The lexical syllabus has a long history. The lexical syllabus was first proposed by John Sinclair (1988) in *The Lexical Syllabus for Language Learning*. *The Lexical Syllabus: a new approach to the language teaching*, was written by Dave Willis (1990). Moreover, the best documented course book to apply the lexical syllabus is the *Collins COBUILD English Course* by Willis & Willis (1988). In the language learning process, learners are exposed to lexis more rather than grammar, for as Lewis suggests "language consists of grammaticalized lexis, not lexicalized grammar" (Lewis, 2002). Therefore, to learn a language, it is necessary to comprehend and produce lexical phrases as unanalyzed wholes or chunks, which are raw data for learners to begin to perceive grammar. The methodology associated with the lexical syllabus allows learners to experience language items in natural contexts and to learn from their experience. The lexis or chunks selected are the most common ones, according to the frequency in the language corpus. A list of lexis, chunks, collocations or short sentences which are selected according to the frequency in the language corpus are to be learned. Moreover, a list of tasks are ordered according to simplicity should be developed.

Using a lexical syllabus has many merits. They are efficient: as Sinclair suggests a lexical syllabus 'only offers to the learners things worth learning' (Sinclair, 1988). Since authentic materials are gathered from the data through a corpus, a lexical syllabus uses only words from authentic or spontaneously-produced texts.

The notion of a 'lexical syllabus' was originally proposed by Sinclair and Renouf (1988), and further developed by Willis (1990), who points out a contradiction between syllabus and methodology in language teaching:

> The process of syllabus design involves itemising language to identify what is to be learned. Communicative methodology involves exposure to natural language use to enable learners to apply their innate faculties to recreate language systems. There is an obvious contradiction between the two. An approach which itemises language seems to imply that items can be learned discretely, and that the language can be built up from an accretion of these items. Communicative methodology is holistic in that it relies on the ability of learners to abstract from

> the language to which they are exposed, in order to recreate a picture of the target language. (p.8)

The lexical syllabus attempts to reconcile this contradiction. Rather than relying on a clear distinction between grammar and lexis, the lexical syllabus blurs the distinction and builds itself on the notion of phraseology.

In the 80s and 90s, some researchers (e.g., Nattinger and DeCarrico, 1989; 1992; Pawley & Syder, 1983) came to realize that phrases (also called 'lexical phrases', 'lexical bundles', 'lexical chunks', 'formulae', 'formulaic language', 'prefabricated routines', etc.) are frequently used, and therefore are important for the teaching and learning of English. Later researchers such as Cowie (1998) and Wray (2002) are also convinced that a better command of such phrases can improve the fluency, accuracy and complexity of second language production.

Unfortunately, most syllabuses for ELT are based on traditional descriptive systems of English, which consist of grammar and lexis (Hunston, 2002). Such descriptive systems, according to Sinclair (1991), fail to give a satisfactory account of how the language is used. Besides, combining the building blocks (lexis) with grammar does not result in a good account of the phrases in a language. Against this background, Sinclair (1991) proposes a new descriptive system of language, completely denying the distinction between grammar and lexis and putting phraseology at the heart of language description.

The lexical syllabus is not a syllabus consisting of vocabulary items. It consists of phraseology, which "encompasses all aspects of preferred sequencing as well as the occurrence of so-called 'fixed' phrases" (Hunston, 2002, p. 138). Such a syllabus, according to Hunston (2002), differs from a conventional syllabus only in that the central concept of organization is lexis. To put it simply, as a relatively small number of words in English account for a very high proportion of English text, it makes sense to teach learners the most frequent words in the target language. However, as learning words out of context does not seem to be a good idea, a syllabus had better not be designed in such a way that it only specifies the vocabulary items to be learned. Rather than the lexis of the target language, phraseology (the words along with their most frequently used patterns) is what is to be specified in detail in a lexical syllabus.

According to Sinclair & Renouf (1988), 'the main focus of study' should be on

- (a) the commonest word forms in the language;
- (b) the central patterns of usage;
- (c) the combinations they usually form (p.148).

This is exactly what is covered in Willis' (1990) syllabus. Willis argues that the lexical syllabus effectively addresses Sinclair & Renouf's 'main focus of study'. His syllabus consists of three different levels:

a) Level I covers the most frequent 700 words in English, which, according to Willis (1990), make up around 70% of all English text. Level II covers the most frequent 1,500 and Level III covers the most frequent 2,500 words in English.
b) The lexical syllabus illustrates the central patterns of usage of the most frequent words in English. Such patterns of usage were later developed into a system of grammar called "pattern grammar" (Hunston & Francis, 2000).
c) Typical combinations of word forms (collocations) from authentic language are highlighted to provide information about the phraseology of the words concerned (p.148).

It can be seen that the lexical syllabus is not a syllabus which lists all the vocabulary items learners are required to learn. To Willis (1990), "English is a lexical language", meaning that "many of the concepts we traditionally think of as belonging to 'grammar' can be better handled as aspects of vocabulary" (Hunston, 2002, p.190). Conditionals, for example, could be handled by looking at the hypothetical meaning of the word 'would'. The most productive way to interpret grammar, therefore, is by lexical patterning, rather than using rules about the sequence of words that often do not work. However, the lexical syllabus, as proposed in Willis (1990), is not without challenges.

First, frequency is a useful factor to take into consideration when a syllabus is designed. Nevertheless, language learning is not that simple. Native language influence, cultural difference, learnability, usefulness, and many other factors can all bring about some difficulty for language learners. As Cook (1998, p.62) notes, "an item may be frequent but limited in range, or infrequent but useful in a wide range of contexts". Proponents of the Lexical Syllabus seem to have ignored this fact. They believe their syllabus will work for learners of all linguistic and ethnic backgrounds. To many

researchers and practitioners of applied linguistics, such a belief is too simplistic to account for complicated processes such as language learning.

Second, it is not an easy task to select a manageable yet meaningful number of items from the entire vocabulary of a language for inclusion in a lexical syllabus. While it may be true that the 2,500 words in Willis' syllabus can account for 80% of all English text, knowing 80% of the words in a text does not guarantee good comprehension. In fact, most of the 80% are functional words or delexicalized words, which do not have much content. In other words, the role of the commonest words in language comprehension and production may not be as significant as the frequency counts suggest. Also, while it may be relatively easy to include a content word as an entry in a lexical syllabus, function words can be a big problem. Such a word entry may take tens of pages in the lexical syllabus. If the most frequent words are to be accounted for in detail, it is very likely that the syllabus will become a comprehensive guide to the usage of functional words.

Finally, the size of the syllabus may also be a problem. Willis (1990), when creating his "elementary syllabus", had to work with huge amounts of data. He complained that "the data sheets for Level I alone ran to hundreds of pages which we had to distil into fifteen units" (p.130).

2.3.3. Data-Driven Learning (DDL)

The use of corpora in the language teaching classroom owes much to Tim Johns (Leech, 1997), who began to make use of concordancers in his teaching in as early as the 1980s. He then wrote a concordance program himself, and later developed the concept of Data-Driven Learning (DDL) (Johns, 1991).

DDL is an approach to language learning by which the learner gains insights into the language that he or she is learning by using concordance programs to locate authentic examples of language use. The use of authentic linguistic examples is claimed to better help those learning English as a second or foreign language than invented or artificial examples (Johns, 1994). They are believed to be far better than the examples the teachers make up themselves, which unavoidably lack authenticity. In DDL, the learning process is no longer based solely on what the teacher expects the learners to learn, but on the learners' own discovery of rules, principles and patterns of usage in the foreign language.

The theory behind DDL is that students could act as ‘language detectives’ (Johns, 1997, p.101), exploring a wealth of authentic language data and discovering facts about the language they are learning. In other words, learning is motivated by active involvement and driven by authentic language data, and learners become active explorers rather than passive recipients. To a great extent, this is very much like researchers working in the scientific laboratory, and the advantage lies in the direct confrontation with data (Leech, 1997).

It can be seen that in DDL, language learning is a hypothesis-testing process: whenever the learner has a question, she goes to the concordancer for help. If what she discovers coincides with the authentic language data shown in the concordance lines, her hypothesis is tested to be true, and her knowledge of the language is reinforced; conversely, if the concordance data contradict her hypothesis, she modifies it and comes closer to how the language should be used.

Higgins (1991) mentions that classroom concordancing tends to have two characteristic objectives:

> using searches for function words as a way of helping learners discover grammatical rules, and searching for pairs of near synonyms in order to give learners some of the evidence needed for distinguishing their use (p.92).

What this shows is that in data-driven learning, the learner often has a question in mind. She then goes to explore the data for an answer. The whole process, as mentioned before, involves testing a hypothesis with hands-on activities. In so doing, the learner is more likely to be motivated.

It is worth mentioning that many of the features of DDL fit exactly into the constructivist approach to language teaching, in which:

1. Learners are more likely to be motivated and actively involved;
2. The process is learner-centered;
3. Learning is experimentation;
4. Hands-on activities and experiential learning are used as teaching methods;
5. Teachers work as facilitators;

As pointed out by Gavioli (2001), DDL raised several pedagogic questions, which we have to answer when we encourage our students to engage themselves in data-driven learning:

1. if learners are to behave as data analysts, what should be the role of the teacher?
2. the work of language learners is similar to that of language researchers insofar as "effective language learning is itself a form of linguistic research" (Johns 1991, p.2). So, should we ask the learners to perform linguistic research exactly like researchers?
3. provided that learners adopt the appropriate instruments and methodology to actually be able to perform language research, are the results worth the effort? (p.29)

It is likely that a good number of learners around the world are already using the Internet in ways not entirely dissimilar to DDL, a practice which may be actively encouraged by their teachers while remaining invisible in the DDL research literature. This approach is in many ways attractive, offering as it does a familiar, intuitive, and easy way to begin simple DDL which brings immediate benefits (cf. Shei, 2008). To reach a wider audience, there is also something to be said for encouraging the perception of DDL as ordinary practice rather than radical or revolutionary one (Boulton, 2010). For those who wish to go further, it provides a handy first step on the road to more 'hard-core' DDL (Conroy, 2010). Other intermediate steps might include using individual websites such as newspapers for DDL-like queries, or web concordancers (such as WebCorp and KWiCFinder4), which still use the web-as-corpus approach but provide output which is more linguistically relevant and useful for language learning.

Today in the modern world, the availability and accessibility of the internet resources should not be underestimated. While this dissertation does not have space to provide an extensive presentation of how learners and teachers can use the web for language learning, or a detailed theoretical analysis of whether this constitutes DDL, but there are reasons to consider that this is the case. These topics will be the subject of future research.

CHAPTER III

METHODOLOGY

3.1. The Design of the Study

The aim of this chapter is to provide information about the research design, procedures, participants, and the data collection tools utilized within this study. The design of the study can be summarized in a figure.

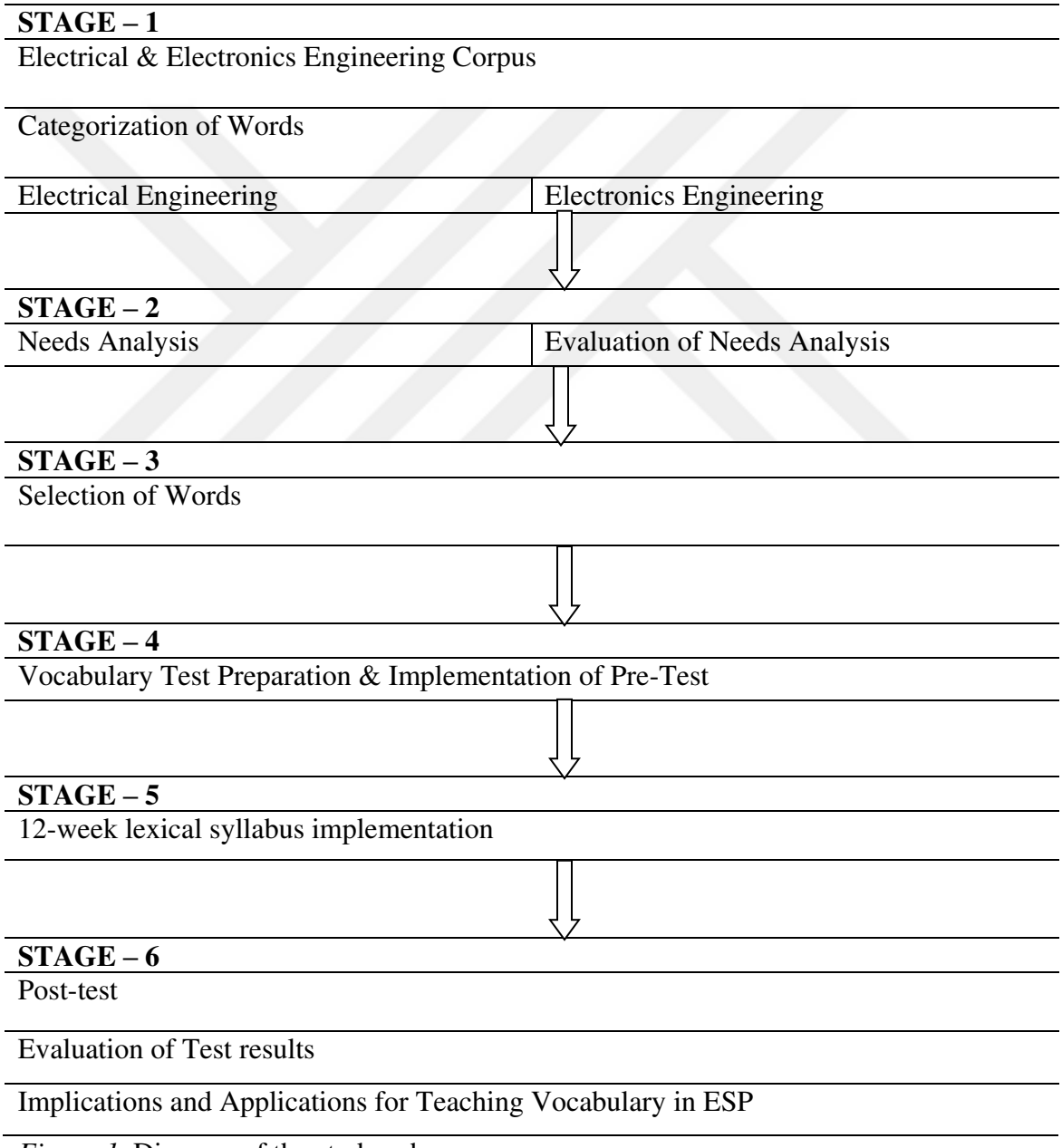

Figure 1. Diagram of the study scheme

As can be seen in Figure 1 above, there are six stages in the study. During stage 1, the researcher ill compile and prepare Electrical and Electronics English corpus. Then the words will be categorized in the field. After the completion of the corpus compilation process, a needs analysis will be conducted. Following the evaluation of the needs analysis, the categorized words will be selected. Then, a vocabulary test will be prepared and conducted. The test is regarded as the pre-test which will be conducted again at the end of a 12-week lexical syllabus implementation. The process will be ended through a post-test and its evaluation.

Although quantitative research seems to be more appreciated in the field than qualitative research, neither is better than the other: they are just different methods, and both have their pros and cons. Furthermore, a combination of these two methods allows a triangulation of methods (Taylor and Bogdan, 1998) for the same subject of interest. In order to gain insight into the research issues as they were defined in the first chapter, both qualitative and quantitative research designs were adopted for this study, and they determined the elicitation techniques for gathering the data.

Thus, both qualitative and quantitative methods for data collection were used. Firstly quantitative data was collected from the participants of the study via questionnaires designed by the researcher. Later on, in order to gain a deeper insight into the situation which the quantitative data put forward, qualitative data was collected with the help of interviews and document analysis. In order to analyse the data obtained, both quantitative and qualitative methods were used.

3.2. Context of the Study

The current study was conducted at Niğde University, Engineering Faculty Department of Electrical and Electronics Engineering, where subjects are taught in English, where the students must take an ESP course during the first two terms of their education.

3.3. Selection of Participants

The participants of the current study were randomly selected from the engineering faculty department of Electrical and Electronics Engineering at Niğde University. There were two groups of students at the department: group one

consisted of 75 students who studied during the day and the other group consisted of 72 students who took lessons during the evening. In order to avoid the manipulations of the students' current level on the results of the experiment, the researcher decided to apply a diagnostic test. The test was taken from the course books 'Touch Stone' published by the Cambridge University Press (see Appendix J). The test itself contained 100 questions aimed to determine the level of the students from the beginning (A1) through the intermediate (B2) levels of proficiency. All the students studied four series of the course book during the prep year at the School of Foreign Languages during the 2014-2015 academic year. At the end of the academic year, they all passed the proficiency exam, which is compulsory. After that, they started studying in the Department of Electrical & Electronics Engineering. The students' level was determined by the test results. The students between the pre-intermediate and intermediate levels were selected to participate in the experimental process. As a result of the test, 31 students from group A and 28 students from Group B were excluded from the study. Therefore, it was determined that 44 students who took lessons during the day would be considered as the experimental group, and 50 students who take the lessons during the evening would be considered as the control group. All the participants were willing to participate in the study. All the students take a compulsory 3-hour ESP course every week.

3.4. Research Instruments

In the current study, the researcher aimed to utilize different kinds of research instruments so that the purposes of the study would be achieved accordingly.

3.4.1. Needs Analysis

The main aim of the empirical part of the thesis was to determine the needs of EEE students who are taking an ESP course as part of their curriculum in the first year of their university education. In other words, the research represented the first stage of an ESP syllabus design process, the outcomes of which could subsequently be used when making any important decisions about the course contents and its

execution, such as the selection of items to be included in the syllabus or the choice of materials to be employed.

Prior to the creation of the new questionnaire survey, the researcher conducted informal interviews with the head of the EEE Department and three lecturers at Niğde University, so that their opinions as to their students' English needs could consulted in creating the questionnaire for the students. Moreover, the researcher asked the opinions of two instructors teaching ESP courses at the department where the study was conducted. As these were informal interviews, they were not recorded. Then, through information obtained from the lecturers and instructors as well as the questions, a new questionnaire was developed by making some necessary changes to the old questions.

The questionnaire was developed to investigate the needs of the participants. The developed questionnaire consisted of two main sections and nine parts. The two sections were:

1. Demographic Information (Open-ended questions)
2. General Opinions on ESP and ESP courses

1. Expectations of an ESP course (a Likert-scale question)
2. Advantages of an ESP course (an open-ended question)
3. Time spent extensive on English (a multiple choice question)
4. Opinions on a useful and enjoyable English course (an open-ended question)
5. Students' language level before beginning the ESP course (a Likert-scale question)
6. Students' language improvements after taking the ESP course (a Likert-scale question)
7. Students' expectations of using English in different context (Likert-scale questions)
8. Students' expectation of both English teacher and an ESP course (an open-ended question)
9. The areas of language difficulties (an open-ended question)

The first stage in the study was to carry out a needs analysis. The needs analysis was preceded by a means analysis—an examination of the conditions under which the course is to take place with special attention to the available resources and the course participants' level of English. The needs analysis procedure was based on Hutchinson and Waters needs analysis framework (see Appendix A) and consisted of two parts: an objective needs analysis and a subjective needs analysis. The aim of the former was to establish the requirements of the language use in the target situation, while the latter was concerned with the examination of the characteristics of the learners. Both the objective and subjective analyses started with identifying the reason why the students register for the course. In our situation, students do not have much choice: they take ESP as it is a compulsory subject in their curriculum. Thus, it might seem that there is no apparent need for the course at the time it occurs; yet it is widely acknowledged that in order to meet the demands of the current fiercely competitive workforce market, technology professionals should possess versatile skills, especially language skills. Consequently, the first task for the empirical part of the thesis was to look at the objective reasons for conducting an ESP course at Niğde University Engineering Faculty, Department of Electrical & Electronics Engineering.

On the first day of class, students completed a questionnaire about their background information as well as their perceived areas of difficulty in their content lessons. Such information is significant to determine the learning needs of each student in the class: their strengths as well as their weaknesses. The majority of the students participating in the questionnaire mentioned that their most challenging matter in their content lessons is lack of relevant vocabulary related to their content area. It is evident from their responses that they all see the significance of the vocabulary in four skills: reading, listening, writing and speaking. Furthermore, most of them have difficulty understanding the texts presented to them during the lessons even if they have a chance to read the lectures through the written forms of the lesson. During the course, the students expected to improve their technical vocabulary knowledge in Electrical and Electronics Engineering and overcome their feelings of discomfort understanding the texts and lectures. They also wanted to learn to write efficiently. One student wrote that he was taking English "in order to understand technical vocabulary and abbreviations." Another wrote: "for years we were presented grammar and I find it unnecessary, I believe that technical

vocabulary related to my content area will more efficient." Another wrote: "I am interested in the topics included in the course; they are all related to the Electrical and Electronics Engineering programme." Another wrote: "I hope to be able to understand the texts and write more confidently in the exams at the end of the course."

3.4.2. Interviews

Before starting the data compilation process, the researcher decided to ask for the opinions of the lecturers at the department in order to strengthen the data obtained. The lecturers were asked to express their opinions as to which disciplinary materials should be taken into consideration. 11 sub-disciplinary fields were selected, since we required more specific data to analyze. The fields were: Advanced Engineering Mathematics, Electric Circuits, Control Systems, Power Systems, Electrodynamics, Field & Electromagnetics Communication Systems, Sensors & Control Systems, Electric Power Systems, Automation and Differential. The aim of the selection was to determine the corpus data within the Electrical and Electronics Engineering domain, as the above listed courses are obligatory for all the departments of the Engineering faculty. The lecturers recommended the researcher to use various disciplinary books they use during the educational process.

The interview questions were:

- What are the major problems in terms of language use they have encountered during lectures?
- What do you think possible solutions to those problems are?
- When it comes to the interviews with students, out of 44 students, 15 students participated in the interviews voluntarily. The participants were selected randomly. The students were exposed to the same questions asked to the teachers of their subject lessons. The results of the interviews will further be given in Chapter IV.

3.4.3. Corpus Compilation

After the results of needs analysis were obtained and the basic outline of a corpus was determined, it was time to begin the actual creation of the corpus. This

was a three-part process which involved the collection, computerization, and annotation of data.

3.4.3.1 Creating the Electrical and Electronics Engineering Corpus (EEEC)

This step involved building the EEEC. As Sinclair states (2004), there are some certain features which a corpus reveals, and the ones most significant to the current study are size, balance and representativeness.

The size of the corpus represents the amount of linguistic data which is ready for analysis. The studies relevant to the current study were considered in the review of literature. In order to create the MAWL, Wang et al (2008) used a corpus with 1,093,011 tokens. Konstantakis (2007) built a 600,000-token corpus for the technical business vocabulary study. Coxhead and Hirsh (2007) used a 1.76 million-token corpus in the pilot study they conducted to build a scientific word list. However, in compiling the AWL, Coxhead conducted far more extensive study, which consisted of 3.5 million words in order to extract a broadly-independent list of academic words. It is likely that a far more extensive corpus was required for creating the frequency of general academic lexis; moreover, it seems true that a more extensive corpus provides for a more proper sampling of language. According to Zip's law (1935), it is stated that "the frequency of any word is inversely proportional to its rank in the frequency table". Accordingly, different corpora size requires different frequencies of the occurrence of words as long as the frequency is a criterion for the selection of the words in a technical word list (see Section 4). Since less frequent words do not appear in a less extensive corpus, this is not necessarily a parallel relationship. As the aim of the current study was to create an EEEC, it was believed that a corpus of approximately the same size as that used by Coxhead (2000) would be large enough, and should be developed using properly-determined criteria.

There are several limiting factors that prevent the size of the corpus from becoming much more extensive. In the current study, there were two factors which restricted the size of the EEEC. First, creating a corpus requires considerable time: therefore, the size of the corpus for the current study was limited by the time of labor available to create it. Second, the size of the corpus was restricted to the availability of texts in order to ensure balance and representativeness. Thus, it was

determined to include about 5.5 million words in the current study, which seems sufficient.

Representativeness is one of the main factors that supports the textual relevance for the aim of a corpus based study. The EEEC was designed to provide a word list for students of Electrical and Electronics Engineering at higher education level. Therefore, it was crucial to select relevant texts to include from which students in the discipline and at such a level could benefit.

In order to determine what texts an EEE student might access the researcher in the current study conducted interviews with university lecturers, similar to those conducted by Coxhead and Hirsh (2007). It was mainly recommended that the textbooks relevant to the field were the main sources to prepare lecture notes; besides, they contain millions of related words. The EEEC was supposed to be created through the disciplinary books offered by the lecturers.

The next issue was to determine the sub-disciplinary areas related to EEE. The lecturers at the department offered the 11 sub-disciplines listed above, which mainly cover the subject field. 30 books were selected relevant to the 11 sub-disciplines offered by the lecturers. For each sub-discipline, three text books written by three different authors were selected. See Table 2.

Table 2

Electrical & Electronics Engineering Sub-disciplines

Advanced Engineering Mathematics	**Electric Circuits**
Control Systems	**Power Systems**
Electrodynamics	**Field & Electromagnetics**
Communication Systems	**Sensors & Control Systems**
Electric Power Systems	**Automation**
Differential	

As can be seen in Table 2 above, having considered the corpus qualities of size and representativeness, it was crucial to take balance into account. This feature uses an equal distribution of texts with equal sizes to ensure that a corpus has no bias. After considering the limiting factors of corpus size, such as frequency variation and availability of enough texts per discipline, a final size for the EEEC was determined: it would contain approximately 5.5 million tokens.

The most significant factor for the selection of texts for the EEEC was that texts would be available in digital form. Therefore, all the textbooks were purchased in digital form. In creating a corpus of such a size for the current study, it would have been impossible to work manually to transcribe the printed texts to a digital version. The texts were thus taken from digital form and were converted into machine-readable form. The list of the books and authors are given in Appendix H.

Having finished the collection and conversion of the books into machine readable forms, the corpus was complete. It contained a total of 5,346,384 tokens, evenly compiled from 11 sub-disciplines of EEE. Accordingly, a representative, balanced corpus of sufficient size for identification of technical lexis in the field of Electrical & Electronics Engineering was obtained.

3.4.3.2. Software

The researcher selected different software programs for different purposes to utilize during the analysis of the corpus data, one of which was AntWordProfiler (Anthony, 2013), which can be downloaded from Laurence Anthony's homepage (www.laurenceanthony.net). The tool is capable of comparing the corpora with various word lists. It is already loaded with the GSL1, GSL2, and AWL lists. Yet, researchers can replace or add to these lists with those from different kinds of sources.

For the current study, the researcher decided to use different set of word lists. There is a Range program available for free download at Paul Nation's homepage (http://www.victoria.ac.nz/lals/about/staff/paul-nation) which includes a number of different word lists. Accordingly, corpus analysis for the current study was conducted through the AntWordProfiler tool (Anthony, 2008) along with the Nation GSL and AWL (Nation & Heatley, 2002).

AntConc (Anthony, 2014) is another program to use for the analysis of corpus data since the Collocates tool was the most useful tool used to conduct the research. Such a function can establish the range and frequency that tokens collocate to several positions left and right of the search term, which can allow the user to detect multi-word units within the corpus (see chapter 3).

3.4.3.3.1 Extracting Unwanted Data From EEEC

First of all, it was crucial to add any unwanted data to separate word lists before extracting the technical language from the completed EEEC including abbreviations, acronyms and proper nouns. Then, the EEEC was run against the complete BNC/COCA 25k frequency bands (Nation & Heatley, 2002) so that the unwanted data could be identified, since the tokens that fell outside this large frequency range might possibly have been accidentally included in the unwanted data. Two word lists, called 'Basewrd31' and 'Basewrd34' were the lists compiled to collect the relevant information.

Nation's BNC/COCA 25k frequency bands (Nation & Heatly, 2002) includes Basewrd34 that contains an extensive list of common abbreviations and acronyms like CNN, which are usually excluded from token corpora (Coxhead, 2000). According to Konstantakis (2010), such abbreviations and acronyms can be excluded as they are self-explanatory and cause no burden for learning on the reader. Besides, in his study Minshall (2013) offers the same proposal as a way of preventing such words from manipulating a technical corpus. In academic writing, it is common to write such a word in its fully expanded version the first time it is printed. That's why more acronyms or abbreviations were added which existed in the EEEC but were not available in Basewrd34, such as 'AC' or 'DC'. Moreover, tokens that were not recognizable as English or proper nouns such as 'CD-ROM' were also included in the list. Those words mostly stemmed from mathematics or algorithms available in the corpus. The number of types and the coverage provided by Basewrd34 of the EEEC before and after it was cleared are given in Table 3

Table 3

Basewrd31 and Basewrd34

Word List	**Before clearance of the EEEC**		**After clearance of the EEEC**	
	Types	**Coverage**	**Types**	**Coverage**
Basewrd31	19165	1,04%	19204	1,12%
Basewrd34	454	0,54%	829	1,90%
Total	19619	1,58%	20033	3,02%

As can be seen in Table 3 above, the BNC/COCA 25k frequency bands (Nation & Heatley, 2002) contain a word list which is called Basewrd31, which contains a large compilation of proper nouns such as place names, company names and people's names. It was included in the current word list. After clearing the proper nouns existing in Basewrd31 (such as Michael, Sony and Facebook) from the EEEC, the cumulative results of the expansion could be calculated accordingly (see Table 6).

All in all, 3.02% of the corpus contained such kind of data. Just as Coxhead (2000) did in his study, the researcher excluded the data from coverage counts in order to prevent the manipulation in terms of comprehension problems existing in the corpus for additional evaluation.

3.4.3.4. Criteria For the Selection of Technical Words in the EEEC

Following the exclusion of unwanted data from the EEEC, it became possible to begin the compilation of the EEEC, which was the core of the first research question. The three criteria used by Coxhead (2000), specialized occurrence, range and frequency, were applied for the selection and addition of technical words to the EEEC. These criteria were also applied and modified by other researchers in their studies (Coxhead & Hirsch, 2007: Konstantakis, 2007; Wang et al, 2008; Minshall, 2013).

Specialized occurrence denotes a property of words not available within the GSL as identified by Coxhead (2000). Additional research by those who added the AWL helped expand the definition in order to include words which were not available in the AWL (Konstantakis, 2010; Minshall, 2013). Therefore, specialized occurrence was believed to be a crucial criterion for the current study, since the current study followed almost the same methodology. AntWordProfiler (Anthony, 2008) assured that this criterion was trivial, since the programme is capable of eliminating filter words automatically from the AWL if an appropriate word list is loaded.

Another criterion established by Coxhead to select technical lexis was range (Coxhead, 2000), which means for a word to be included in a technical word list, it has to be present in at least half of the corpora (Wang et al, 2008). This was a straightforward modification of Coxhead's (2000) original range, yet it was used by

several studies (Aichah, 2012; Coxhead & Hirsch, 2007; Minshall, 2013). Upon reaching this point, the corpora for each text type that is ready for use were combined: there are 11 sub-corpora within the EEEC.

The third and the final criterion was the frequency, which refers to the number of individual occurrences of a word in the corpus. Coxhead (2000) set the minimum frequency for the AWL at 100. Nevertheless, since it was that lowering the set to 80 gave a significantly better result. As the EEEC was of a similar size to one employed by Coxhead during the creation of the AWL (Coxhead, 2000) and Minshall's corpus (called the CSC: Computer Science Corpus) (Minshall, 2013), the researcher decided to adopt the same frequency of 80. Some other studies have lowered the scale down to the minimum frequency level so that they can suit the size of the corpora they used for their studies. In the MAWL (Wang et al, 2008), for a 1.09 million-word corpus, the minimum frequency set was at 30; in addition Coxhead and Hirsch (2007) used a minimum frequency of 50 for their 1.76 million-word corpus. At rather smaller corpus sizes, words can leave the frequency tables altogether in a non-linear correlation. That's why, the researcher in the current study decided to choose approximately the same corpus size as Coxhead (2000) and Minshall (2013) in order to use the same frequency criteria.

3.4.3.5. Completing the EEEWL

The researcher employed AntWordProfiler (Anthony, 2008) once more by means of the expanded form of word lists for GSL1, GSL and the AWL. At this stage of the process, it became possible to identify the words outside of the the word lists, which were ordered by range and frequency. The researcher added the words with a range of 5 or more and a frequency of 80 or more to the EEEWL.

First of all, in line with the words in the GSL and AWL above, the word lists used by the software are expanded in a similar fashion so that it became sensible to retain the agreement. It was likely that the deviation from such a standard influenced the statistical data. Since most researchers have used level 6 expansion as a basis in their studies, the same procedure was followed (Coxhead, 2000; Konstantakis, 2007; Minshall, 2013). As a final assumption, it is considered that level 6 expansion is within the morphological capability of students who have achieved a certain level of English proficiency to be able to study electrical &

electronics engineering in English at a university in Turkey. By means of the BNC/COCA 25k frequency bands created by Nation (Nation & Heatley, 2002), the researcher simplified the individual entries.

At this stage of the process of creating the word list, another way of filtering was required. While editing the TXT files for the EEEC, all non-alphabetical characters was replaced with a white space, which included hyphens since pre-hyphenated words in the texts were considered as separate tokens in the corpus. The words meeting the selection criteria to be included in the EEEC could be checked through the Collocates tool of the AntConc, which was one of the reasons why the researcher decided to use the software. If a word occurred as part of a multi-word unit, it was considered to qualify for the Electrical & Electronics Engineering Multi-Word list (EEEMWL) as long as range and frequency demands were satisfied. By means of the process applied, a number of types acting simply as affixes were excluded from EEEWL. They were all given in Table 4.

Table 4

Affixes Excluded From EEEWL

non	**micro**
multi	**mega**
re	**poly**
co	**kilo**
meta	**giga**

As can be seen in Table 4 above, it was considered that the EEEWL was ready for testing after the process was completed successfully. The list consisted of 654 types (see Appendix C)**.**

3.4.4. Pre-test

Using the data obtained from the corpus including 11 different sub-disciplines, a test was prepared to determine the level of the knowledge of the vocabulary items the participants frequently meet in their field. Therefore, during the process of preparing the test, all the disciplinary topics participants study and the

frequency of the words were taken into consideration. The vocabulary items used in the test were taken from the EEEC.

The test includes different question types: multiple choices, cloze tests, gap filling, matching, rearranging words/collocations and word formation. Eighty items consisting of different types of questions are included in the test. For details of the test applied, see Appendix C.

3.5.5. Syllabus Design

In this section of the study, the details of the syllabus design process will be discussed.

3.5.5.1. The Content of the Syllabus

As a result of the data compiled in corpus, a lexical syllabus was designed to be used on the experimental group over twelve weeks since there are fourteen weeks to implement the treatment process in an academic term. The pre-test was applied in the first week and the post-test was applied in the last week of the term.

The syllabus was divided into three sections, each of which includes different courses, since the syllabus should include all the data obtained from different subjects. Section A of the data was compiled from the materials related to the course Fundamentals of Information Technologies, Section B from materials related to Introduction to Electrical Engineering, and finally section C from the materials related to Introduction to Computer Programming course materials. Besides this, each section was divided into four parts so as to apply the whole syllabus within the period time the term allowed to the researcher.

After compiling the representative corpus, another analysis were to be performed so as to exclude grammar words (i.e., words such as “and”, “but,” “if,” and so on) from the analysis and leave only content words or lexical items pertinent to the target discourse community.

To design the materials, the commercially available concordancing software AntConc (2013) was used in order to find the most frequent lexical items in the Electrical & Electronics Engineering corpus. The 20 most frequently occurring items and their frequencies were:

1-	SYSTEM	38.855
2-	CONTROL	17.739
3-	FIGURE	17.139
4-	EQUATION	14.199
5-	FUNCTION	13.497
6-	TIME	12.968
7-	POWER	12.906
8-	STATE	10.622
9-	SOLUTION	10.255
10-	VALUE	9.118
11-	PHASE	8.888
12-	FREQUENCY	8.759
13-	SIGNAL	8.746
14-	POINT	8.723
15-	VOLTAGE	8.595
16-	OUTPUT	8.429
17-	CURRENT	8.359
18-	CIRCUIT	8.416
19-	RESPONSE	7.841
20-	INPUT	7.815

The teaching materials which were designed on the basis of this analysis aimed to cover the most frequently occurring lexical chunks that would facilitate the reading of the texts and the comprehension of key concepts and ideas from the texts during the 12-week intensive course in Electrical & Electronics Engineering English. The materials were essentially of two types: consciousness-raising activities and practice exercises. Consciousness-raising activities provide and inductive way of increasing learners' awareness of prefabricated lexical chunks (Carter, 2003; Johns, 1991). For example, students were asked to focus on lexical items in sections of the text or, working from the list of the most frequent lexical items in the corpus, to study the co-text in order to find the collocates for these key words. The practice activities were mainly variants of classic 'fill-in-the-blank' exercises, as well as matching exercises and cloze texts. Even though 'fill-in-the-blank' exercises are currently out of fashion, they are an ideal way of activating learning because the most frequent words are often used in relatively fixed

collocations, and by the simple act of deleting key words, the learners' attention can be drawn to the surrounding co-text. In short, by focusing on and deleting the most frequent words from short extracts of text drawn from the corpus, the instructor can use them as "bait" for retrieving the co-text that makes up the lexical chunks relevant to the target discourse community. Similarly, matching exercises that encourage the learners to match the constituent parts of key collocations are also a relatively simple way of promoting a focus on lexical chunks. In addition, matching synonyms and antonyms of certain lexis enables learners to be aware of the similar as well as opposite meanings of the words in their content area.

The computational analysis of the texts thus gave the instructors knowledge of the key lexis used by the Electrical & Electronics Engineers and co-text surrounding these key lexical items. Consequently, they were able to bridge the initial gap caused by their lack of knowledge of Electrical & Electronics Engineering lexis, and more specifically the technical lexis required by the engineering students as well as the engineers of the same discourse community. For details of the content of the syllabus, see Appendix D.

3.5.6. Implementation of the Syllabus

After applying the pre-test in the first week of the course, the syllabus of the course was distributed to the participants of the treatment group so as for them to be aware of the whole program to be applied until the end of the term. The lessons were divided into two parts and lasted for two hours in total; Part I included the presentation of the words and Part II included the exercises and activities the participants would do as well as the feedbacks along with reflections.

Each unit of the course was specified in terms of the content of the title; namely, every unit included parts on related subjects since a lexical syllabus is supposed to be based on vocabulary drawn from related authentic materials. Willis (1990) states that the process of syllabus design involves itemizing language to identify what is to be learned. On the strength of Willis' statement, the vocabulary items were determined and included in each part of the unit.

The purpose of the course *Technical Vocabulary* was to help ESP students improve their technical vocabulary knowledge related to their disciplinary area. The specific objectives of the course were as follows:

By the end of the course, students will be able to:

1. understand the definition of the lexical items identified by the corpus compilation;
2. be aware of the term ‘affixation’ in English;
3. generate all forms of the targeted vocabulary items;
4. be aware of appropriate use of the vocabulary items in the given context;
5. identify the meaning of relevant vocabulary items;
6. differentiate the vocabulary items having almost similar senses;
7. identify the synonyms of the relevant vocabulary items;
8. identify the antonyms of the relevant vocabulary items;
9. use the identified vocabulary items in a context in an appropriate fashion
10. differentiate technical vocabulary items in a technical context.

The syllabus included all sub-disciplines at the department:

i. Advanced Engineering Mathematics
ii. Electric Circuits
iii. Control Systems
iv. Power Systems
v. Electrodynamics
vi. Field & Electromagnetics
vii. Communication Systems
viii. Sensors & Control Systems
ix. Electric Power Systems
x. Automation
xi. Differential

Unit I consists of four parts, each of which contains the authentic texts selected from the materials based on the courses students take during the term. The vocabulary selected for each part is parallel with the vocabulary determined by the representative corpus; therefore, the learners highly benefit from the original texts they frequently encounter during their content lessons. In addition, the frequency of appearance of the vocabulary items in the representative corpus was taken into account in the selection process by comparing the selected vocabulary items with those which are in the corpus.

Unit II, like Unit I, has four parts. All the texts were selected from the materials based on the content of the course 'Introduction to Electrical Engineering', thus enabling the learners to encounter the vocabulary several times not only in the technical vocabulary course, but during their lessons, as well. They are the most frequently occurring lexical items.

The last unit is Unit III. The entire texts were again selected from the materials based on the content of the courses EEE students take, thus providing the learners with vocabulary used both in the technical vocabulary course and in their general lessons. These are the vocabulary items which are the most frequently occurring lexical items in the corpus.

Much fruitful feedback about the strength of these practices conducted during the course was given from all the students participating in the process. Moreover, from the beginning to the end of the course, all the students were eager to participate and complete the tasks presented during the lessons for an example of how each lesson was implemented, see Appendix E).

However, a lexical syllabus has more functions than just selecting and presenting the vocabulary used in the content of the lessons, and thus 'teaching' them. According to Becker (1975, p.1), "people speak mostly by stitching the together swatches of texts they have learnt previously." He also suggests that "productive processes have the secondary role of adapting the old ones to the new situations." That's why students were encouraged to use the vocabulary items presented during the lesson as often as possible so that they would add the new ones to those learnt previously. Besides, the students started to believe that the more often they were exposed to new vocabulary, the less time they needed to spend to retain the vocabulary already learnt.

The researcher put the lexical approach in the centre of the methodology in teaching technical words, since it can be an effective pedagogic tool. This is true for three main reasons. First, it is argued that an overemphasis on teaching single (decontextualized) words may hinder the development of an L2 lexicon and could deny the learner the possibility of rapid and fluent use of the L2. Besides, it can be more effective for the learner to try to learn the whole and break it into its parts. According to the results of the study conducted by Wood (2004), by helping learners to recognize the lexical chunks that make up language and, more specifically, the lexical chunks statistically more likely to appear within the genre, the learner will be able to perform tasks in L2 more fluently. Second, not only does a lexical approach improve the fluency

of language output, but it also improves the learner's receptive skills. Partington (1998), for example, suggests that lexical approach can help students to recognize lexical chunks in use and thus enable the learner to decode rapid colloquial speech more quickly and effectively. Third, a lexical approach to language instruction can improve accuracy as well as fluency, since errors in collocation are particularly frequent amongst language learners. An approach that specifically targets collocations rather than 'words' in isolation can therefore help address this problematic area of language learning (McAlpine& Myles, 2003, p.75).

At the end of the course, the researcher achieved the objectives and goals determined prior to the course by directing the learners to specific lexis in use by their discourse community. This conclusion was supported by the post-test results. Moreover, the learners found that the syllabus included 'words' that were useful to them. They also found that the course provided opportunities for them to develop their skills of recognizing concordances, which will continue to be useful to them after the end of the course.

3.5.7. Post-test

At the end of the twelve-week treatment, the same test was applied on both the treatment and the control group. It was found that members of the treatment group had improved their vocabulary significantly more than members of the control group. This will be discussed in detail in Chapter IV. For details of the test, see Appendix D**.**

3.5.8. Conclusion

In this section, the methodology used in the creation of the EEEC, the EEEWL, the lexical syllabus and the pre/post-tests was described. All the stages were supported by the previous research into technical word lists (Aichah, 2012; Coxhead, 2000; Coxhead & Hirsch, 2007; Konstantakis, 2007, 2010; Minshall, 2013: Wang et al, 2008). It is considered that EEEC is an appropriately-sized corpus which is both balanced and representative of the literature that Electrical & Electronics Engineering students studying at Engineering faculties are supposed to encounter during their studies.

The lexical syllabus containing EEEWL was created so that we could test the research questions posed. The results are given in the next chapter.

CHAPTER IV

FINDINGS

4.1. Findings from the Needs Analysis

The purpose of this chapter is to present the results of the study, which aims to investigate: to what extent a corpus-based approach will help ESP teachers in developing ESP materials; what the advantages are of using Corpus Linguistics approach to produce ESP materials for Electrical and Electronics Engineering students studying English; and finally what the positive effects are of designing a corpus-based lexical syllabus based on learning technical vocabulary.

4.1.1. Needs Analysis Questionnaire

In order to learn more about participants' ideas and opinions as to what they consider important in a technical English course, there are four items in the questionnaire. These are included to provide the researcher with more concrete and objective data, thus allowing for a deeper understanding of the participants' reasons. As a result, the researcher will be able to prepare a more efficient syllabus along with a classroom environment specially designed for the students (see Appendix A).

As already discussed in the literature review, the researcher constructed a questionnaire with different types of questions. One type of question asked the participants to measure something on a scale; in particular, a 1-to-5 rating referred to as a Likert response scale was used. Another type of question was asked to measure how much time participants spend studying English outside the classroom; this is known as a nominal question, where the answer can be whatever the person wants. Finally, open-ended questions were also asked in order to reach a deeper understanding of the group members' opinions and ideas. The questions inquire about the students' expectations of the Technical English course, the amount of time they spend studying English outside classes, their current level of English at the time of the questionnaire, their priorities for improvement by the end of the technical English course, and finally their opinions as to how much they expect to use the English learned in the specified contexts.

Table 5
Students' Expectations of a Technical English Course

	1		2		3		4		5	
Student Objective	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**
a. to learn more vocabulary	4	9.09	4	9.09	8	18.18	10	22.72	18	40.90
b. to understand written texts in course books more efficiently	5	11.36	7	15.90	6	13.63	11	25	15	34.09
c. to understand spoken English more efficiently	25	56.81	5	11.36	7	15.90	3	6.81	4	9.90
d. to speak more fluently	13	29.54	11	25	10	22.72	4	1.76	6	13.63
e. to write more efficiently	2	4.54	7	15.90	3	6.81	16	36.36	16	36.36

As can be seen in Table 5 above, there were five items in the expectations category of the questionnaire. Students were expected to rank their expectations of a technical course in English from 1 to 5, from the least desired to the most. There were clear differences amongst students' expectations of a technical English course. 18 students (40.90% of the total) ranked 'to learn more vocabulary' as the most desired. 10 students (22.72%) ranked it as the second most desired. 8 students (18.18%) gave it a rank of 3 with the percentage of 18.18.

According to the results of item 2 in the questionnaire, which tries to find out students' opinions about advantages of a vocabulary-based Technical English course; out of 44 participants of the needs analysis, only 5 of them said no, which means they do not see the importance of a technical English course. Two of them commented that they were against such a course because a technical English course is simply based on memorization, because the students found their own way of learning, and because students felt that they had enough vocabulary items to support their technical English.

Yes responses of the participants to the questions were given in Table 6 below:

Table 6

The Advantages of a Vocabulary Based Technical English Course

Improve technical English vocabulary	15
Learn more vocabulary	13
Not enough vocabulary	12
Understand technical English better	12
Necessary to read in English	11
Importance of technical English	10
Necessary to speak English	5
Do not need much grammar	3
Discuss technical matters better in English	2
The materials they deal with is based on technical English	2
Keep in touch with the technical vocabulary	1

As can be seen in Table 6 above, most of the participants chose more than one item as a response; 15 of them stated that they needed to improve their technical English vocabulary; 13 of them said that they would learn more vocabulary; 12 of them claimed that they did not have enough vocabulary; 12 of them had the opinion that they could understand technical English better; 11 of them find it necessary to read in English; 10 of them see the importance of technical English; 5 of them find it necessary to speak English; 3 of them put forward the idea that they do not need much grammar; 2 of them allege that they could discuss the matters better in English; 2 of them support the idea that their materials are based on technical English and only one of them believed that it would help learners to keep in touch with the technical vocabulary.

The next item tried to investigate the time spent by the students outside classes. The results were given in Table 7 below.

Table 7

The Time Spent By the Students Outside Classes

	F	***%***
a. 1 hour per week	17	38.63
b. 2 hours per week	20	45.45
c. at least 1 hour a day	4	9.09
d. more than 1 hour a day	3	6.81

As it is clearly seen above in Table 7, there are four items. It is obvious that the amount of time spent by the students outside classes varies. 17 students (38.62 per cent) indicated that they study one hour per week. 20 students (45.45 percent) said that they studied two hours. 4 students said they studied at least 1 hour a day and only 3 students said they studied more than 1 hour a day.

The next item tried to investigate the answer to question 'a useful and enjoyable English course they attended and what made that course so good for them'. The results were given in Table 8 below.

Table 8

Think Back To a Useful and Enjoyable English Course You Attended. What Made That Course So Good For You?

It was enjoyable	15
I enjoy learning English	9
Speaking activities	6
Vocabulary activities	5
Learn more about different cultures	3
More involvement in the lesson	2
Conversation clubs	2
Affinity/Listening	1/1

As seen in Table 8 above, the responses to this question also vary: 15 of the participants think that the lessons were enjoyable; 9 of them support the opinion that they enjoy learning English; 6 of them believe that speaking activities were encouraging; 5 of them believed that vocabulary activities made the lesson so good; 3 of

them had the idea that learning more about different culture made the lesson so good for them; 2 of them believed that they were very involved in the lesson, 2 of them claimed that conversation clubs were helpful, 1 of them feels special affinity and 1 of them thought listening was the reason the lesson was so good for the learners.

The next item tried to investigate students' language level before they took the technical course. The results were given in Table 9 below.

Table 9

Students' Language Level Before The Technical Course Now

	None	Not great	OK	Good	Excellent
	f (%)	*f (%)*	*f (%)*	*f (%)*	*f (%)*
a. your range of vocabulary	1 (2.27)	10 (22.72)	20 (45.45)	13 (29.54)	0 (0.00)
b. your comprehension when reading technical texts	7 (15.90)	16 (36.36)	16 (36.36)	4 (9.09)	1 (2.27)
c. your understanding of other speakers	3 (6.81)	20 (45.45)	15 (34.09)	5 (11.36)	1 (2.27)
d. your competency in English	3 (6.81)	20 (45.45)	15 (34.09)	6 (13.63)	0 (0.00)
e. your accuracy when reading	2 (4.54)	11 (25)	17 (38.63)	12 (27.27)	2 (4.54)

As seen in Table 9 above, there are 5 items in this section. To item #a, which asked about the student's range of vocabulary, out of 44 students, 1 student (2.27%) responded as *"none"*. 10 students (22.72%) gave an answer as *"not great"*. 20 students gave a response as *"ok"* which was equivalent to 45.45%., and the last fraction of the students (13 participants, 29.54%) gave an answer as *"good"*. No results occurred under the response *"excellent"*.

Item #b was related to students' comprehension when reading technical texts. 7 students (15.90%) said *"none"*. On the other hand, 16 students (36.36%) claimed their comprehension was *"not great"*. The same in frequency and percentage, again 16 students (36.36 %) gave their answer as *"ok"*. 4 (9.09%) students reacted as *"good",* and the remaining 1 student which represents 2.27% of the sample size responded as *"excellent"*.

Another item, representing students' understanding of other speakers, was item #c. To this item, 3 students (6.81%) responded as *"none"*. 20 (45.45%) students gave a response as *"not great"*. The following response was *"ok"* returned by 15 students

(34.09%), and the following fraction of students occurring under the response *"good"* had a frequency of 5 and a percentage of 11.36. As the remaining 1 student with the percentage of 2.27 said *"excellent"*.

Next comes item #d, which was related to students' competency in English. 3 of the students (6.81%) said *"none"*. On the other hand, 20 students (45.45%) responded as *"not great"*. Similarly, 15 students (34.09%) responded as *"ok"*. 6 students (13.63%) gave a response of *"good"*. There were no responses under "excellent".

As for the last item which was about students' accuracy when reading was item #e. 2 students (4.54%) said *"none"*. 11 students (25%) said *"not great"*. On the other hand, 17 students (38.63%) responded as *"ok"*. The next response was *"good"*, returned by 12 students (27.27%) and the last answer was *"excellent"* with 2 students (4.54%).

The following item tried to investigate students' priorities for improvement by the end of the technical English course. the results were given in Table 10 below.

Table 10

Students' Priorities for Improvement By the End of the Technical English Course Future

	None *f* %	Not great *f* %	OK *f* %	Good *f* %	Excellent *f* %
a. your range of vocabulary	0.00	0.00	3-6.81	20-45.45	21-47.72
b. your comprehension when reading technical texts	0.00	0.00	3-6.81	19-43.18	22-50
c. your understanding of other speakers	0.00	1-2.27	3-6.81	16-36.36	24-54.54
d. your competency in English	0.00	1-2.27	2-4.54	21-47.72	20-45.45
e. your accuracy when reading	0.00	1-2.27	2-4.54	19-43.18	22-50

As seen in Table 10 above, there are again the same numbers of items, which tries to seek information about students' priorities for improvement by the end of the Technical English course. As for item #a, which was asked to learn about the range of vocabulary, no students responded as *"none"*. Besides, no students gave an answer as *"not great"*. 3 students gave the response *"ok"*, which was equivalent to 6.81 %, and 20

students (45.45%) gave an answer of *"good"*. The last fraction of 21 students (47.72%) gave the responses *"excellent"*.

Item #b was related to students' comprehension when reading technical texts. None of the students said *"none"*. Moreover, no students responded as *"not great"*. 3 students (6.81%) gave an answer of *"ok"*. 19 students (43.18%) reacted as *"good"*, and the remaining 22 students (50% of the sample) responded as *"excellent"*.

Another item representing understanding of other speakers was item #c. To this item, again no students responded as *"none"*. 1 student (2.27%) gave a response as "not great". 3 students (6.81%) gave a response of *"ok"* and 16 students (36.36%) responded *"good"*. The remaining 24 students (54.54%) said *"excellent"*.

As for item #d, which was related to students' competency in English, no students responded as *"none"*. 1 students (2.27%) responded as *"not great"*. 2 students (4.54 %) responded as *"ok"*. On the other hand, 21 students (42.72%) gave a response of *"good"*. As the final response, 20 students with the percentage of 45.45 said *"excellent"*.

As for the last item, which was about students' accuracy when reading, was item #e. Again no students responded as "none". 1 student (2.27%) said *"not great"*. 2 students (4.54%) responded as "ok". The next response was "good", which was returned by 19 students (43.18%). The last answer was "excellent" with 22 students (50%).

The next item tried to investigate students' expectations of using English in different contexts. The results were given in Table 11 below.

Table 11

Students' Expectations of Using English In Different Contexts

	N	R	S	F	A
	f %	*f* %	*f* %	*f* %	*f* %
a. reading reports, correspondence etc.	3-6.81	10-22.72	20-45.45	10-22.72	1-2.27
b. reading instructions manuals, technical articles	2-4.54	11-25	21-47.72	10-22.72	2-4.54
c. telephone calls	18-40.90	10-22.72	11-25	2-4.54	3-6.81
d. conversation and informal meetings in small groups	3-6.81	11-25	21-47.72	10-22.72	1-2.27
e. addressing an audience-giving presentations	1-2.27	22-50	15-34.09	5-11.36	1-2.27
f. taking notes during lessons, meetings and conferences etc.	4-9.09	7-15.90	15-34.09	16-36.36	4-9.09
g. writing e-mails	3-6.81	15-34.09	15-34.09	10-22.72	1-2.27
h. writing technical reports	10-22.72	25-56.81	5-11.36	2-4.54	2-4.54
i. working with others who speak English	14-31.81	4-9.09	17-38.63	5-11.36	3-6.81
j. translating technical texts	3-6.81	19-43.18	10-22.72	11-25	1-2.27

As seen in Table 11, there are ten items in the table, all of which are related to the students' expectations of using English in different contexts. As for item #a, which tries to learn about students' reading reports, correspondence etc., 3 students (6.81%) said '*never'*. 10 students (22.72%) said '*rarely'*. 20 students (45.45%) said '*sometimes'*. 10 students (22.72%) said '*frequently*' and only 1 student (2.27%) said '*a lot'*.

Another item in the table is item #b, which is related to using English while reading instructions manuals, technical articles. 2 students (4.54%) said '*never'*. 11 students' (25%) responses were '*rarely'*. 21 students (47.72%) said '*sometimes'*. 10 students (22.72%) said '*frequently'*. And finally, only 2 students (4.54%) said '*a lot'*.

Item #c is related to using English during telephone conversations. 18 students (40.90%) said '*never'*. 10 students (22.72%) said '*rarely'*. 11 students (25%) said '*sometimes'*; 2 students (4.54%) said '*frequently'*. And 3 students (6.81%) said '*a lot'*.

Next comes item #d, which is regarding students' using English during conversation and informal meetings in small groups. 3 students (6.81%) said '*never'*. 11 students (25%) said '*rarely'*. 21 students (47.72%) said '*sometimes'*. 10 students (22.72%) said '*frequently'*. And finally, 1 student (2.27%) said '*a lot'*.

Item #e is about students' using English while addressing an audience or giving presentations. 1 of the students (2.27%) said '*never'*. 22 students (50%) said '*rarely'*. 15 students (34.09%) said '*sometimes'*, and 5 students (11.36%) said '*frequently'*. At last, only 1 student (2.27%) said '*a lot'*.

The next item, #f, is related to students' using English while taking notes during lessons, meetings and conferences etc. 4 students (9.09%) said '*never'*; 7 students (15.90%) said '*rarely'*. 15 students (34.09%) said '*sometimes'*. Similarly, 16 students (36.36%) said '*frequently'*. 4 students (9.09%) said '*a lot'*.

Item #g is related to using English as a means while writing e-mails. 3 students (6.81%) said '*never'*. 15 students (34.09%) said '*rarely'* and the same size of the sample said '*sometimes'*. 10 students (22.72%) said '*frequently'*. And finally, only 1 student (2.27%) said '*a lot'*.

When it comes to the next one, item #h, which is about using English as a means while writing technical reports; 10 students (22.72%) said '*never'*. On the other hand, 25 students (56.81%) said '*rarely'*. 5 students (11.36%) said '*sometimes'*. 2 of them (4.54%) said '*frequently'*. And finally, 2 of them (4.54%) said '*a lot'*

The next one is item #i, which is related to using English as a means while working with others who speak English. 14 students (31.81%) said '*never'*. 4 students (9.09%) said '*rarely'*. 17 of them (38.63%) said '*sometimes'*; 5 of them (11.36%) said '*frequently'*. And finally, 3 of them (6.81%) said *'a lot'*.

The last one in Table 11, item# j, regards the use of English as a means while translating technical texts. 3 students (6.81%) said '*never'*. On the other hand, 19 students (43.18%) said '*rarely'*. In a similar fashion, 10 students (22.72%) said '*sometimes'*. Again similarly, 11 students (25%) said '*frequently'*. And finally, 1 of them (2.27%) said '*a lot'*.

The following item tried to investigate the expectations of students of the English teacher or the technical English course. The results were given in Table 12.

Table 12

The Expectations of Students of the English Teacher or the Technical English Course

Improve technical / general vocabulary in English	21
Understand technical English better in general	20
Improve reading skills; understand written materials, articles and reading passages in English	18
Speak well	12
More involvement in the lesson	12
Improve general English	10
More enjoyable	4
Four skill-based	4
No exam stress, flash back effect	3
Understand instructions in exams better	1

As can be seen in Table 12, the responses to the question in the questionnaire for this item vary. 21 of the participants hoped to improve both their technical and general vocabulary in English, 20 of them expected to understand technical English better in general, 18 of them hoped to improve reading skills; understand written materials and articles as well as reading passages in English, 12 of them expected to speak well, another 12 of the responses were based on more involvement in the lesson, 10 of them expected that they would improve their general English, 4 of them expected the lesson to be more enjoyable, another 4 of them expected the course should be based on four skills, 3 of them expected no exam stress or flash back effect, and finally only one of them would like to understand instructions in exams better.

The following item tried to investigate special needs, learning difficulties or other factors which might affect students' learning English. The results were given in Table 13 below.

Table 13

Special Needs, Learning Difficulties or Other Factors Which Might Affect Students' Learning English

Listening and general understanding difficulties; understand songs	15
Reading difficulties	12
Not enough vocabulary	12
Learning difficulties in vocabulary	11
Unable to watch films	10
Speaking difficulties	9
Different functions of vocabulary items	6
Learn more about the vocabulary of EEE	5
Unable to translate from English into Turkish	3
Pronunciation	2
More opportunities to practice	2
Phrasal verbs	1
Missing speech parts	1

As can be seen in Table 13 above, 15 of the participants expressed their listening and general understanding difficulties and difficulties in understand songs; 12 of them mentioned that they had reading difficulties; again 12 of them did not have enough vocabulary. 11 of them said that they had difficulties in learning vocabulary; 10 of them were unable to watch films; 9 of them had speaking difficulties; 5 of them they did not know different functions of vocabulary items; 5 of them wanted to learn more about the vocabulary of EEE; 3 of them were unable to translate from English into Turkish; another 2 of them asked for more opportunities to practice. 1 of them had problems with phrasal verbs and another constantly missed speech parts.

4.2. Findings from Interviews

Initially, the researcher decided to learn more about the opinions of the content teachers and students at the department because this approach would strengthen the data. Therefore, the content teachers were asked to express their opinions as to which data should be taken into consideration and the materials they prefer to use (see Appendix B). Upon the recommendation of the lecturers and content teachers, out of

eight courses were selected since more specific data were required. The courses selected were Introduction to Computer Programming, Introduction to Electrical Engineering and Fundamentals of Information Technologies. The aim of the selection was to determine the corpus data within the Electrical and Electronics Engineering domain as the other courses are obligatory for all the departments at the engineering faculty. Except for the question regarding the material selection, the rest of the questions were the same as those asked to the content teachers.

4.2.1. Findings from Content Teachers' Interviews

There were three items in the interviews. First of all, content teachers were asked to make their recommendations regarding the selection of data for the corpus compilation procedure. The details of the question were given in the corpus compilation part. The first question was intended to learn more about the major problems the teachers have encountered during the lectures. Two of the lecturers complained about the reluctance of the students' involvement in the lesson, as they were forced to ask their questions in English and added that "even if I warn them hundreds of times, they insistently ask their questions in Turkish." The other lecturer expressed that "most students find it funny to speak English to a lecturer whose mother tongue is Turkish." Therefore, whatever efforts lecturers have made, they all have a tendency towards using Turkish in the classroom. The other question was about possible solutions to the problems in general. One of the lecturers recommended that the course should be designed in line with the language needs of the students at the department.

4.2.2. Findings from Student Interviews

As was the case in the lecturers' interviews, students were asked to express their opinions about the major problems they encountered during the lectures. The answers vary and are given in Table 14.

Table 14

Qualitative Analysis of Student Interviews Regarding Major Problems

Items	***f***
Technical vocabulary and abbreviations	10
Overall understanding of technical texts	8
Find it funny to speak English during the lectures	6
Pronunciation of vocabulary during note taking	4
Responding in exams	2
Difficulty in translation	2
Difficulty in understanding instructions in exams	1

As can be seen in Table 14 above, there are seven items in the table. As for the first item, 10 students found it difficult to understand technical vocabulary and abbreviation used in the texts. Another item was favored by 8 students, which was about the problem they face as to overall understanding of technical texts. 6 of the students found it funny to speak English during the lectures. Four of the students thought that they had difficulty in both pronouncing of vocabulary and acquiring the pronunciation of vocabulary items during note taking. Only 2 of them had difficulty in responding in exams through English. The number of the following response was the same as the previous one. On the other hand, only one response favored the idea that it was difficult to understand the instruction in exams.

As for the second item in the interview, they were asked to make their recommendations regarding the technical English courses they took in the first year of their education. There are five items in the table. The responses also vary and are given in Table 15.

Table 15

Students' Thoughts and Opinions Regarding the Course

Items	**frequency**
There should be more related texts to the field	13
Lack of competency of the English teacher regarding the field	9
Inadequacy in the number of lesson hours	8
There should be less grammar	5
There should be more visual aids such as videos, posters...etc.	3

As can be seen in Table 15, the expressions made the most were about the inadequacy of the related texts to their fields with 13. Another item was about the lack of competency of the English teacher regarding the field and 9 students favored that. 8 students complained about the inadequacy in the number of lesson hours. 5 students claimed that there should be less grammar. On the other hand only 3 of the students found it necessary to increase the number of visual aids and ask for more videos, posters and so on.

4.3. Findings from the Corpus Compilation

This section of the study represents the data collected through the corpus compilation process to answer the first research question. To what extent will a corpus-based approach help ESP teachers in developing ESP materials?

4.3.1. Data Collection Procedure

The data were collected from 30 course books from 11 sub-disciplinary fields: Advanced Engineering Mathematics, Electric Circuits, Control Systems, Power Systems, Electrodynamics, Field & Electromagnetics, Communication Systems, Sensors & Control Systems, Electric Power Systems, Automation and Differential.

The data were first converted into a plain text, machine-readable form and then uploaded to the program called AntConc (2013), which generates word lists based on plain text files. The entire corpus includes 5,346,384 tokens and 82,778 types and the word lists are automatically generated in frequency order.

4.3.2. Coverage of the GSL and AWL in the EEEC

In order to determine the coverage of the GSL and AWL in the EEEC, is important to consult the related studies. Previous studies have differed in their treatment of proper nouns and other unwanted data from the findings. Coxhead (2000) decided to extract all such data from her results with the AWL, whereas in her later research with Hirsch (2007) she changed her mind and decided to include them. In the studies conducted by Minshall (2013) and Konstantakis (2010), they were also included. Wang et al (2008) did not mention their treatment of the matter. In the current study, the researcher found it appropriate to report the findings in both forms—with proper nouns included and excluded—so they can be fairly compared to the findings of the other

studies. Moreover, Electrical & Electronics Engineering literature has a significant proportion of mathematical terms and, it would be appropriate to report coverage with all single alphabetic data (the letters except for A and I) removed from the GSL1 word list (Table 24). The researcher decided to use AntWordProfiler (Anthony, 2008) in order to obtain all the above results.

Section 4.5 showed how 3.02% of the corpus data was comprised of proper nouns and other unwanted data. Calculating the coverage of the GSL and AWL with this data excluded involved the following equation:

Coverage after exclusion = Coverage before exclusion / (100 - Unwanted Data) x 100

The next item tried to investigate the coverage of the GSL and AWL in the EEEC. The results were given in Table 16.

Table 16

Coverage of the GSL and AWL in the EEEC

Word List	**Coverage Proper nouns included**	**Proper nouns included and single Letters excluded from GSL1**	**Proper nouns excluded**
GSL1	64.63%	68.73%	66.92%
GSL2	4.76%	4.76%	4.84%
AWL	9.51%	9.51%	9.92%
TOTAL	78.9%	83%	81.68%

It may be clearly seen in Table 16 above, when data with proper nouns are included in the count, the GSL and AWL provide only 78.9% coverage, which would mean that the EEEWL would have to provide between 16.1-19.1% extra coverage to match the lexical threshold for text comprehension of 95-98% (Laufer, 1989; Nation, 2008).

On the other hand, if proper nouns were to be excluded from the count, then the coverage required by the EEEWL to reach the threshold would need to be lower 5.78-8.78%. The results obtained in other studies reveal how difficult it is to achieve of such an objective. The results of four corpora were given in Table 17.

Table 17

Coverage of the GSL and AWL in the EEEC, PMC, LC and CSC

WORD LIST	EEEC	PMC (Published Material Corpus) (Konstantakis, 2007)	LC (Law Corpus) (Aichah, 2010)	CSC (Computer Sciences Corpus) (Minshall, 2013)
GSL1	66,92%	80,26%	77,71%	70,73%
GSL2	4,84%	5,46%	4,08%	5,70%
AWL	9,92%	4,66%	9,79%	12,79%
TOTAL	81,68%	90,38%	91,58%	89,22%

As can be seen in Table 17 above, the details of the process followed by three researchers were given in details. The coverage of PMC was 80,26%, LC was 77,71%, that of CSC was 70, 73%. And finally, the coverage of EEEC was 66,92% in GSL1. In GSL 2, the coverages vary; CSS was 5,70%, PMC was 5,46%, EEEC was 4,84% and LC was 4,08% . In AWL, the coverage of CSC was 12,79%, LC was 9,79%, and EEC was 9,92%. Total coverages of the four corpora; LC was 91,58%, PMC was 90,38%, CSC was 89,22% and EEEC was 81,68, respectively.

4.3.3. Coverage of the EEWL in the EEEC

When the poor coverage of both GSL and AWL within the EEEC was taken into account, it was evident that the EEEWL would have to provide a significant amount of coverage to obtain lexical threshold values (Laufer, 1989). The researcher decided to use AntWordProfiler (Anthony, 2008) in order to extract these results and they were given in Table 18.

Table 18

Coverage of the EEEWL in the EEEC

Word List	Proper nouns included in Coverage	Proper nouns excluded from coverage
GSL1	64.63%	66.92%
GSL2	4.76%	4.84%
AWL	9.51%	9.92%
EEEWL	13.13%	13.32%
Proper Nouns (Basewrd31)	1.12%	
Abbreviations (Basewrd34)	1.90%	
Total	95.05%	95%

As can be seen in Table 18 above, there are some slight changes in the coverage of the EEEWL in the EEEC when proper nouns were included and then when the proper nouns were excluded.

Laufer (1989) argued that it was necessary to obtain the lexical threshold in order to comprehend a text. However, it was unnecessary to reach the higher threshold of 98%, as claimed by Nation (2008). Given the fact that a sum of 3.02% of the corpus data consisted of proper nouns and abbreviations, this threshold of 98% was not an achievable figure if unwanted data was maintained within the count. Therefore, all further coverage data will be expressed with proper nouns excluded. When investigated it seems clear that each corpus consists of a different numbers of proper nouns and unwanted data, the researcher decided to make the calculations for each separately.

4.3.4. Coverage of the EEEC with the BNC and BNC/COCA word lists

At this stage of the study, it might be asked whether or not it would be more sensible to acquire the combination of the GSL, AWL and CSWL than to acquire all the words from the frequency bands required to obtain 95% coverage of EEEC. To achieve this, it is necessary to implement a simple process of counting the combination of the

number of word families within the GSL, AWL and CSWL, and compare this number to the number of frequency bands which are needed to gather the same coverage. As long as the GSL, AWL and CSWL provide a lower word family count, it may be concluded that it will be more efficient.

As previously mentioned, there is a difference in the number of word families the GSL has. That's why, in the current study the number of word families proposed is extracted from the GSL1 and GSL2 word lists (Nation & Heatley, 2002). While GSL1 has 1,001 word families, GSL2 has 988. The AWL contains 570 word families and the EEEWL contains 654—3,214 word families in all. In order for it to be equally efficient to learn vocabulary through the frequency bands, 95% coverage of the EEEC would need to be obtained by the first 3k frequency bands.

Several kinds of frequency bands are available for download within Nation's Range programme. (Nation & Heatley, 2002). One of the examples in the Range programme is the first 14k frequency bands excluded from the BNC. The other one has the first 25k frequency bands extracted from the BNC/COCA corpora. When the first BNC 14k frequency bands were compared, coverage of 95.65% was obtained by the first 10k frequency bands. The first 9k frequency bands only provided 94.94% coverage in total. Only 96.44% coverage could be achieved with all 14k frequency bands. By means of the BNC/COCA word lists, it became possible to acquire a total of 93.53% coverage through all 25k frequency bands. In order to explain the discrepancy between these figures, the differences between the corpora from which the word lists were originally extracted should be taken into account. It also shows the high proportion of low-frequency words used in the Electrical & Electronics Engineering discipline. However, it may be seen that the first 10k frequency bands of the BNC are required to obtain the lexical threshold of 95%, which seems to be considerably less efficient than learning the combination of the word families of the GSL, AWL and EEEWL.

4.3.5. Comparison Against A Technical Dictionary

According to Chung and Nation (2003), it was recommendable to make a comparison with a technical dictionary as a valid means of supporting the same data. When Konstantakis (2010) utilized this method with his BWL, he demonstrated that majority of the headwords on his list appeared in a business dictionary. That's why, the

EEEWL is to be compared to a technical dictionary so that its technicality can be validated.

For the current study, the researcher decided to use the Wiley Electrical and Electronics Engineering Dictionary (2004). This dictionary has over 35,000 entries so it is large enough for this type of research. Chung and Nation (2003) supported the notion that the larger dictionary is, the larger proportion of non-technical lexis it contains. The researcher noted any lexical type within the EEEWL which had a main entry in the dictionary. If a type from the EEEWL appeared as part of a main entry in the dictionary, the type was recorded, as well (see Table 19).

Table 19

Distribution of Words in A Technical Dictionary from This Study and Related Research

	Entry in subject specific dictionary		
	Main entry	**Part of a multi-word unit**	**No entry**
EEEWL	498 (91.5%)	-	56 (8.5%)
BWL (Konstantakis, 2010)	686 (54%)	-	580 (46%)
LWL (Aichah, 2012)	139 (37.3%)	77 (20.9%)	156 (41.8%)
CSWL (Minshall, 2013)	229 (52.9%)	75 (17.3%)	129 (29.8%)

As can be seen in Table 19 above, a total of 91.5% of all word families in the EEEWL had an entry in the dictionary, which supports the idea that it contains mostly specific technical lexis. Minshall, 2013 demonstrated that 70.2% of all word families in the CSWL had an entry in the dictionary. For his LWL, Aichah (2012) identified only 58.2% of words with dictionary entries for his subject whilst Konstantakis (2010) only 54%. All in all, the results given above support the subject specific technicality of the EEEWL.

4.3.6. Multi-Word Units in the EEEC

At this stage of the study, the researcher used the software AntConc (Anthony, 2002) as it had several beneficial tools to support in this process. The ngram tool could identify any chunks of tokens that existed within a corpus and the frequency with which they occurred. Following the identification of these chunks, they could then be

processed by the Concordance Plot tool, which noted the corpora in which it occurred, and thus could identify the range of such chunks. The researcher found it necessary because any multiword unit, which was to be added to the EEEMWL, was also to address the same criteria that were utilized during the creation process of the EEEWL. They should have a frequency of at least 80 throughout the EEEC and a range of 50% across the sub-corpora that comprise it. As a final step, the Collocates tool was beneficial to identify the frequency of collocational activity for a specific token to be examined. The Collocates tool could do this by means of counting the frequency with which other tokens to a number of places left or right of the original search token appeared.

The process of identification of multi-word units consisted of two different stages within the EEEC, both of which will be handled in detail in the following sub-sections (also, See Appendix G)**.**

4.3.7. Hyphenated and Compound Words in the EEEWL

Since AntWordProfiler (Anthony, 2014) was not created to deal with non-alphabetic characters, hyphenated and compound words in the EEEWL were removed during editing of the EEEC. Yet, it was possible that words from the EEEWL, which were previously hyphenated, were lost at this stage. In a similar fashion, it was likely that a compound word was written as a multiword unit. There was also a possibility that as several of the headwords that the EEEWL contained were either compound words, or a known affix, for example, ‘interface’, ‘toolbox’ or ‘wattmeter’ could be hyphenated. In order to clarify the issue, the headword was stripped of its affix or divided into its constituent parts and they were run through the Collocates tool. Such an effort could have an effective contribution to the total coverage provided by the EEEWL within the results so far. Table 20 shows some of the results of this issue.

Table 20

Examples of hyphenated or multi-word units in the EEEWL

Headwords and Constituent parts	
Air-gap	D-axis
Complex-conjugant	Filtered-reference
Closed-loop	First-order
Break-in	w-plane
Bus-bar	z-axis
Continuous-data	z-direction
Continuous-time	Zero-sequence
Cross-correlation	z-plane
Simple-harmonic oscillation	z-transform

As seen in Table 20 above, a total of 329 headwords from the EEEWL also existed within the EEEC as part of a multiword unit or hyphenated word, which means the EEEWL expanded to a sum of 983 words (for details, see Appendix B).

4.4. Post-Test Results

This part of the study was designed to respond RQ 3: What are the positive effects of designing a corpus-based lexical syllabus on learning technical vocabulary?

According to the data obtained, a t-test was conducted to assess the level of both control and experimental groups. The results of the pre-VAT are given below in Table 21.

Table 21

T-test Results of the Pre-Test Scores of Control and Experimental Groups

Groups	**N**	$\bar{X}$	**s**	**Sd**	**T**	**p**
Experimental	44	29.31	11.55	140	-5.05	.000
Control	50	21.95	19.49			

As it can be seen clearly from Table 21, the mean score of the experimental group was $\bar{X}$=29.31, while the means score of control group was $\bar{X}$=21.95, which

suggests that the experimental group has significantly higher scores than those of control group ($t_{(140)}$=-.5.05, p<.001).

The results of the post-tests of Vocabulary Achievement Test (VAT) are given below in Table 22.

Table 22

Post-test Results of Both Control and Experimental Groups

GROUPS	**N**	***Means***	**Adjusted Means**
Experimental	44	41,50	50,44
Control	50	15,18	12,15

According to Table 22, the post-VAT scores of the experimental group were 41.50 and the scores of the control group were 15.18. Additionally, adjusted scores of the both groups were 50.44 and 12.15 respectively. In order to determine whether the differences between the groups were significant, the ANCOVA analysis was performed and the results were given in Table 23.

Table 23

Ancova Results According To Adjusted Means Scores In Terms Of Experimental And Control Group

Source	**Sum of Squares**	**Df**	**means square**	**f**	**Sig.**
Pre VAT	15348.71	1	15348.71	163.246	.000
Group	46367.530	1	46367.530	493.157	.000
Error	13069.028	139	94.022		
Total	61272.683	141			

According to Table 23, there was a significant difference between the adjusted post-VAT scores of the students in the control and the experimental groups [$F_{(1-139)}$=493.157, p<.001]. In other words, there was a correlation between the performance of the experimental group and the ESP training course. This meant that the students who

participated in the course showed overall improvement of their technical vocabulary as an experimental group, whereas control hardly improved their capacity.

CHAPTER V

DISCUSSION

5.1. Introduction

This section presents the discussion of the current study, its implications for ELT and suggestions for further research. The results obtained from the study are summarized, and certain significant outcomes of the study are presented along with as how the current study could prove fruitful for other ELT contexts are discussed.

5.2. Discussion

In the current study, the aim was to design an effective corpus-based lexical syllabus based on authentic data which were gathered through the disciplinary materials such as textbooks, lecture notes and on line resources at the Engineering Faculty, Department of Electrical & Electronics Engineering (EEE) at Niğde University where the majors are in English. Then, the collected data were made into a machine-readable form to be analyzed by means of AntConc & AntWordProfiler. With the data obtained through a corpus based approach, a lexical syllabus was designed. After that, both the lectures and students at the department of EEE were interviewed. Then, a questionnaire was conducted with the students in order to find out their perceptions regarding their English language needs. Moreover, a pre-test was applied to the students in order to assess the students' current level of English. Then, the students were divided into two groups, one of which was the control group and the other was the experimental group. The conventional General English syllabus was applied in the former, whereas the lexical syllabus for the students was applied in the latter so as to see to what extent the students could improve their vocabulary capacity in terms of their disciplinary area. At the end of a 12-week treatment in the experimental group, a post test was conducted to assess the differences between the two groups.

The literature review identified some missing issues in the current vocabulary research which this study aimed to redress. The most important one among these was the lack of any relevant research into the subject specific lexis of Electrical & Electronics Engineering. Other researchers (e.g. Coxhead & Hirsch, 2007; Wang et al, 2008; Ward, 1999; Minshall, 2013) have covered other scientific disciplines, whereas

none have considered this increasingly popular and influential discipline, which provided the motivation for this study and the development of the EEEWL.

Besides these, other missing gaps in the current state of vocabulary research were also noted. They provided the bases for the research questions (chapter 3). Following the establishment of a methodology (chapter 4), the results from the experimental data provided a mix of both conclusive and tentative answers to the question (chapter 5). These results will be handled in a more extensive context, relevant where possible to previous research in this field and emphasizing any problematic data or unexpected results.

In this chapter, the conclusions obtained from the findings of the interviews carried out by students and interviews with both students and lecturers, corpus compilation and preparation of Electrical & Electronics corpus, lexical syllabus design and pre-post test results will be discussed. The research questions that were addressed in the current study are as follows:

1. To what extent will a corpus-based approach help ESP teachers in developing ESP materials?
2. What are the advantages of using CL approach to produce ESP materials for engineering students studying English?
3. What are the positive effects of designing a corpus-based lexical syllabus on learning technical vocabulary?

5.3. Coverage of the GSL and AWL

The coverage of academic electrical & electronics literature has to be viewed in a more general context of corpus size.

The GSL accounted for 64.63% of all tokens within the EEEC. Compared to the coverage it provided in similar studies, this was very low indeed. Konstantakis (2007) achieved 85.72% coverage, Mishall (2013) 70.73% and Aichah (2012) 81.79%. It is likely that it is comparable to the 76.1% achieved by Coxhead (2000). However, when single letters (other than A and I) were removed from the GSL1 word list, the overall coverage of the GSL dropped to 61.54% in the EEEC. In fact, a total of 152 word families from the GSL, which are meant to represent the most common words in English, were not found within the EEEC. The results suggest two issues. First,

performing a corpus analysis of Electrical & Electronics Engineering literature is difficult since a significant amount of the data is not written in English, but in the languages of mathematics. Secondly, and although there are the arguments of Gilner (2011), it is likely that the GSL it not as efficient a word list for teaching students of the Electrical & Electronics Engineering discipline, since it can also be used for other academic subjects.

The coverage results of the AWL might demonstrate that Ward's (1999) decision to create a single word list was a preferable methodology. The AWL performed significantly well (or poorly) against all technical corpora in this study. Coxhead (2011) illustrated how on average the AWL provides 10% coverage across the technical word list studies available for analysis. Regarding the EEEC, the AWL accounted for 9.51% of all tokens. Only four word families of the AWL were not available in the EEEC. It was expected that the AWL should perform so well in Electrical & Electronics Engineering literature. There are so many polysemic words in the AWL (Wang & Nation, 2004) with an Electrical & Electronics Engineering bias, which had very high representation within the corpus data of this subject. The headwords 'equation', 'function', 'phase', 'output', 'response', 'input', 'chapter', 'section', 'constant' and 'error' were the 10 most frequent AWL words in the EEEC. Any further studies into Electrical & Electronics Engineering vocabulary should incorporate the AWL.

5.3.1. Contents and Coverage of the EEEWL

The methodology discussed in this paper (chapter 3) summarized the way in which the EEEWL was created. The researcher decided during the compilation of the EEEWL that no subjective evaluations were to be made about the headwords chosen for inclusion. If they met the criteria, that was considered sufficient. This led to the incorporation of several words which can be considered general purpose words that are even relevant to other academic disciplines. The headword '*auto'* is present in the EEEWL with *'autocorrelation'* the only other member of the family. Despite its being a general purpose discourse marker, it has relatively frequent use within the literature of the Electrical & Electronics Engineering discipline, but has no particular reason to be prevalent within it. '*Absorb'* was another unexpected headword within the EEEWL and is normally associated with other subjects, but it is there as long as it met the relevant criteria.

The EEEWL had several words which might otherwise be hyphenated or even written as separate words (see section 4.3.6), which led to the inclusion of words like '*waveguide'* into the EEEWL. *Wave* is a word on the AWL but was allowed for inclusion within the EEEWL as it occurred frequently enough and with sufficient range as a compound noun to qualify. The criterion of specialist occurrence is not broken here as '*waveguide'* is certainly not within level 6 expansion of the word *'wave'* and must be treated as a separate headword in its own right. The same judgment applies to '*waveequation'*, '*windturbine'* and others. As a result of the analysis, it was evident that no words included within the EEEWL existed more frequently in their hyphenated or individual constituent forms.

Table 24 shows the coverage per headword in details.

Table 24

Coverage per Headword

	EEEWL	**LWL (Aichah, 2012)**	**Science Word List (Coxhead & Hirsch, 2007)**
Headwords	654	373	318
Coverage	13.13%	3.86%	3.79%
Coverage per headword	0.018	0.010	0.012

As can be seen in Table 24, the coverage obtained by the EEEWL differed. It covered 13.13% of the EEEC, which is a relatively high amount of coverage per headword compared to other studies.

5.3.2. Efficiency of the GSL/AWL/EEEWL Against the BNC Frequency Bands

The third issue that was to be handled was to learn whether it was more efficient to learn the combined GSL, AWL and EEEWL (3,214 headwords) than it would be to learn however many frequency bands from the BNC (Nation & Heatley, 2002) which it would take to achieve the same coverage of the EEEC.

As a result of the analysis, it was evident that 95% coverage could only be achieved by the first 10k BNC frequency bands, which means that 10,000 words would have to be learned by a L2 learner of English studying Electrical & Electronics

Engineering in place of 3,214 demonstrated by the other word lists, a ratio of 3.34:1 (BNC: GSL/AWL/EEEWL). Since this figure is over 3 times as many words, it is obvious that it is an efficient practice and that it has important pedagogical implications. Aichah (2012) found that his LC could be covered by only the first 4k BNC frequency bands, representing a ratio of 1.36:1. Therefore, it might be argued that the combination of GSL, AWL and EEEWL represents a particularly efficient vocabulary set for the instruction of the intended significance of the current study.

Another significant factor was to demonstrate that it was unlikely to achieve the 98% lexical threshold (Hirsch & Nation, 1992; Hu and Nation, 2000; Schmitt, Jiang & Grabe, 2011) using all 14k frequency bands of the BNC or even with the 25k frequency bands of the BNC/COCA (Nation & Heatley, 2002). It is a commonly acknowledged notion that lexical thresholds reach a natural ceiling of around 95% in technical word lists, which is the standard Coxhead (2000) established for the AWL. None of the studies which considered a 98% lexical threshold (Hirsch & Nation, 1992; Hu and Nation, 2000; Schmitt, Jiang & Grabe, 2011) used technical corpora to calculate such a figure; therefore, this value is to be regarded as inappropriate to any technical corpus study.

5.3.3. Technicality and Distribution of the EEEWL

The method of identifying technical vocabulary by comparison to a technical dictionary was recommended by Chung and Nation (2003). In comparison with the Electrical & Electronics Engineering dictionary, 91.5% of all headwords (or their different lexical types) in the EEEWL were discovered to either have a main entry in the dictionary or were part of a multi-word entry. Minshall (2013) found 52.9%, Aichah (2012) found only 58.2% technicality in his LWL in this way and Konstantakis (2010) found only 54%. Whilst Konstantakis (2010) only looked for headword main entries, it is obvious that this process supported the technicality of the EEEWL.

As a matter of fact, the majority of evidence obtained by these five experiments suggested the highly technical nature of the EEEWL, as lexical technicality is currently defined (e.g. Chung & Nation, 2003l; Coxhead, 2000; Schmitt & Schmitt, 2012).

5.3.4. Multi-Word Units in the EEEC

As a final process of the compilation of EEEC was to find out whether there were any multi-word units in Electrical & Electronics Engineering. It was necessary to detect any multi-word units in the EEEC so that there could an appropriate response to this issue. It was evident that it was a complicated process, as several of the headwords in the EEEWL suggested a number of different spelling conventions which could lead to them existing in a compound form (as in the EEEWL), in a hyphenated form or even in a multiword unit form. Moreover, for these multi-word units to be accepted as part of Electrical & Electronics Engineering discourse and to be included into the EEEMWL, they would have to exhibit the same criteria of range and frequency as demanded of words in the EEEWL.

So far few, studies have been conducted on the presence of multi-word units in technical genres. This is probably because it is a relatively new area of research. Martinez and Schmitt (2012) produced a PHRASE list of high-frequency formulaic language only a few years ago. Durrant (2009) looked at formulaic language in the AWL and found a range of lexical and grammatical collocations and this helped determine that a technical multi-word list should only exist of subject specific phrases. This was the methodology used by Aichah (2012) and also adopted for this study. The results were similar to those obtained by Ward (2007) in that every item on the EEEMWL consisted of noun phrases, but this was to be expected, given the criterion of selection of these items by comparison with a technical dictionary. In this way, the EEEMWL only proved that items in the technical dictionary occurred within the EEEC; therefore, they generally existed in Electrical & Electronics Engineering literature. The result was as expected and it only suggests a low coverage value for multi-word technical units in a technical corpus. All in all, such a methodology could not expect to suggest the ubiquity of formulaic language as discovered in other studies (Martinez & Murphy, 2011; Martinez & Schmitt, 2012), as it was associated with infrequent combinations of infrequent vocabulary.

5.4. Student Questionnaires and Interviews

The data from the students' questionnaire and interview have illustrated a number of issues which need to be considered because they offer significant implications for introducing a change in the syllabus that the instructors currently use.

Initially, the results of the needs analysis gave the researcher an insight regarding the preparation of the lexical syllabus. Findings from the questionnaire were used as a reference in both preparation and application of the syllabus.

The analysis showed that students expect various things from a technical English course. They focus on using English in terms of two skills; reading and writing rather than using it in listening and speaking, which is in line with the aims of the syllabus. Besides this, they expect to learn more vocabulary, which is also parallel with the aims and objectives of the course.

In terms of the advantages of the vocabulary-based technical English course, the majority of the students believe that they should improve technical English via learning more technical vocabulary. Moreover, again a significant number of students claim that they do not have adequate vocabulary to understand technical English efficiently. A significant number of students' responses concentrated on the necessity of reading skills as well as technical vocabulary in English. Only a few students favor speaking as they think that they will mostly encounter written materials in their situation.

Most students spend 1-2 hours a week on English out of the classroom environment, which means that they do not spare enough time on English or they simply do not find it necessary to spend more time dealing with English. Moreover, such responses also suggest that they mostly encounter English within the classroom environment. Therefore, in order that students spend more time dealing with English, there should be some points in the application of the syllabus focusing on attracting students to participate in online activities provided by the researcher which complement those given in the classroom. As a result, students should be encouraged to expose themselves to English extensively.

Another important point is to learn about students' opinions in terms of a useful and enjoyable English course. They mostly associate an effective course with fun, suggesting that by providing different kinds of enjoyable activities, students will tend to participate in the lesson, and thus increase their involvement in the learning process.

To see what students' thoughts are as to their level prior to the course, the majority of them claim that their range of vocabulary was good, yet none of them claim that it was excellent. As for the comprehension of technical texts, their responses vary but none of them rank their own comprehension as excellent. It is evident from students' responses that they are all aware of the fact that they are all aware of the fact

that they lack some English reading skills as well as lacking necessary vocabulary knowledge in English.

To see what students' expect from the English teacher and the technical English course they are taking, they mostly have the opinion that they should improve their vocabulary, thus enabling them to understand English better in terms of four skills. All in all, students' ideas and opinions help the researcher to further understand the expectations of students and to make use of this knowledge during the preparation and the application of the syllabus.

As a final point the majority of students responded that their greatest reading difficulties were caused by lack of enough vocabulary. Since they mostly encounter vocabulary while reading technical texts, they do not have the chance to reinforce or practice these words.

In the lecturers' interviews, the lecturers complain about the reluctance of the students to participate in the lectures, which suggests that the lecturers have also faith in the importance of students' participation in the learning process. Interestingly enough, and parallel with some of the students' ideas, the lecturers believed that some students find it funny to interact with the lecturers in English in the classroom environment, since they can also communicate their ideas to them in their mother tongue outside the classroom environment. Moreover, the majority of students are hesitant to participate in the lectures simply because they are afraid of making mistakes as well as being insulted by their classmates.

In the students' interviews, they complain about having difficulties in understanding technical vocabulary and their abbreviations, as they mostly encounter them for the first time in their educational process. Some students complain about not being allocated enough time for participation in the lectures, while others claim that they are afraid of making mistakes during participation. Again, a significant number of students find it funny to speak to a person in English whose mother tongue is Turkish in English.

In addition, students believe that there should be more texts related to their specialized area, which suggests that they wish to deal with authentic materials selected out of their content courses. Another striking point students emphasised is that the teacher should be competent enough regarding their field—Electrical and Electronics Engineering. Furthermore, they think that their English lessons are boring and should be supported by some visual aids, such as real pictures and videos and so on.

As a result, in the syllabus designed, all the items mentioned above were taken into consideration, and the syllabus was applied accordingly.

The current study is far from exhaustive; however, it seems clear that it has reached its aims regarding the preparation of the ground for an ESP syllabus design. The thesis looked at the characteristics of an ESP course, identified the steps in the process of lexical syllabus design, outlined the general structure of syllabi and completed the key stage of syllabus design – the course participants' needs analysis, and the data obtained from the compilation of the corpus, the results of which will be extremely valuable for setting course objectives and preparing suitable materials.

As a matter of fact, a simple list of words is not nearly explicit enough to constitute a syllabus. In order to construct an adequate syllabus, it is necessary 'to decide, in addition to which words we want to include in our syllabus, such things as what it is about a word that we want to teach, and what counts as a word.

Whilst the question of lexical selection has passed many course writers by, there have been attempts made through the years by a number of individual linguists to establish criteria for creating lexical inventories for teaching purposes. It seems reasonable to researchers, in the presence of specific guidelines of preparing a corpus, to propose that, for any learner of technical vocabulary in English, the main focus should be on the commonest word forms in the language along with their central patterns of usage.

5.5. Corpus-Based Lexical Syllabus

The content of the syllabus was based on the authentic data obtained from the corpus compilation and comparison with the reference corpora. Learning from a related word list can be beneficial to learners, especially learners of English as a second language (Thornbury, 2004; Nakata, 2008). In this research, the word list created is able to be put into extensive and beneficial use by students, whereby students will actually take the initiative to find the meanings of these specialized words in their first language.

The main purpose of the current corpus-based study is not necessarily to advocate any kind of word list or vocabulary teaching methodology. Rather, it was to gain a deeper understanding of the occurrences of types of lexis in an authentic context; besides, another aim was to enable language teachers and course material designers' to be more aware of teaching ESP for Electrical & Electronics Engineering students.

Moreover, test results provide valuable implications for the Electrical & Electronics Engineering students to get to know more about which vocabulary they need to study and learn.

Following the research, it is expected that the use of related words for specialized fields will contribute enormously to students' curriculum development. In taking into account the use of the selected words for specialized fields in assisting students' curriculum development, there are two interrelated features of vocabulary occurrence in texts. These two features can be divided according to their role in encouraging incidental vocabulary acquisition. The first feature is repetition. However, there is no estimated total number of repetitions of a word to ensure it is securely learnt (Huckin & Coady, 1999). Nonetheless, numerous researches have suggested a target of 10 repetitions in order to learn unknown words (Saragi, Nation, & Meister, 1978; Nation & Wang, 1999; Webb, 2007).

Although ESP courses are applied nowadays at different faculties and colleges around Turkey, designing one is not an easy task for teachers who have not been trained formally in this area as well as for those whom the whole concept of ESP and its teaching methodology is rather unclear. Thus, the current study attempted to define the nature of a corpus based lexical syllabus in order to be able to compile one for the students at the Department of Electrical and Electronics Engineering at Niğde University. According to a common consensus among lecturers, ESP is not substantially different from general English in teaching methodology, materials or learning outcomes (Anthony, 1997). Consequently, the organization of an ESP syllabus generally follows the same principles as that of a General English course; an effective syllabus should be flexible, cyclical and combine the elements of both analytic and synthetic approaches to new material processing.

However, the distinguishing feature of ESP is that the selection of the syllabus content is based on the results of the course participants' needs analysis and the Electrical and Electronics Engineering corpus compiled by the researcher. Thus, determining Niğde University EEE students' reasons for taking the course and the content based on the corpus compiled by the researcher was the main focus of the current research, as it could then form a basis for the course syllabus design.

First of all, the findings of the study have revealed the need for setting up a language course with a clear focus on English for Specific Purposes and on the target discipline, Electrical and Electronics Engineering. In addition, there is a call for a highly

specific course to implement a corpus as well as needs based syllabus document as part of the syllabus renewal process (Richards, 2001). It has also been indicated that the current situation arrangements are not at all in agreement with the "identified needs" (Long, 2005).

Furthermore, the fact is stressed that the participants have some certain expectations with respect to their need to use the target language in their field, which highlights the merits of needs analysis concerning the identification of the learners' needs. On this basis, certain differences among responses in ranking the students' reasons for using English can be justified. As such, the need is stressed for an ESP course, which addresses the learners' immediate needs in the contact of the Electrical and Electronics Engineering.

All in all, in the current study, the treatment group is homogeneous; therefore, the newly designed ESP course has had a great impact on students in terms of enhancing their technical vocabulary capacity, which was proved by the comparison of pre-test and post-test results.

5.6. The Effect of Lexical Syllabus on Learning Technical Vocabulary

According to the t-test results conducted to assess the level of both control and experimental groups, the mean score of experimental group was $\bar{X}$=35.33, while the means score of control group was $\bar{X}$=17.18, the gap of the scores between the experimental group and the control group was not equal. Therefore, in order to obtain more reliable results, adjusted scores were used in the evaluation of the post-test VAT scores.

According to post test results, there was a significant difference between the adjusted post-VAT scores of the students in the control and the experimental groups [$F_{(1\text{-}139)}$=493.157, p<.001]. In other words, there was a correlation between the performance of experimental group's and the treatment performed. For example, 15 out of 44 students doubled their vocabulary capacity according to the post-test results.

So far, a number of scientists have examined the potential applications of corpora utilized in language instruction to address a variety of language issues. Moreover, the findings of the current study confirmed the previous studies carried out by several academicians. According to the results of a study carried out by Kirkgöz (2005), the lack of disciplinary materials in terms of teaching English in Economics can

cause difficulties among English teachers regarding the provision of relevant teaching materials for Turkish students. Several related studies were conducted on various aspects of vocabulary teaching. To illustrate, Tribble & Jones (1990), Gabrielatos (2005) and Barlow (1992) conducted a study on homonyms and synonyms as well as lexical inference. Tribble & Jones (1990) studied words and grammar as well as general grammar rules. The current study performed the tasks performed by the students throughout process of the study; the outcomes were parallel with the literature discussed before. Levy (1990) and Willis (1998) carried out a study on the implementation of a syllabus to discover & learn phrases or typical collocations, a study on ESP terminology and derivations. Barlow (1992) conducted various researches on the analysis of usage of lexical items, analysis of the language used in particular books and textbooks, the comparison of language usage between native and non-native speakers, and a study regarding word order. Leech (1994) and Gabrielatos (2005) performed a study on lexical & critical examination of traditional ELT rules. Willis and Willis (1996) conducted a study on consciousness raising (increase awareness and sensitivity to language). Cob (1997) studied new lexis through multiple contexts. Willis (1998) conducted a study on potentially different meanings of some frequent words, comparison of the characteristics of written and spoken discourse as well as the frequency of some items in different types of texts. Gabrielatos (2005) carried out a study on both intensive and extensive reading with Spanish ESP students. Marinov (2010, 2011) conducted a study on meeting some of the principles of the Lexical Approach to learning / teaching English.

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter presents the conclusions resulting from this study. In this section of the study, the conclusion and a number of recommendations are presented for further design and research into the current issue handled throughout the study.

6.2. Conclusion and Implications

The present study examined the effectiveness of a lexical syllabus in enhancing engineering faculty students' technical vocabulary store. The results indicate that the lexical syllabus is relatively effective in enhancing the depth of learners' technical vocabulary. To some extent, the number of uses of technical vocabulary items in the students' test results also expands, which appears to contribute to the students' overall understanding of technical English. Besides the quantitative testing results, the learners also expressed positive attitudes towards the design and function of the lexical instruction.

The lexical syllabus, which is the core of the current study, emphasizes the most frequent uses of the technical vocabulary in Electrical & Electronics Engineering English. The most frequent words are those which are mostly encountered in the technical texts, and mastery of these is especially rewarding. Each word very frequently used and a number of minor words that can be given a low priority in the selection of items to be taught. The top 200 most frequent words on the list in this study have quite a low percentage in the whole corpus. The function words that compose the structural framework of language—which are all ignored—and that are the recurrent elements of phrases to dominate the frequency list.

Utility in a lexical syllabus is not simply confined to the exploitation of mostly recurrent vocabulary items, and prominent among those are devices, signals and strategies in both spoken and written discourse. The emphasis shifts from constructing messages to delivering them with maximum effect and thus enabling learners to achieve their intended goals.

The vocabulary terms used in the syllabus was selected depending on their frequency. Therefore, frequency is fairly useful; however, language teaching cannot proceed with only 200 or so of the most frequent words. Words relating to classroom environment reality ought to be added; such as classroom procedures, etc.

For deciding the central usage of items, computers are often more reliable than other tools and frequently produce evidence that goes beyond expectations. The importance of such evidence should not be underestimated in the preparation of the syllabus.

The lexical syllabus does not foster massive vocabulary acquisition, yet encourages learners to make full and extended use of words they have already learned through the combination of elements again and again. In the newly designed lexical syllabus, such things are secondary, and they should result from of the implementation of the lexical syllabus rather than constrain it.

As highlighted by researchers and mentioned in the literary review, it has been acknowledged that the target group learners, although they are all adults, are far from what could be categorized as a homogeneous group (Mc Kay & Tom. 1999) of ESP learners considering their previous learning experience. For example, the newly developed course is to consider their previous learning experience and their level of proficiency as well as the difficulties they face in terms of the technical vocabulary capacity related to their field. The course should attempt to bridge the gap between learners' competence at the beginning of the course and the competence required of them in the process of their engineering education.

As technology develops and new occupations emerge, there is an increasing need for ESP studies to support the educational programmes both in Turkey and abroad. There are several technical English courses in almost all universities around Turkey. The researcher carried out the study in EEE; however, equivalent studies are needed in other fields such as medical sciences, chemistry and other engineering departments. Since there is a lack of corpus-based studies in ESP contexts, further studies can also be carried out through the corpus-based approach. Besides, the role of language teachers in terms of creating ESP materials and their applications is significant. There should be more teacher training programmes, especially at ELT departments which address such inadequacies in the field.

Apparently, ESP instructors are faced with a major challenge and have to be properly trained on aspects of ESP principles and practice as the outcome of their effort

to deliver effective and efficient ESP courses is heavily dependent on the multi-dimensional nature of the roles assumed of them (Chostelidou, Griva & Tsakiridou, 2009). Although the complexity of adopting a needs-based approach to ESP cannot be ignored, needs analysis as a decision making process which informs course design specifications (Bosher & Smalkoski 2002) is regarded as indispensable component of an ESP course (Long 2005).

Professional requirements in teaching and learning environment should be taken into consideration, since rapid developments in technology require more and more science-oriented engineers for whom English is primarily a library language. Learners are expected to comprehend sufficient English to gain access to relevant knowledge in textbooks and particularly in periodicals and journals. Furthermore, another significant part English plays for engineers or engineering students is that English is required as a *lingua franca* at conferences, symposia, and seminars, during which they ought to understand both written and spoken specialized language. Besides, participating actively in such meetings requires an ability to communicate with colleagues, participants and so on. Moreover, skills in the specialized language of Engineering also demand knowledge of informal language. The professional requirement to comprehend the written word concerns ultimately almost all engineering students as well as engineers in their professional field. The proportion of engineers who have the opportunity to study English or practice it in countries where people speak English may not be possible; therefore, at the university level, English teachers should concentrate on teaching to engineering students the skills needed to read the materials such as memos, text messages and e-mails sent by their colleagues written in everyday English as well as the skills needed for writing. Therefore, there is a strong need for a specialised syllabus specially designed for the students' needs.

As a conclusion, with the increasing specialization within professional communities and the consequent demand for more specialized language learning, language instructors often do not have sufficient knowledge of the specific language required by their learners. Thus, the instructors often lack the authority that will guarantee their acceptance as credible sources of language knowledge by learners who have a high level of competence within their own community of practice and, on occasion, know more than their instructors. A lexical approach to ESP constitutes one way of resolving this problem and of increasing the authority of the language instructor. The collection and analysis of a corpus of naturally occurring language that the target

discourse community uses will provide the most frequent lexis in use. By using such lexis as the basis of at least one strand in a syllabus, the language instructor will be able to teach the specialized language in use by the target discourse community without difficulty.

6.3. Recommendations for Further Studies

To begin with, since precisely which syllabus practice is the most useful for EFL productive lexical teaching remains unknown, future inquires may focus on the effect of different syllabi. Moreover, the syllabus was designed based on the data obtained from three courses presented in the first year of the technical education, which restricts the number of vocabulary items used in the content of the syllabus. Thus, there should be more studies regarding technical syllabus designs and more detailed technical corpora should be prepared to help the ESP students enhance their technical vocabulary.

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APPENDICES

APPENDIX A: NEEDS ANALYSIS QUESTIONAIRE

Name & Surname: _____

Email address & Phone number: _____

Phone number: _____

1. What do you expect to do in a technical vocabulary course? Please grade according to your priority from the most to the least one: (1,2,3,4,5)

a) To learn more vocabulary _____

b) To understand written texts in course books more efficiently _____

c) To understand spoken English more efficiently _____

d) To speak more fluently _____

e) To write more efficiently _____

2. Do you see any advantages in a vocabulary based Technical English course which is specially designed for you? If so, what are they?

_____

_____

_____

3. How much time do you regularly spend working on English outside classes?

a) 1 hour per week **b) 2 hours per week**

c) at least 1 hour a day **d) more than one hour a day**

4. Think back to a useful and enjoyable English course you attended in the past. What made that course so good for you?

_____

_____

_____

5. Please tell us about your language level at the moment (NOW) and your priorities for improvement by the end of the Technical English course (FUTURE), where 1-5 correspond to: 1,2,3,4,5 1 None / 2 Not great / 3 OK /4 Good / 5 Excellent

	NOW	FUTURE
a) your range of vocabulary	_____	_____
b) your comprehension when reading disciplinary texts	_____	_____
c) your understanding of other speakers in English	_____	_____
d) your competency in speaking	_____	_____
e) your accuracy when writing	_____	_____

6. Please tell us how much time you expect to use English in the following contexts where 1-5 correspond to: 1 Never / 2 rarely / 3 Sometimes / 4 Frequently / 5 A lot

a) reading reports, correspondence etc. _____

b) reading instruction manuals, technical articles _____

c) telephone calls _____

d) conversation and informal meetings in small groups _____

e) addressing an audience- giving presentations _____

g) taking notes during lessons, meetings, conferences etc. _____

h) writing emails _____

i) writing technical reports _____

j) working with others who speak English _____

k) translating English texts _____

7. What expectations do you have of your English teacher or the technical English course?

_____

_____

_____

8. Is there anything else we should know; such as special needs, learning difficulties or other factors that might affect your learning English?

_____

_____

_____

Thank you for completing this questionnaire. We will treat the information you have given us with the strictest confidence, using it.

APPENDIX B. ELECTRICAL & ELECTRONICS ENGINEERING WORD LIST

absorb
accelerate
access
ace
acoustic
actuated
adaptive
adjacent
adjoint
adjusting
aerodynamic
algebra
algorithm
aliasing
alternate
ambient
ampere
amplification
amplitude
amps
analog
analogous
analogy
analyses
angle
antenna
app
apparatus
applies
approximate
arbitrarily
arc
area
arithmetic
armature
array
arrow
asymptotic
asynchronous
attenuation
augmented
autocorrelation
automated
autonomous
axes
backlash
balance
bandpass
bands
bandwidth
base
baseband
battery
beam
bifurcation
binary
binomial
bipolar
bit
board
boiler
booster
bound
boundary
breakaway
breakdown
breaker
broadband
broadcast
bundle
buses
cable
calculate
calculus
calibration
canonical
capacity
car
carrier
cartesian
cascade
causal
cavity
cells
chamber
change
channel
chapter
charge
chip
circle
circuit
circular
click
cliffs
clockwise

closed
coaxial
coefficient
coil
combustion
command
compact
compensate
components
compression
compressor
compute
condenser
conduction
configuration
conformal
conjugate
constant
constellation
constraint
contact
contingency
contour
control
converge
convert
conveyor
convolution
cooling
copper
core
corona
coulomb
counter
counterclockwise
coupling
crane
crossover
cubic
curl
current
curve
curvilinear
cutoff
cycle
cylinder
damp
dashed
decibels
decimal
decoder
decomposition
decoupled
deflection
deformation
demodulation
denominator
denote
density
depreciation
derivation
derive
designate
detector
determinant
deviation
diagonal
diagram
diaphragm
dielectric
differentiate
digit
dimensional
diode
dipole
disc
discharge
disconnected
discontinuity
discontinuous
discrete
dispatch
displacement
display
dissipation
distortion
distributor
disturbances
divergence
dot
downward
drag
drift
drive
droop
dual
dynamic
efficiency
eigenfunction
eigenvalue
eigenvector
elastic

electricity
electrodynamics
electromagnetic
electromechanical
electron
electronics
electrons
electrostatic
elliptic
enclosure
encoding
energy
ensemble
entropy
equal
equation
equilibrium
equipotential
equivalent
estimator
euclidean
excitation
expand
exponent
factorization
fading
faraday
faulty
feed
feedback
feedforward
fiber
field
figure
filter
finite
fixed
flapper
flip
float
flop
flow
fluid
flux
fourier
fraction
frequency
friction
frobenius
function
fuses
fuzzy
gamma
gauge
gaussian
gear
generate
geometric
grad
gradient
graphical
gravity
grid
ground
hamming
hardware
harmonic
heater
high
homogeneous
horizontal
hybrid
hydraulic
hydroelectric
hyperbolic
hysteresis
impedance
implement
impulse
increment
indicator
indices
induce
inequality
infinity
inflow
initial
inner
input
inrush
insert
instability
installation
installed
instantaneous
insulate
integer
integral
integrate
interchange
interconnect
interface

interference
interpolation
intersect
intersymbol
interval
invariant
inversely
inverted
ions
isolated
isotropic
iteration
junction
kinetic
labeled
labview
ladder
lagging
lagrange
laplace
laser
leakage
legendre
limiter
linear
linkage
linked
liquid
load
locus
log
logarithm
loop
lossless
lossy
loudspeaker
machines
magnet
magnitude
manual
mapped
margin
mass
matrix
measured
mechanics
mechanisms
membrane
memory
microphone
minimise
minus
mode
model
modem
modify
modulated
momentum
monitoring
motions
motor
mounted
multichannel
multilevel
multipath
multiply
narrowband
network
neural
nodes
nominal
noncausal
noncoherent
nonhomogeneous
nonlinear
nonminimum
nonnegative
nonsingular
nontrivial
nonzero
normalized
notation
nozzle
nuclear
numerator
numeric
offset
ohm
online
operators
optical
optics
optimal
optimisation
orbit
oriented
orthogonal
orthonormal
oscillation
outage
outer
output

outward
overdamped
overhead
overload
overshoot
panel
parabola
parameter
parseval
partial
passband
peak
pendulum
periodic
permeability
permittivity
perpendicular
phase
photoelectric
physically
piecewise
piezoelectric
pin
pipe
piston
pivot
planar
plane
plant
plate
plots
plug
pneumatic
pole
polynomial
polynomials
pontryagin
potentials
potentiometer
power
pointing
preceding
precision
preface
prefault
prelab
prey
primary
probe
proceed
process
programmable
propagate
properties
proportionality
prototype
proximity
pulse
pump
quadrant
quantization
quantizer
radial
radians
radiate
radio
radius
ramp
rate
rayleigh
reactance
reactor
reciprocal
rectangle
rectifier
redundancy
region
regulated
relativity
relay
remainder
reservoir
reset
residue
resistance
resistive
resistor
resonance
resultant
reversed
rigid
river
robot
robust
rod
root
rotare
rotor
rows
saddle
salient
satellite

saturation
scalar
scanning
scope
secondary
segments
semicircle
semiconductor
sensor
series
set
settling
shaft
shift
shock
shunt
sideband
sided
signal
simulate
simulink
singular
sinusoid
sketch
slack
sliding
software
solenoid
solid
space
spatial
spectra
sphere
spinning
spiral
spline
spring
square
stability
starter
state
stations
steady
stiffness
stochastic
stokes
stored
string
subsection
subspace
substation
substitute
subsystem
subtract
subtransient
summation
superposition
supply
surfaces
suspension
swing
switch
symbolic
symmetry
synchronize
synthesis
system
tachometer
tangent
tank
tensegrity
terminal
termination
theorem
thermal
threshold
timers
tool
toolbox
torque
torques
torsional
trajectories
trajectory
transactions
transducer
transfer
transforms
transient
transients
transistor
transition
translational
transmit
transpose
transverse
triangle
trigonometric
tripped
tube
tuned
turbo

turbine
unbalanced
uncompensated
uncontrollable
uncorrelated
undamped
underdamp
undertermine
unipolar
uniqueness
unitary
unstable
unsymmetrical
upward
utilities
value
valve
van
variables
variance
varying
vector
velocity
vertex
vertical
vibrating
vibration
vibrations
viscous
volt
voltage
voltmeter
wattmeter
wave
waveform
waveguide
wavelength
weight
wheel
width
wileyplus
wind
windup
wire
workpiece
ybus
yield
zone

APPENDIX C. TECHNICAL VOCABULARY TEST

Part I Introduction to Electrical Engineering

A) Read the text below and try to match the vocabulary items given in **bold** with the definitions**.**

COMPUTER-AIDED CIRCUIT ANALYSIS: SPICE

If the source consists of two (or more) signals, we know from 1) **linear** system theory that the 2) **output** voltage equals the sum of the outputs 3) **produced** by each signal alone. In short, linear 4) **circuits** are a special case of linear 5) **systems**, and therefore superposition 6) **applies**. In particular, suppose these 7) **component** signals are complex 8) **exponentials**, each of which has a 9) **frequency** different from the others. The transfer 10) **function** portrays how the circuit affects the 11) **amplitude** and 12) **phase** of each component, allowing us to understand how the circuit works on a 13) **complicated** signal. Those components having a frequency less than the 14) **cutoff** frequency 15) **pass through** the circuit with little 16) **modification** while those having higher frequencies are 17) **suppressed**. The circuit is said to act as a 18) **filter**, filtering the source signal based on the frequency of each component 19) **complex** exponential. Because low frequencies pass through the filter, we call it a 20) **lowpass** filter to express more precisely its function.

Match the definitions and the words given in the table.

a) _____ (v.) to make use of something or use it for a practical purpose.

b) _____ (adj.) involving a lot of different parts, in a way that is difficult to understand.

c) _____ (n.) a large amount or wide range.

d) _____ (n.) a part that combines with other parts to form something bigger.

e) _____ (v.) to make something or bring something into existence.

f) _____ (v.) to go past a particular point in time.

g) _____ (adj.) consisting of or to do with lines.

h) _____ (n.) a process which a computer or a software program uses to complete a task.

i) _____ (n.) an amount of something produced by a person, machine, factory, country, etc.

j) _____ (n.) a system such as a business or other organization that consists of many connected parts which should change as conditions change in order to succeed.

k) _____ (n.) an electronic filter that passes low-frequency signals and attenuates (reduces the amplitude of) signals with frequencies higher than the cutoff frequency.

l) _____ (n.) any stage in a series of events or in a process of development.

m) _____ (n.) a set of connected things or devices that operate together.

o) _____ (n.) a computer program that receives and processes information before displaying it or preventing it from being seen.

p) _____ (v.) to prevent something from continuing or operating.

q) _____ (n.) a closed system of wires or pipes through which electricity or liquid can flow.

r) _____ (n.) a number or sign that shows how many times another number is to be multiplied by itself.

s) _____ (n.) a change to something, usually to improve it.

t) _____ (n.) the act of stopping the supply of something.

u) _____ (n.) the number of times something happens within a particular period.

B) Word formation: Use the words in their correct forms

Introduction to Computer Programming
Types of Data

Computers are often 1) _____ to as digital devices. The term *digital* can be used to 2) _____ anything that uses binary numbers. *Digital data* is data that is 3) _____ in binary, and a *digital device* is any device that works with binary data. In this section we have 4) _____ how numbers and 5) _____ are stored in binary, but computers also work with many other 6) _____ of digital data. For example, 7) _____ the pictures that you take with your 8) _____ camera. These images are 9) _____ of tiny dots of color known as *pixels*. (The term pixel stands for *Picture element*.) Each pixel in an image is 10) _____ to a numeric code that 11) _____ the pixel's color. The numeric code is stored in 12) _____ as a binary number. The music that you play on your CD player, iPod or MP3 player is also digital. A digital song is broken into small pieces 13) _____ as *samples*. Each sample is converted to a binary number, which can be stored in memory. The more samples that a song is 14) _____ into, the more it sounds like the original music when it is played back. A CD 15) _____ song is divided into more than 44,000 samples per second!

1) reference
2) descriptive
3) storage
4) discussion
5) characteristics
6) typical
7) consideration
8) digit
9) composition
10) conversion
11) representative
12) memorable
13) knowledgeable
14) division
15) qualification

C) Cloze Tests

I) Circle the correct choice Part A

MEASUREMENT OF POWER A *wattmeter* is an 1) _____ with a potential coil and a current coil so arranged that its deflection is 2) _____ to *VI* cos ϑ, where *V* is the voltage (rms value) 3) _____ across the potential coil, *I* is the 4) _____ (rms value) passing through the current coil, and ϑ is the 5) _____ between *V* and *I.* By 6) _____ such a single-phase wattmeter to 7) _____ the average real power in each phase (with its current 8) _____ in series with one phase of the load and its 9) _____ coil across the 10) _____ of the load), the total real power in a three-phase system can be 11) _____ by the sum of the wattmeter readings. However, in practice, this may not be possible due to the 12) _____ of either the neutral of the wye 13) _____, or the individual phases of the delta connection. Hence it is more desirable to have a method for measuring the total real 14) _____ drawn by a three-phase load while we have 15) _____ to only three line terminals.

1) a)	instrument	b) indication	c) conversion	d) computation
2) a)	different	b) proportional	c) transferable	d) winding
3) a)	applied	b) practiced	c) stored	d) administered
4) a)	meaning	b) storage	c) current	d) necessity
5) a)	information	b) angle	c) solution	d) concern
6) a)	linking	b) switching	c) converting	d) inserting
7) a)	measure	b) convey	c) lengthen	d) process
8) a)	differentiation	b) stage	c) coil	d) step
9) a)	valuable	b) potential	c) helpless	d) systematic
10) a)	admission	b) claim	c) phase	d) knowledge
11) a)	determined	b) disqualified	c) selected	d) realized
12) a)	susceptibility	b) non-accessibility	c) simplicity	d) reliability
13) a)	connection	b) arrangement	c) selection	d) presentation
14) a)	division	b) feature	c) methodology	d) power
15) a)	suppression	b) access	c) complication	d) production

II) Circle the correct choice Part B

The three-phase power can be 1) _____ by three single-phase watt-meters having current coils in each line and 2) _____ coils connected across the given line and any common 3) _____. Since this common junction is completely 4) _____, it may be placed on any one of the three lines, in which case the wattmeter 5) _____ in that line will indicate zero power because its potential coil has no voltage across it. Hence, that wattmeter may be 6) _____ with, and three-phase power can be measured 7) _____ only two single-phase watt-meters having a common potential junction on any of the three lines in which there is no current coil. This is known as the two-wattmeter method of measuring three-phase 8) _____. In general, m-phase power can be measured by means of m − 1 watt-meters. The method is valid for both balanced and 9) _____circuits with either the 10) _____ or the source unbalanced.

1) a)	designed	b) indicated	c) converted	d) measured
2) a)	differential	b) durable	c) potential	d) winding
3) a)	response	b) circuit	c) storage	d) junction
4) a)	arbitrary	b) storable	c) harmless	d) necessary
5) a)	informed	b) connected	c) processed	d) concerned
6) a)	dispensed	b) empowered	c) enlarged	d) widened
7) a)	with the aim of	b) by means of	c) in spite of	d) in addition to
8) a)	datum	b) utility	c) reference	d) power
9) a)	unbalanced	b) formed	c) assisted	d) systematized
10) a)	circulation	b) network	c) load	d) deformity

III) Circle the correct choice

Introduction to Information Technology

Information technology is the study, design, development, 1) _____, support or management of computer 2) _____ information systems, particularly 3) _____ applications and computer 4) _____. It is the capability to 5) _____ input, process, store, output, 6) _____ and receive data and information, including text, graphics, sound and video as well as the ability to control 7) _____ of all kinds electronically. It is 8) _____ computers, networks, satellite communications, robotics, e-mail, electronic games and 9) _____ office equipment. The information industry consists of all computers, communications and electronics related organizations, including hardware, software and services. Information is the summarization of data. Data are raw facts and figures that are 10) _____ into information, such as summaries and totals.

1) a)	system	b) indication	c) development	d) implementation
2) a)	interested	b) shocked	c) based	d) demanded
3) a)	reply	b) precision	c) durability	d) software
4) a)	purpose	b) hardware	c) insistence	d) vitality
5) a)	electronically	b) disposable	c) accessible	d) undeniable
6) a)	elaborate	b) implement	c) transmit	d) apply
7) a)	sources	b) machines	c) waves	d) processors
8) a)	comprised of	b) engaged with	c) referred to	d) described as
9) a)	exchanged	b) aided	c) automated	d) transferred
10) a)	responded	b) processed	c) charged	d) known

D) Match the words in the passage with their synonyms

Power in Balanced Three-Phase Circuits

In a balanced three-phase system, the sum of the three individually **pulsating** phase powers adds up to a **constant**, non-pulsating total power of **magnitude** three times the average real power in each **phase**. That is, **in spite of** the sinusoidal nature of the voltages and currents, the total instantaneous power delivered into the three-phase load is a constant, equal to the total average power. The real power *P* is expressed in watts when voltage and current are **expressed** in volts and amperes, **respectively**. You may **recall** that the **instantaneous** power in single-phase ac circuits **absorbed** by a pure inductor or capacitor is a double-frequency sinusoid with zero average value. The instantaneous power absorbed by a pure resistor has a nonzero **average** value plus a double-frequency term with zero average **value**. The instantaneous reactive power is alternately positive and negative, **indicating** the reversible flow of energy to and from the reactive **component** of the load. Its **amplitude** or maximum value is known as the reactive power.

1) pulsate-	**a) remember**
2) constant-	**b) immediate**
3) magnitude	**c) ingest**
4) phase-	**d) common**
5) in spite of	**e) in turn**
6) express-	**f) prize**
7) respectively	**g) stage**
8) recall-	**h) show**
9) instantaneous-	**i) significance**
10) absorb-	**j) convey**
11) average-	**k) invariant**
12) value -	**l) part**
13) indicate-	**m) despite**
14) component-	**n) amplitude**
15) amplitude-	**o) beat**

G) Multiple choice questions

TIME-DEPENDENT CIRCUIT ANALYSIS

With the aid of theorems 1) _____ Laplace transforms and the table of transforms, linear differential equations can be 2) _____ by the Laplace transform method. Transformations of the terms of the differential equation yield an algebraic equation 3) _____ the variable s. Thereafter, the solution of the differential equation is 4) _____ by simple algebraic manipulations in the s-domain. By 5) _____ the transform of the solution from the s-domain, one can get back to the time domain. The 6) _____ due to each term in the partial-fraction 7) _____ is determined directly from the transform table. There is no need to perform any kind of 8) _____. Because initial conditions are automatically 9) _____ into the Laplace transforms and the constants arising from the initial conditions are automatically evaluated, the resulting response expression 10) _____ directly the total solution.

1) a)	depending	b) driving	c) concerning	d) including
2) a)	formulated	b) solved	c) idealized	d) examined
3) a)	in terms of	b) because of	c) dependent on	d) with the aim of
4) a)	imported	b) affected	c) sensed	d) inconvenienced
5) a)	defining	b) forming	c) inverting	d) signifying
6) a)	response	b) description	c) stand	d) resistance
7) a)	interest	b) expansion	c) shape	d) possession
8) a)	integration	b) storage	c) determination	d) variety
9) a)	separated	b) changed	c) incorporated	d) influenced
10) a)	reforms	b) yields	c) recharges	d) results

APPENDIX D. LEXICAL SYLLABUS ON ELECTRICAL & ELECTRONICS ENGINEERING ENGLISH AT NIGDE UNIVERSITY

The course will continue for 14 weeks in Fall term, 2015. Students are responsible for taking two vocabulary tests; the grade they will get will be added to the grades they will get from Visa and Final exams (50%). The course is purely on the vocabulary of the courses at the department. The distribution of the lessons to the weeks is as follows:

Instructor: Necmettin KÜRTÜL (nkurtul@nigde.edu.tr)

Week I

Unit 1 Pre-test and implementation of the Questionnaire

Week II

Unit 1 Information Technologies

Week III

Affixation in English

Week IV

Management Information systems (MIS)

Week V

Moving and Copying data

Week VI

Unit 2 Introduction to Electrical Engineering: Electrical Quantities

Week VII

Electricity

Week VIII

Electric Circuits

Week IX

Semiconductor Devices

Week X

Unit 3 Computer Programming: Anatomy of Computer

Week XI

Circuit concepts

Week XII

Nodal- voltage methods

Week XIII

Nodal voltage & Mesh – Current analysis

Week XIV Implementation of Post-test

APPENDIX E. SAMPLE LESSON

Unit III

Part I

Unit VII Introduction to Computer Programming

A) Read the text below and try to guess the meanings of the vocabulary items given in **bold.**

From Machine Language to Assembly Language

Computers can only 1) **execute** programs that are written in machine language. A program can have thousands or even millions of binary 2) **instructions**, and writing such a program would be very 3) **tedious** and time consuming. Programming in machine language would also be very difficult because putting a 0 or a 1 in the wrong place will cause an 4) **error**. Although a computer's CPU only understands machine language, it is 5) **impractical** for people to write programs in machine language. For this reason, 6) ***assembly*** *language* was created in the early days of computing as an 7) **alternative** to machine language. 8) **Instead of** using binary numbers for instructions, assembly language uses short words that are known as *mnemonics*. For example, in assembly language, the mnemonic add typically means to 9) **add** numbers, mul typically means to 10) **multiply** numbers, and mov typically means to move a value to a 11) **location** in memory. When a 12) **programmer** uses assembly language to write a program, he or she can write short mnemonics instead of binary numbers.

• Output devices

1- execute	**2- instructions**	**3- tedious**	**4- error**
5- impractical	**6- assembly**	**7- alternative**	**8- instead of**
9- add	**10- multiply**	**11- location**	**12- programmer**

Match the definitions and the words given in the table.

a) _____ (n.) the structure produced by this process.

b) _____ (n.) something that is different from something else, especially from what is usual, and offering the possibility of choice.

c) _____ (n.) the increase in the amount and suddenly in number.

d) _____ (n.) a mistake.

e) _____ (v.) to increase very much in number.

f) _____ (prep.) rather than.

g) _____ (adj.) boring.

h) _____ (adj.) e not naturally good at doing useful jobs such as making or repairing things.

i) _____ (v.) to put two or more numbers or amounts together to get a total.

j) _____ (n.) a person whose job is to produce computer programs.

k) _____ (v.) to do or perform something, especially in a planned way.

l) _____ (n.) a place or position.

B) Word Formation

Use the words in their correct forms.

Key Words, Operators, and Syntax: an Overview

Each high-level language has its own set of 1) _____ words that the 2) _____ must use to write a program. The words that make up a high-level programming language are 3) _____ as key words or 4) _____ words. Each key word has a specific meaning, and cannot be used for any other purpose. You 5) _____ saw an example of a Python statement that 6) _____ the key word print to print a message on the screen. In 7) _____ to key words, programming languages have 8) _____ that perform various operations on data. For example, all programming languages have math operators that 9) _____ arithmetic. In Python, as well as most other languages, the + sign is an operator that adds two numbers. The 10) _____ adds 12 and 75:

```
12 + 75
```

1) definition
2) programme
3) know
4) reservation
5) previous
6) useful
7) add
8) operate
9) performance
10) follow

C) Cloze Test: Circle the correct choice

High-Level Languages Part A

Although assembly language makes it 1) _____ to write binary machine language instructions, it is not without 2) _____. Assembly language is primarily a direct 3) _____ for machine language, and like machine language, it 4) _____ that you know a lot about the CPU. Assembly language also requires that you write a large number of instructions for even the simplest program. Because assembly language is so close in nature to machine language, it is 5) _____ to as a low-level language. In the 1950s, a new generation of programming languages known as high-level languages began to 6) _____. A high-level language allows you to create powerful and complex programs without knowing how the CPU works, and without writing large numbers of low-level instructions. 7) _____, most high-level languages use words that are easy to understand. For example, if a programmer were using COBOL (which was one of the early high-level languages created in the 1950s), he or she would write the following instruction to 8) _____ the message Hello world on the computer screen:

DISPLAY "Hello world"

1) a) probable	b) unnecessary	c) sensitive	d) practical
2) a) connections	b) signs	c) difficulties	d) signals
3) a) add	b) substitute	c) refers	d) operate
4) a) resists	b) converts	c) controls	d) requires
5) a) referred	b) stored	c) executed	d) defined
6) a) correct	b) appear	c) measure	d) weigh
7) a) Otherwise	b) As a result	c) However	d) In addition
8) a) display	b) combine	c) destroy	d) cooperate

D) Multiple choice questions

High-Level Languages Part B

In addition to key words and 1) _____, each language also has its own *syntax,* which is a 2) _____ of rules that must be strictly followed when writing a program. The syntax rules 3) _____ how key words, operators, and various punctuation 4) _____ must be used in a program. When you are learning a programming language, you must learn the syntax rules for that 5) _____ language. The 6) _____ instructions that you use to write a program in a high-level programming language are called 7) _____. A programming statement can 8) _____ key words, operators, punctuation, and other allowable programming 9) _____, arranged in the proper 10) _____ to perform an operation.

1) a)	operators	b) indicators	c) conversions	d) computations
2) a)	kind	b) set	c) type	d) sort
3) a)	dictate	b) respond	c) store	d) administer
4) a)	contents	b) positions	c) characters	d) concerns
5) a)	meaningful	b) storable	c) harmful	d) particular
6) a)	logical	b) individual	c) micro	d) current
7) a)	statements	b) switches	c) wavelengths	d) processors
8) a)	take off	b) put up	c) consist of	d) turn into
9) a)	evaluations	b) elements	c) assistances	d) systems
10) a)	response	b) claim	c) charge	d) sequence

E) Match the words in the passage with their synonyms

Compilers and Interpreters

Because the CPU understands only machine language **instructions**, programs that are written in a high-level language must be **translated** into machine language. **Depending o**n the language that a program has been written in, the programmer will use either a **compiler** or an interpreter to make the translation. A compiler is a program that translates a high-level language program into a **separate** machine language program. The machine language program can then be **executed** any time it is needed. Compiling and executing are two different processes. The Python language uses an **interpreter**, which is a program that both translates and executes the instructions in a high-level language program. As the interpreter reads each individual instruction in the program, it **converts** it to machine language instructions and then **immediately** executes them. This process repeats for every instruction in the program. Because interpreters combine translation and execution, they **typically** do not create separate machine language programs.

1) instruction**-**	**a)** collector
2) translate**-**	**b)** different
3) depend**-**	**c)** rely
4) compiler**-**	**d)** interpret
5) separate**-**	**e)** illustrating
6) executed**-**	**f)** direct
7) interpreter**-**	**g)** at once
8) convert**-**	**h)** change
9) immediately-	**i)** command
10) typically-	**j)** translator

F) Multiple choice questions

The 1) _____ that a programmer writes in a high-level language are called source 2) _____. Typically, the programmer types a program's code into a 3) _____ editor and then saves the code in a 4) _____ on the computer's 5) _____. Next, the programmer uses a compiler to 6) _____ the code into a machine language program, or an 7) _____ to translate and execute the code. If the code contains a syntax error, however, it cannot be translated. A syntax error is a mistake such as a misspelled key word, a missing punctuation 8) _____, or the incorrect use of an operator. When this happens, the compiler or interpreter 9) _____ an error message indicating that the program contains a syntax error. The programmer corrects the 10) and then attempts once again to translate the program.

1) a)	dependences	b) drives	c) statements	d) inclusions
2) a)	formulation	b) code	c) ideal	d) examination
3) a)	text	b) cause	c) aim	d) key
4) a)	import	b) file	c) sense	d) interpretation
5) a)	definition	b) form	c) disk	d) significance
6) a)	translate	b) describe	c) stand	d) resist
7) a)	interest	b) interpreter	c) shape	d) possession
8) a)	character	b) storage	c) determination	d) variety
9) a)	separates	b) changes	c) displays	d) influences
10) a)	reforms	b) error	c) recharge	d) result

G) Multiple choice questions

The Python Interpreter

Python is an 1) _____ language. When you 2) _____ the Python language on your computer, one of the 3) _____ which is installed is the Python interpreter. The Python interpreter is a program that can read Python programming statements and 4) _____ them. (Sometimes we will refer to the Python interpreter 5) _____ as the interpreter.) You can use the interpreter in two modes: 6) _____ mode and script mode. In interactive mode, the interpreter waits for you to type Python statements on the 7) _____. Once you type a statement, the interpreter executes it and then waits for you to 8) _____ another statement. In script mode, the interpreter reads the 9) _____ of a file that contains Python statements. Such a file is known as a Python program or a Python script. The interpreter executes each 10) _____ in the Python program as it reads it.

1) a)	depended	b) driven	c) interpreted	d) included
2) a)	formulate	b) install	c) idealize	d) examine
3) a)	items	b) terms	c) findings	d) purposes
4) a)	value	b) execute	c) try	d) inconvenience
5) a)	sensitively	b) likely	c) simply	d) hardly
6) a)	interactive	b) descriptive	c) resistible	d) convertible
7) a)	screen	b) keyboard	c) ram	d) CPU
8) a)	type	b) integrate	c) determine	d) vary
9) a)	separators	b) buttons	c) contents	d) hardwires
10) a)	translation	b) statement	c) conclusion	d) result

APPENDIX F. TECHNICAL VOCABULARY USED IN THE TEST

1- linear
2- output
3- produce
4- circuit
5- system
6- apply
7- component
8- exponential
9- frequency
10- function
11- amplitude
12- phase
13- complicated
14- cutoff
15- pass through
16-modification
17-suppress
18- filter
19-complex
20- low-pass
21) referred as
22) describe
23) store
24) discuss
25)character
26) types
27) consider
28) digital
29) compose
30) convert
31)represent
22) memory
33) known
34) divide
35) quality
36) instrument
37) proportional
38) applied
39) current
40) angle
41) inserting
42) measure
43) coil
44) potential
45) phase
46) determine
47) non-accessibility
48) connection
49) power
50) access
51) measure
52) potential
53) junction
54) arbitrary
55) connect
56) dispense
57) power
58) unbalanced
59) load
60) system
61) implementation
62) based
63) software
64) hardware
65) electronically
66) transmit
67) machine
68) comprised of
69) automated
70) process
71) remember
72) recall
73) immediate
74) instantaneous
75) ingest
76) absorb
77) common
78) average)
79) in turn
80) respectively
81) prize
82) value
83) stage
84) phase
85) show
86) indicate
87) significance
88) amplitude
89) convey
90) express
91) invariant
92) constant
93) part
94) component
95) despite
96) magnitude
97) beat
98) pulsate
99) modify
100) electrical

APPENDIX G. MULTI WORD UNITS

Electric: circuit, current, field, potential, force, vector, equipotential, force, line, network, bulb, motor, component, energy, actuator, resistance, filter, furnace, friction, charge, shaver, vehicle, generator, flux density, utility, voltage, battery, appliances, field intensity, device, heater, stove, machines, dipole, power systems, monopole, quadrupole, machinery, power control, energy, supply, shock, utility system, power station, hydro-electric plant, supply system

Electrical: system, circuit, problem, conductivity, current, vibration, application, analog, network, force, equivalent, oscillation, signal, pulse, power, resistance, conductance, inductance, resistance, impedance, energy, shock, isolation, torque, radian, degree, output, energy, equipment, load, input, filter, power series, equilibrium state, state equations, variable.

Control: system, circuit, fuse, device, scheme, relay

Beam: equation, elastic beam, vibrating beam, walking beam, rigid beam, light beam, narrow beam, laser beam, radar beam, electron beam

Electronic: device, timer, circuit, component, pulse, charge, appliance, switch, power, system, control, amplifier, controller

Wave: acceleration, equation, propagation, rectifier, rectification

Charge: density, distribution, element- capacitor charge, voltage charge, battery charge

Dielectric: constant, medium, permittivity, material, strength, waveguide, interface, body, region, layer, boundary, slab, rod, sphere, loss, stress-polarized dielectric, nonpolar dielectric, slab-waveguide

Resistance: air-resistance, armature-resistance, primary-coil resistance, motor resistance, hydraulic resistance, internal resistance, external resistance, input resistance, rotor resistance, circuit resistance, cutoff-resistance

Magnetic: field, flux, actuator, beaming, wave, control, circuit, core, force, pole, pull, relay, levitation, torque, energy, ball-suspension, levitation system

Impedance: intrinsic impedance, wave impedance, input impedance, surface impedance, load impedance, internal impedance

Sensor: speed-sensor, force sensor, current-sensor-sensitivity, level-sensor- sensitivity, temperature sensor, flow sensor, torque sensor

Pulse: rectangular pulse, input pulse, output pulse, output pulse, pulse-transform, pulse-modulation, pulse-amplitude-modulation, pulse-code-modulation, pulse-width

Node: input node, output node, non-input node

Turbine: wind-turbine, steam-turbine, hydro-turbine, combustion-turbine, gas-turbine

Electro: statics, hydraulic-valve, magnetic device, mechanical drum, mechanical system, mechanical field, mechanical hysteresis, mechanical converter, motive-force, hydraulic-governor, hydraulic stress, chemical work, mechanical switch, magnetic-media

Oscillation: damped, free, torsional, vertical, simple-harmonic, self-sustained, nonlinear, forced, undamped, periodic, pure, sinusoidal, high-frequency, biochemical, under-damped, horizontal, synchronous, speed-deviational, interarea, rotor, modal

Others: air-gap, complex-conjugant, closed-loop, break-in, bus-bar, continuous-data, continuous-time, cross-correlation, cross-section, d-axis, filtered-reference, first-order, w-plane, z-axis, z-direction, zero-sequence, z-plane, z-transform

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APPENDIX I. SAMPLE LESSON PLAN

Main Aim:

-Students learn meaning and usage of target lexis

Sub Aims:

-Reading comprehension

-Noticing lexical structures

Materials:

Reading text / Laptop computer / Projector

STAGE /FOCUS/ PROCEDURE/ TIME

Stage: Warm-up

Focus: Student

Procedure: Use any warmer which gets Ss thinking about the topic/content and introduces the text. Time: 5 – 10 mins

Stage: Gist Read

Focus: Student

Procedure Assign a gist question and students read or listen to the text to answer it. / Give a time limit for a gist reading task/ Elicit the answer.

Time: 5 - 10

Stage: Reading for the meaning of the vocabulary in the texts

Focus: Student

Procedure: Assign reading for the meaning and the use of the vocabulary in the texts.

- Students read and listen to the text and complete the gaps with suitable forms of the vocabulary.

- Elicit the answers (have students pair check before doing this).

Time: 5 - 15

Stage: Language Analysis

Focus: S or S-S

Procedure: - Assign topic or task-related noticing task e.g., “Read the text and look for collocations and/or expressions that are used to talk about Information technologies”. Tell students to underline the lexical chunks on their copy of the text.

Time: 10 - 15

Stage: Clarification

Focus: T-Ss

Procedure: - Elicit the lexical chunks that the students found and write them on the board.

- Explain meaning where necessary and elicit and/or provide slot-fillers in semi-fixed expressions.

Time: 10 - 20

Stage: Controlled Practice

Focus: S-S

Procedure: - Get students to practice using the lexical chunks in speaking. For example, they ask their partner a question which would elicit one of the lexical chunks in the answer (e.g., Q “How would you describe the signaling process of in electricity?”

Time: 5 - 10

Stage: Production

Focus: T-Ss

Procedure: - Assign a writing task and specify that students have to use the lexical chunks that they extracted from the text. You can specify how many you want them to use or just give a minimum number. The task can be related by genre to the original text.

Procedure: - To make it easier to mark, you can ask them to underline them. Then when you assess their writing, give them a mark based only on the use of the lexical chunks, which means you only look at what is underlined and don’t bother correcting the text. Or mark them solely on how many they use, making it really easy.

Time: 10 - 15

Homework: Tell students to listen or read for lexical chunks when they are outside of class and assign them a number of chunks you want them to bring in to the next class (3 is a good number). You can ask for them to be related to the text or not (e.g. more lexical chunks related to the content of the lesson). This encourages them to notice lexical structures whenever they encounter the language.

APPENDIX J. CAMBRIDGE PLACEMENT TEST

PART A

Choose the best answer. Mark it with an X. If you do not know the answer, leave it blank.

1 _____ name is Robert.
a) Me b) I c) My

2 They _____ from Spain.
a) is b) are c) do

3 _____ are you from?
a) What b) Who c) Where

4 What do you do? I'm _____ student.
a) the b) a c) the

5 Peter _____ at seven o'clock.
a) goes up b) gets c) gets up

6 _____ you like this DVD?
a) Are b) Have c) Do

7 We _____ live in a flat.
a) don't b) hasn't c) doesn't

8 Wednesday, Thursday, Friday, _____
a) Saturday b) Tuesday c) Monday

9 _____ he play tennis?
a)Where b) Does c) Do

10 Have you _____ a car?
a) any b) have c) got

11 We don't have _____ butter.
a) a b) any c) got

12 _____ some money here.
a) There're b) There c) There's

13 We _____ got a garage.
a) haven't b) hasn't c) don't

14 Those shoes are very _____ .
a) expensive b) a lot c) cost

15 Have you got a pen? Yes, I _____ .
a) am b) have c) got

16 It is a busy, _____ city.
a) traffic b) quite c) noisy

17 They _____ at home yesterday.
a) was b) are c) were

18 I _____ there for a long time.
a) lived b) living c) live

19 He didn't _____ glasses.
a) put b) wear c) take

20 The restaurant was _____ busy.
a) very b) a lot c) many

21 Do you like the red _____ ?
a) it b) that c) one

22 He _____ to Brazil on business.
a) go b) goed c) went

23 Yesterday was the _____ of April.
a) third b) three c) day three

24 She's got _____ hair.
a) dark, long b) long and dark c) dark, long

25 I _____ play football at the weekend.
a) usually b) use c) usual

26 I _____ in an armchair at the moment.
a) sitting b) 'm sitting c) sit

27 My brother is older _____ me.
a) then b) that c) than

28 Their car is _____ biggest on the road.
a) than b) this c) the

29 It's the _____ interesting of his films.
a) more b) much c) most

30 The phone's ringing: _____ answer it.
a) I'll b) I c) will

31 Do you _____ classical or rock music?
a) rather b) prefer c) more

32 He has _____ breakfast.
a) ate b) eaten c) eat

33 The _____ have seen it before.
a) childs b) child c) children

34 I've never met an actor _____ .
a) before b) already c) after

35 _____ is very good exercise.
a) Swim b) To swim c) Swimming

36 Have you _____ been on a winter sports holiday?
a) always b) ever c) soon

37 I can't _____ another language.
a) speaking b) speak c) to speak

38 They _____ pay for the tickets.
a) haven't to b) don't have c) don't have to

39 _____ old is their car?
a) What b) When c) How

40 Are you _____ for one or two weeks?
a) staying b) stayed c) stay

41 Stephen _____ to visit his parents.
a) will b) going c) is going

42 I don't _____ getting up early.
a) not like b) want c) enjoy

43 We _____ like to see the mountains.
a) would b) will c) are

44 They _____ ever check their emails.
a) hard b) harder c) hardly

45 They won't come, _____ they?
a) won't b) come c) will

46 He _____ know how to spell it.
a) doesn't b) hasn't c) don't

47 Carla _____ to the radio all morning.
a) listening b) heard c) listened

48 They _____ come to the cinema with us.
a) doesn't b) not c) didn't

49 I like this song. _____ do I.
a) Either b) So c) Neither

50 We _____ them at eight o'clock.
a) meet b) 're meet c) 're meeting

PART B

51 They are going _____ in America next month.
a) to be b) will be c) be d) being

52 This is the cinema _____ we saw the film.
a) when b) which c) that d) where

53 Have you ever _____ in a jazz band?
a) seen b) played c) listened d) wanted

54 I'm _____ when I'm with you.
a) happyer b) happier than c) happier d) the happy

55 This is _____ than I thought.
a) bad b) badder c) worse d) worst

56 Can you tell me the way _____ ?
a) to the bank b) is the bank c) where is bank d) of the bank

57 Do you know what _____ ?
a) time is it b) time is c) time is now d) time it is

58 Were you _____ to open the door?
a) could b) can c) able d) possible

59 Everybody _____ wear a seat belt in the car.
a) must b) mustn't c) don't have to d) doesn't have to

60 Tom has lived in this town _____ three years.
a) since b) from c) after d) for

61 We _____ work in that factory.
a) use to b) was c) used to d) then

62 I think it _____ be sunny tomorrow.
a) will probably b) probably c) can d) will to

63 He _____ like his brother.
a) look b) isn't c) isn't look d) can look

64 _____ does your boyfriend look like?
a) How b) What c) Why d) Which

65 I've got _____ many problems.
a) too b) a c) enough d) really

66 If we get up in time, _____ catch the train.
a) we catch b) we caught c) we had caught d) we'll catch

67 They _____ to go to France for a year.
a) decide b) deciding c) decided d) to decide

68 I'm working _____ to pass my exam.
a) hardly b) much c) hard d) good

69 I'm writing _____ ask you to explain.
a) for b) in order to c) because d) because of

70 He said that most problems _____ by teenagers.
a) cause b) caused c) were caused d) were causing

71 What _____ to do at the weekend?
a) have you like b) are you liking c) do you like d) is you like

72 Football _____ in most countries.
a) plays b) players c) is played d) is playing

73 Who was _____ the door?
a) at b) on c) in d) of

74 We _____ lunch when you telephoned.
a) was having b) had c) were having d) are having

75 Your work is _____ better.
a) being b) doing c) getting d) falling

76 She could play the piano _____ she could walk.
a) during b) while c) as well d) before

77 The train was cancelled, so we _____ .
a) couldn't go b) wasn't go c) didn't went d) mustn't go

78 The problem was _____ solved
a)easy b) easy to c) an easy d) easily

79 It was a difficult journey, but I _____ get home.
a) could b) managed to c) at last d) was

80 We had not _____ heard the news.
a) already b) always c) yet d) today

81 We arrived at the station, but the bus _____ earlier.
a) has left b)had leave c) has leave d) had left

82 We can _____ walk or go by car.
a) both b) rather c) either d) neither

83 If I _____ enough money, I'd buy a new car.
a) had b) would c) did d) shall

84 It _____ correctly.
a) hasn't done b) hasn't been done c) hasn't been do d) not been done

85 The accident wouldn't have happened, if you had been more _____ .
a) careful b) carefully c) careless d) caring

86 It _____ be possible sometime in the future.
a) can b) hope c) may d) is

87 Schools then _____ having more children in the class.
a) was used to b) were used to c) was use to d) were use to

88 We _____ to go to work at six in the morning.
a) must b) would c) had d) did

89 They _____ an old photograph of the place.
a) came up b) came across c) came into d) came after

90 I _____ I had been able to meet her.
a) hope b) want c) think d) wish

91 We'll have taken our exams _____ this time next month.
a) by b) on c) during d) for

92 I will do badly in my work, _____ try harder.
a) if I'm not b) if I wasn't c) if I haven't d) if I don't

93 I _____ wasted my time when I was at university.
a) regret b) shouldn't c) ought not to d) shouldn't have

94 This is going to be my chance to _____ any difficulties.
a) repair b) sort out c) solve d) improve

95 It was difficult at first, but I soon got _____ it.
a) got used to b) get used to c) changed to d) used to

96 How did you manage to cook _____ a good meal?
a) so b) that c) absolutely d) such

97 The solution had been found, _____ we hadn't realised it.
a) however b) therefore c) although d) even

98 She _____ I had been doing for all that time.
a) asked to me b) asked for me c) asked with me d) asked me

99 They _____ heard us coming, we were making a lot of noise.
a) must have b) must c) might d) could

100 He _____ to help me with the decorating.
a) suggested b) offered c) invited d) told

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