



**UNIVERSITI PUTRA MALAYSIA**

***DEVELOPMENT OF A CORPUS OF MALAYSIAN KBSM ENGINEERING  
TEXTS AND RELATED WORD LIST***

***NG YU JIN***

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TEXTS AND RELATED WORD LIST**

**By**

**NG YU JIN**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in  
Fulfillment of the Requirements for the Degree of Doctor of Philosophy**

**June 2015**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

## **DEVELOPMENT OF A CORPUS OF MALAYSIAN KBSM ENGINEERING TEXTS AND RELATED WORD LIST**

By

**NG YU JIN**

**June 2015**

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Engineering students are required to read Engineering textbooks which are specialized in nature, containing significant amount of Engineering vocabulary and terminology. There is a language need for better comprehension of Engineering concepts and this can be done by focusing on the frequent and essential Engineering vocabulary required. In addition, since most English Language Teaching (ELT) teachers are non-specialists in the field of Engineering, they can be unguided when it comes to the teaching of required Engineering vocabulary in a classroom. Furthermore, the core problem concerning the Malaysian textbooks is that the textbooks produced are not based on any essential word lists or corpora in the syllabus. Thus, evaluating and analyzing the specialised textbooks is a substantial way to highlight the importance of lexical components for the Engineering students to initiate them into their discourse community and for ELT teachers who teach English for Specific Purposes (ESP) courses in Engineering.

Since there is no existing corpus available on the language applied in the teaching and learning of Engineering subjects in English, this study aims to develop an Engineering vocabulary corpus from the prescribed Malaysian KBSM Vocational Engineering Textbooks (MKVET). The corpus was then used to create the Engineering Word List (EnWL) with the properties of technical and semi-technical engineering vocabulary. The aims of the study were (1) To develop a pedagogic Engineering corpus from the Malaysian KBSM Vocational Engineering Textbooks (MKVET); (2) To investigate the similarities and differences in the vocabulary loading or distribution patterns of the Engineering textbooks when compared to the Malaysian KBSM Sciences and English in vocational schools. (3) To develop a specialised Engineering Word List (EnWL) from the created corpus and to determine the lexical patterns of language use in the Engineering textbooks in terms of noun compounds. These objectives were addressed in four research questions and the research design used was content analysis (corpus linguistics approach) to obtain data. The reliable concordance software was the

WordSmith Tools Version 5.0 (Scott, 2008) and RANGE (Heatley, Nation & Coxhead, 2002) were used for the purpose of text analysis and word list development.

The corpus is made up of 391,505 words (15,621 types) and the EnWL consists of 842 word families (1,704 types). Thus, the developed corpus and word list can be easily used by other researchers. The word selection criteria used in generating the EnWL is novel for detailed investigation in determining the essential Engineering words. This study suggests the usage of the General Service List (GSL), Academic Word List (AWL) and EnWL for Engineering students to gain greater benefit from word list learning in terms of text coverage. In addition, the suggested noun compounds for English for Engineering Purposes (EEP) provide extended insights to teachers and students to deal with the arbitraries in Engineering language, especially when noun compounds do not follow a specific pattern or hierarchy. With the EnWL and the Engineering corpus, the findings provide a foundation for teachers, textbook writers, syllabus designers and curriculum planners to design and develop more relevant and lexically guided materials to arrive at effective pedagogic approaches in teaching vocabulary.

**Keywords: Engineering Corpus, English Word List, Engineering Language, Engineering Noun Compounds, Engineering Lexis, Technical and Semi-Technical Engineering Vocabulary**

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah.

**PEMBANGUNAN KORPUS TEKS KEJURUTERAAN KBSM MALAYSIA  
DAN SENARAI KATA BERKAITAN**

Oleh

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Pelajar keruteraan perlu menggunakan buku teks kejuruteraan yang khusus yang menggunakan perbendaharaan kata dan terminologi kejuruteraan sebagai rujukan. Oleh itu terdapat keperluan bahasa untuk pemahaman yang lebih baik tentang konsep kejuruteraan. Perkara ini boleh dilakukan dengan memberi tumpuan kepada perbendaharaan kata Kejuruteraan yang kerap dan penting yang terdapat dalam buku teks. Di samping itu, kebanyakan pengajar bahasa Inggeris bukan pakar dalam bidang kejuruteraan, mereka tidak dapat menjelaskan dengan baik jika melibatkan kosa kata berkaitan kejuruteraan di dalam kelas. Tambahan pula, masalah utama buku teks di Malaysia yang dihasilkan tidak diberitahu atau berdasarkan mana-mana senarai perkataan penting atau korpus dalam sukatan pelajaran. Oleh itu, menilai dan menganalisis buku teks khusus adalah penting untuk menentukan komponen leksikal bagi pelajar Kejuruteraan dan menghubungkan mereka ke dalam komuniti mereka serta wacana untuk guru ELT mengajar Bahasa Inggeris bagi Tujuan Khusus (ESP) kursus Kejuruteraan.

Oleh kerana tidak ada corpus sedia ada bahasa yang digunakan dalam pengajaran dan pembelajaran mata pelajaran Kejuruteraan dalam Bahasa Inggeris, kajian ini bertujuan untuk membangunkan satu corpus Kejuruteraan daripada Buku-buku Teks Kejuruteraan Vokasional KBSM Malaysia (MKVET). Korpus itu kemudian digunakan untuk mewujudkan Senarai kata Kejuruteraan (EnWL) yang merangkumi perbendaharaan kata teknikal kejuruteraan dan separa teknikal kejuruteraan. Tujuan kajian ini adalah untuk; (1) Membangunkan korpus kejuruteraan pedagogi dari Buku-buku Teks Kejuruteraan Vokasional KBSM Malaysia (MKVET); (2) Mengenalpasti persamaan dan perbezaan dalam perbendaharaan kata atau corak penggunaan dalam buku teks Kejuruteraan berbanding subjek Sains dan Bahasa Inggeris KBSM Malaysia; (3) Membangunkan Senarai Kata Kejuruteraan (EnWL) dari korpus yang dicipta dan menentukan corak penggunaan bahasa dalam buku-buku teks kejuruteraan dari segi kata nama majmuk.



Objektif-objektif ini ditangani dalam empat soalan penyelidikan dan reka bentuk penyelidikan yang menggunakan analisis kandungan (pendekatan linguistik korpus) untuk analisis. Perisian konkordans WordSmith Versi 5.0 dan RANGE telah digunakan untuk tujuan analisis teks dan pembangunan senarai perkataan.

Korpus ini terdiri daripada 391.505 perkataan (15,621 jenis) dan EnWL terdiri daripada 842 keluarga perkataan (1,704 jenis). Korpus dan senarai perkataan yang dibangunkan ini akan memberi panduan kepada penyelidik lain untuk mengkaji aspek-aspek lain yang berkaitan. Kriteria pemilihan perkataan yang digunakan dalam menjana EnWL adalah novel untuk kajian terperinci dalam menentukan perkataan penting dalam Kejuruteraan. Kajian ini mencadangkan penggunaan *General Service List (GSL)*, *Academic Word List (AWL)* dan EnWL untuk pelajar Kejuruteraan untuk mendapatkan faedah yang lebih besar dari senarai pembelajaran perkataan dari segi liputan teks. Tambahan pula, kata nama majmuk dicadangkan untuk Bahasa Inggeris bagi Tujuan Kejuruteraan (EEP) memberi maklumat tambahan kepada guru-guru dan pelajar untuk berurusan dengan kepelbagaian bahasa Kejuruteraan, terutamanya kata nama majmuk yang tidak mengikuti sebarang corak bahasa. Dengan EnWL dan Korpus Kejuruteraan, penemuan menyediakan asas untuk guru-guru, penulis buku teks, penulis sukatan pelajaran dan perancang kurikulum untuk merekabentuk dan membangunkan bahan-bahan yang lebih relevan dan petunjuk leksikal untuk pedagogi yang lebih berkesan.

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This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory committee were as follows:

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## CHAPTER 1

### INTRODUCTION

The introduction section consists of the background of the research which focuses on the need to have English for Specific Purposes (ESP) to help socialize learners into their discourse communities. The role and importance of ESP will be briefly discussed as it justifies the intention to resolve arising issues. The chapter further discusses the role of textbooks, corpus and word lists in vocabulary learning especially in Engineering English, and the learning of specialised Engineering vocabulary. Then, the researcher highlights the relevance of using textbooks to build an Engineering vocabulary corpus in the Malaysian context.

The statement of problem section elaborates on the current issues and problems in the area of ESP for Engineering or specialised lexis learning in ESP context. This study focuses on the analysis and development of a vocational school Engineering vocabulary corpus which in turn creates a useful Engineering academic word list. The local published Engineering textbooks will be analysed in terms of the lexical representation and the degree of difficulties in reading the textbooks. This chapter also discusses the significance of the study especially in using pedagogic textbooks to create a pedagogic corpus for the Malaysian students in secondary and pre-university context. The limitations and essential operational definitions used in the study are also presented.

#### 1.1 Background of the Study

The concept of ‘one academic discipline, one discourse community’ is substantial as people from different fields of study have different goals and needs, and may respond differently to a situation. When students of a specific faculty learn a subject from another faculty, they need a different set of linguistic and cognitive properties to perform well. Within a university, there are sub-disciplines and learners need to reorganize their learning abilities to suit the situation in each faculty. Bartholomae (1986) introduced the idea of reinventing the universities based on the notion that different faculties have got their own distinctive communities which function in various ways. He added that learners need to realign and adapt to the way they learn each time they are in a specific discourse community. People from the field of Engineering may need technical language to function as a means of explaining and describing a theory, concept, calculation or even a formula. Language is needed to transfer the understanding of scientific knowledge to a group of audience who really understand the importance of scientific theory.

Decades ago, experts and researchers have suggested a learner-centred approach which studies and analyses the needs of English learners for various purposes and the trend has changed from teacher talk to addressing learner needs (O’Sullivan, 2004; Cheng, 2000;

Nunan, 1996; Kennedy & Bolitho, 1984). Nevertheless, it is apparent that the fundamentals of a course with exact purposes should revolve around the needs of the learner in specific situations, which is often referred to as English for Specific Purposes (Kennedy & Bolitho, 1984). According to Bartholomae (1986), learners must be exposed to a rich environment of their social discourse in order to assemble, mimic and apply the constructive language in their field confidently and comfortably (p.135). What learners really need in specialised or specific areas is the register, structures or ways to comprehend texts and respond accordingly. The moment they are accustomed to the academic language required, teaching and learning can transpire more efficiently. To Kennedy and Bolitho (1984. P.162),

It may very well be that some students will need to crudely mimic the “distinctive register” of academic discourse before they are prepared to actually and legitimately do the work of the discourse, and before they are sophisticated enough with the refinements of tone and gesture to do it with grace or elegance.

In learning a language for a particular context, the ‘immersion’ process is deemed important as it involves the linking of linguistics and controlled anxiety for context-specific purposes (Krashen, 2002; Naimon, Fröhlich & Todesco, 1978). One of the most recognised and successful immersion projects or programmes was the French Immersion (FI) which was designed for English-speaking kindergarten pupils to promote the mastery of bilingualism of English and French (Wise, 2011; Hsu, 2009b; Weshe, 2002; Naimon et al., 1978). The FI programme has been regarded as an early content-based instruction (CBI) as it integrates academic content into language instruction (Hsu, 2009b). Young English speaking learners in the FI programme in Canada were expected to learn French as a second language based upon certain beliefs. It was believed that young learners found it easier to comprehend the chunks of languages given in the context of daily usage in varied and engaging activities (Weshe, 2002).

Canada has been acknowledged for its creation of FI which has allowed hundreds of thousands of students to be bilingual, enabling them to enjoy cognitive, academic and socio-economic benefits depicted from sociocultural varieties (Wise, 2011). The underpinning objectives and efforts of FI were mimicked by the Malaysian Ministry of Education (MoE) in changing their policy in primary and secondary schools from the national language of ‘Bahasa Malaysia’ to English as the medium of instruction for mathematics and science subjects starting from year 2013 (Kang, 2014; Cheng, 2013). Furthermore, with the emergence of Malaysian Education Blueprint, 2013 – 2025 (Ministry of Education Malaysia, 2012), the importance of the field of engineering has been elevated. Hence, more qualified engineers are in demand to meet the expectation of the policy makers.

The change in educational policy can promote technical development in the nation, especially in the niche areas like engineering (Cheng, 2013). Deciding on the right language content of a given context needs holistic planning, thus an English for Specific Purposes (ESP) approach should be adopted. Learners who learn English for a specific discipline should not allow language deficiency to debilitate their learning. In ESP, a course must be based on a specific purpose and the needs of a learner in given situations (Nesi, 2013; Kennedy & Bolitho, 1984). Hence, knowing a learner’s needs and bridging it with the relevant language input or content can facilitate developmental learning. ESP



refer to the appropriateness of language in a specific activity or field in terms of its discourse, genre, study skills, register, lexis and grammar (Dudley-Evans & St. John, 1998). More discussion about ESP is presented in Chapter 2.

## **1.2 Issues with Teaching and Learning of Science and Mathematics in English**

January 2003 marked a historic inception of teaching and learning of science and mathematics in English when the former Prime Minister of Malaysia, Tun Dr Mahathir Mohamed made the policy-changing announcement, that is, the Teaching of Science and Mathematics in English TeSME, more specifically referred to as PPSMI (Sopia Md Yassin et al., 2009). PPSMI stands for “Pengajaran dan Pembelajaran Sains dan Matematik dalam Bahasa Inggeris”, and literally means the teaching and learning of science and mathematics in English. It was introduced to Malaysians in 2003 and was implemented in stages starting with Year One (primary school), Form One and Lower Six (secondary school) learners in the 2003 school sessions. The materials used in primary and secondary schools syllabus in Malaysia had been reproduced and changed to the English medium as well. PPSMI was considered as a type of content and language integrated learning (CLIL), and which is, widely used in the European Union and focussed on promoting multilingualism (Sopia Md Yassin et al., 2009, p.58), similar to that of the FI.

In relation to FI, Malaysian students were expected to learn mathematics and science in English, which is regarded as a second language of the country, starting from primary schools. The Malaysian government and policy makers were hoping that with the PPSMI, learners’ proficiency in English could be improved and as a result, learners could develop human capital that are competitive in the era of globalization,(Sopia Md Yassin et al., 2009; Gill, 2005; 2007).

As a proactive measure to face the global pressure, the introduction of PPSMI was inevitable at that period of time. The major change in language policy was due to the concern of the country’s challenges in the era of globalization, human resource capital development and the swift development in science and technology (Gill, 2005). According to Gill (2007), the change in the language policy enables Malaysia to be a development oriented country that serves the acquiring of sufficient science and technology knowledge. Teachers and students faced many challenges by the time PPSMI was implemented by the Ministry of Education of Malaysia. More than RM5 billion was used for teachers’ training, teaching courseware development, monetary incentives and new teaching and learning materials and supply of instruments like the laptops, LCDs and textbooks (Sopia Md Yassin et al., 2009, p.57). Despite these efforts, several issues still exist which were considered to debilitate the effectiveness of the PPSMI.

According to Pandian and Ramaiah (2004), the science and mathematics subject teachers were concerned about their skills to convey information using English language. The dilemma of English for science or science for English was seen as a major problem as the proficiency in English of the Malaysian students was doubtful. In 2005, a study was carried out to show the level of teaching efficacy beliefs of the mathematics and science

teachers with 100 science and mathematics Malaysian teachers in the PPSMI system (Kon, 2005).

According to Kon (2005), the subject teachers who believe in their capability in English can affect the students' performance. However, in another study, it was found that these teachers do not possess the adequate techniques and skills to teach the subjects effectively in English and therefore limited English proficiency (LEP) students would take a longer time to comprehend despite their intellectual capabilities (Holme, 2006). Even though teachers felt that they were professionally prepared, it was reported that they faced many difficulties in overcoming the learner's lack of proficiency in the language, especially those who are weak in English, science, or both (Noraini et al., 2007). From the various studies reported, it can be suggested that the PPSMI had suffered from major setbacks in the early years of its implementation from the perspectives of the educators as well as the learners. Despite the setbacks, the endeavour had to be continued for the betterment of the community.

In 2007, Universiti Pendidikan Sultan Idris (UPSI), Malaysia conducted a study on 3,000 primary 5 and 2,800 secondary 2 students and reported that despite 4 years of PPSMI students were not able to cope with their English language and performed poorly in mathematics and science. (John & Aniza, 2008). In another report, Habibah Elias et al. (2009) conducted a study on 688 secondary 4 students from 25 critical condition schools located in 5 zones in Malaysia and concluded that the students possessed low self-efficacy in mathematics and English language. The reason for the poor performance could be contributed to the students' diverse language needs, confusion with certain words or even inadequacy and inability in understanding non-scientific terms in the scientific context (Sopia Md Yassin et al., 2009). PPSMI received enormous opposition from various groups which supported the change in the policy of re-introducing Bahasa Malaysia as the medium of instruction for mathematics and science.

By early 2009, the Ministry of Education was pressured to make a critical decision about changing the medium of instruction back to 'Bahasa Malaysia' due to political pressure and learners' poor proficiency in English language (Sopia Md Yassin et al., 2009; George, 2008). English teachers' lack of competent proficiency in the language leads to the deterioration of English among Malaysian students (Choy & Troudi, 2006). To make matters worse, these students not only need to cope with the complexity of the language, but as they approach higher level or tertiary education, they face more challenges, especially in acquiring essential specialised vocabulary in science and mathematics. Hence, the PPSMI was not successful in the Malaysian education system to engage learners in English-based scientific community.

PPSMI became a major controversy mainly due to the urban-rural learning gap (see Singh, Arba Abdul Rahman & Teoh, 2010), teacher capabilities and students' English language proficiency. Despite the noble effort from the Malaysian government, the effort was not perceived as an immersion programme at all as the national language of Bahasa Malaysia was still the priority among schools. This was despite large exposure to first language like Mandarin and Tamil for Chinese and Indian community learners respectively via various sources of mass media. The PPSMI policy, however, did not last long and the top cabinet members of Malaysian government agreed that PPSMI should be abolished in stages for the improvement of the country (Chapman et al., 2011).



The reverting process started in the 2012 schooling session, in stages. Cheng (2013) contended that the country should have been given a choice whether to opt for the 're-introduction' of PPSMI or the reverted system as various parties had given their memorandum to the Malaysia Ministry of Education for consideration. Despite that, students in the PPSMI cohort will continue to learn the two subjects in English until 2016 in primary school and until 2020 in secondary school (Kang, 2014; Pavithiraa, 2014). However, both subjects will be taught bilingually – in both English and 'Bahasa Malaysia' (Kang, 2014). This study only looks at secondary education as it is only in the secondary schools that vocational students are exposed to Engineering materials which are technical in nature.

Malaysian students need to find alternative ways to improve their level of proficiency in order to compete globally in the open market. This can be an uphill task for many as according to Tourres (2011), the standard of English for Malaysian undergraduates is still an alarming issue as standards are not up to par (The Star, 2011, November 7). Students with low proficiency in English also tend to intersperse their first language with English when using English for various purposes. The low English proficiency level amongst many Malaysian students is evident as learners are found to use their first language while trying to speak English. When a speaker is not fluent in one language, he or she tends to mix the language with another in order to avail full communicative resources in a multilingual country like Malaysia (Lee at al., 2012).

It is also found that varsity students in Malaysia faced difficulties in writing for specific purposes (Mariam Mohamed Nor et al., 2012) and they experienced anxiety in their oral communication apprehension as well as their evaluation (Chan, Ain Nadzimah Abdullah & Nurkarimah Binti Yusof, 2012). These issues are only some of the evidences that Malaysian students may lack the required vocabulary. Thus, introducing the right vocabulary to students in the right context might improve the chances that the students acquire the intended structure to write or even speak. Creating a corpus of the target language would enhance real language use and the creation of a word list would provide all the essential vocabulary the students need. Menon (2009) and Menon and Mukundan (2012) asserted that when students know the target (Science) vocabulary, they are more well-prepared for their technical course.

### **1.3 Introducing Specific Field Vocabulary**

The change in educational policy has affected both educators and learners but the challenges can promote development in the nation (Cheng, 2013). Deciding on the language content of a given context in the teaching of science is indeed not a simple task. In order to counter the lack of English proficiency among Malaysian learners who will be streamed according to their fields at the post PPSMI stage, an ESP approach should be adopted. Learners who learn English for a specific field ought to overcome their language barrier in learning in science by familiarizing with the registers, structures or even vocabulary. By introducing or focusing on specific vocabulary in science, learners in specialised fields can be more focussed and guided given that the essential vocabulary is exposed to them. Most specialised words have Greek or Latin based forms and they only occur within a specialised area (Chung & Nation, 2003). Hence, learners who do

not have sufficient exposure have difficulty in identifying and interpreting the technical definitions of the course they are taking.

Teachers could also be another factor contributing to the students' lack of familiarity with technical or specialised words. This happens when non-specialised English teachers lack knowledge regarding the learners' technical areas, which makes them unable to assist learners in dealing with their specialised field (Chung & Nation, 2003; 2004; Sinclair, 1991). The situation can be improved if these general English teachers would be equipped with a specialised word list to be taught to the students.

#### **1.4 English for Engineering Purposes**

In educating Engineering students, they need to be given exposure to authentic materials in order to assist them to be associated with their discourse community. Students lack exposure to technical and sub-technical words in their various fields (Menon, 2009). Yet, one issue that needs to be taken into consideration is that in order to help students to understand English texts, they need to fulfill the prerequisite of having good level of English proficiency. For Engineering students in Malaysia, Sijil Pelajaran Malaysia (SPM, an open examination which is equivalent to the GCE 'O Level) serves as the advanced level of their English proficiency. Some would sit for the Malaysian University English Test (MUET) while enrolling in pre-university programmes in order to meet the English proficiency standards of entering tertiary education. These students are generally exposed to general English only, but not the type of English that they need to help them perform better in tertiary institutions, practical or industrial training, or future workplace (Kennedy & Bolitho, 1984). In order to perform well, they need to be equipped with more specialized English like Engineering English.

When students enroll in an Engineering programme, they should be taught the Engineering language that professional engineers utilise in their workplace. Once they acquire the Engineering language, they will have a sense of belonging to the Engineering discourse community. Learning is most effective when students understand the relevance of the content to their life and be able to interpret the meaning. Vocabulary learning is related to the language-focused/form-focused strand of teaching and learning (Nation, 2007). It is important for teachers to have sufficient information and knowledge about the types of vocabulary that will be taught to students in an EAP or ESP course, in order to expand and improve students' vocabulary knowledge. However, some teachers from social science backgrounds would find it difficult to teach the technical terms to students as they are not from the specific background (Trimble, 1985; Cowan, 1974). In Malaysia, the introduction of mathematics and sciences in English in 2003 aimed at aiding students to have an academic voice in their discourse community. A better chance to be successful in learning perhaps is to provide a systematic word list to initiate the learning of the relevant vocabulary. It was introduced with the expectation that it would provide the building blocks for students to be able to integrate themselves into their scientific community and allow them to participate and compete globally (Menon, 2009).

With regards to the creation of English for Science and Technology (EST) in the Malaysian context, it was found that it did not offer great assistance to students' comprehension of technical and semi-technical words in the respective fields. Menon (2009, p.254), stated that the "EST textbooks do not cover the language needs of each Science subject and the words provided in the vocabulary lists were insufficient to help learners cope with the complex and confusing scientific vocabulary". Thus, the call for a specific corpus for a specific field in English teaching and learning is now more prominent than ever to bridge the vocabulary gap.

A corpus can be simply defined as an association or a pool of texts often referred to as lexis. In linguistic terms, a corpus is a collection of texts which can be converted into an electronic database, meaning that it must be machine-readable (Tognini-Bonelli, 2001). A corpus can describe several patterns of how words are used. For instance, collocation is one aspect that can be examined (Ward, 2007). Loading and distribution of words is another (Mukundan, 2009). The corpus for English in a specific field needs to have a collection of words and it is not surprising to find a small corpus representing a specific part of a language (McEnery, Xiao & Tono, 2006; Mudraya, 2006). By scrutinizing a corpus of a particular field, educators can explore the nature of the language used in the field more authentically. In Malaysia, research on the creation of a scientific English corpus has not been widely carried out, especially when it comes to corpus creation using textbooks (Menon & Mukundan, 2010). "To our knowledge, there is hardly any corpus-based Engineering material developed in the context of Malaysia" (Sarimah Shamsudin, Noraini Husin & Amerrudin Abd. Manan, 2013, p.1279). Hence, it is essential to have a local Engineering corpus in the context of Malaysia.

### **1.5 The Relevance of Corpus to Specific English Language Teaching**

Corpus analysis of texts is helpful in discovering the best way to introduce language elements in courses designed for academic and specialised purposes (Mukundan, 2009; Fox, 1998; Willis, 1998). Corpus refers to a collection of texts which allows not only researchers, but also teachers and students, to inspect the composition of texts and present a more comprehensive analysis of how the words are used in a precise way. This can consequently provide a better interpretation of the context in which the text is being used. (Fox, 1998; Willis, 1998). Generally, an academic corpus is generated from the accumulation of teaching materials (Ng et al., 2012; 2013; Mukundan & Ng, 2012; Al-Mahrooqi et al., 2011; Ward, 2009; Mudraya, 2006; Sutarsyah, Nation & Kennedy, 1994), texts that are authentic (Hwang & Nation, 1989), samples from students (Díaz-Negrillo & Valera, 2010), and also academic research articles taken from the internet (Martínez et al., 2009; Wang, Liang & Ge, 2008; Chen & Ge, 2007).

The approach adopted in the current study is similar to which of the above-mentioned ways of collecting a corpus whereby a corpus is built based on core Engineering textbooks that are used by vocational schools in Malaysia. In Malaysia, only vocational schools use specific-discipline Engineering textbooks which are specialised in nature. In comparison, the main stream secondary school students learn subjects like physics and chemistry and intend to pursue Engineering as a profession. In other words, the vocational school Engineering textbooks were selected to be analysed in this study because these textbooks are the only Engineering specific textbooks available at upper

secondary level in the Malaysian education system. As for the lower secondary and primary education, students are not exposed to specific Engineering curriculum per se until they are enrolled into vocational schools or even at universities.

To ensure the accountability of the vocabulary that is applied for learning English for Specific Purposes (ESP) or English for Academic Purposes (EAP), building a corpus always includes the steps of comparing, compiling, analysing, constructing and distinguishing. Consequently, ESP and EAP word list designers should custom-design corpora and word lists which will be utilised specifically for ESP and EAP materials. In other words, if a module is designed specifically for Engineering training and education, a corpus would have to be generated with a variety of core textbooks in the field of Engineering in order to create a word list that contains essential vocabulary.

## **1.6 Statement of the Problem**

Mukundan (2009) claimed that textbook in general is considered as 'a misfit in the learning-teaching environment'. Many studies were carried out in the area of ELT material evaluation which indicated that most materials are often developed in an ad hoc manner. Looking from the perspective of corpus-based studies, these studies indicated that the textbooks were developed through a process of material development which involves intuition, and non-retrospect intuition that was revealed to have weaknesses in the area of lexical loading and distribution patterns (Mukundan & Roslim, 2011 ; Mukundan & Khojasteh, 2011; Mukundan & Menon, 2007b; Mukundan & Aziz, 2007; and Mukundan, 2007). . Materials should be developed systematically based on the needed essential words specific to a field (Menon & Mukundan, 2010).

Despite criticisms, textbooks are considered important to learners, especially in the ESL or EFL context as "the textbook becomes the major source of contact students have with the language apart from the input provided by the teacher" (Nooreen & Arshad, 2005, p.1). Teachers depend on textbooks for the provision of task and test for students (Menon & Mukundan, 2010) and they furthermore provide the framework and syllabus for the course (Hsu, 2014; 2009a; 2009b; Hyland, 2006). The major concern is the effectiveness of the textbooks, especially in teaching vocabulary in a specific context as well as the language use in a particular discourse community. Even early developments in (ESP) sought to identify specific and essential vocabulary in relation to various lexical features for ESP materials development (Kennedy & Bolitho, 1984). Since most teachers are not aware or inexperienced when it comes to teaching the required types of vocabulary in a classroom, it is best to provide them with a reliable word list to be incorporated into their pedagogical approaches.

Most teachers and materials developers are believed to be non-experts in word lists creation in specific fields when English language is concerned (Nesi, 2013; Mackiewicz, 2004; Pritchard & Nasr, 2004; Trimble, 1985). Some teachers are also believed to be inexperienced in teaching vocabulary through using word lists like the General Service List (GSL) and the Academic Word List (AWL). The core problem concerning the Malaysian textbooks is that the books are not based on any essential word lists or corpora



which would provide more accurate language functions and vocabulary for learners in a specific discourse community. In addition, there is no empirical evidence about the text coverage statistics in terms of vocabulary categories. To put it another way, up to date, there is a little knowledge about the text coverage of the Malaysian Engineering textbooks compared to other word lists like the General Service List (GSL) and the Academic Word List (AWL). In addition, there is a need to conduct studies to identify a specialised word list to bridge the 'technical vocabulary' gap.

In schools, the language used in Engineering courses is often very technical or context-eccentric, which is too abstract or challenging. ESL students are reported to lack the exposure to target language which is required to be successful in communication with others without proper linguistic guidance (Menon & Mukundan, 2012). These learners need to comprehend complex and uncommon scientific concepts and terms which seem quite distant from their everyday activities and experience (Carlson, 2000). The issue of ineffective teaching of science in English in Malaysia has been reported by Pandian and Ramaiah (2004) which can be linked to the teaching of Engineering syllabus. Identifying the appropriate type of language students need to learn to comprehend their scientific lesson seems to be one of the main problems. In the case of Malaysian learners, the major problem is likely to be with the use of correct lexical items in their discourse. According to Hirsh and Coxhead (2009), the most important questions to ask an educator is 'what are the types of vocabulary an educator should teach?', 'when must the vocabulary be taught?' and 'how valuable is it to the classroom needs?'. Determining the type of lexis needed would guarantee the effective comprehension in lessons.

Since the major focus of this study is on the nature of Engineering discipline for upper secondary level, the first step in identifying the type of language used in Engineering-centred classrooms is to create a corpus of language in this discipline. . There is an abundant need to develop an Engineering pedagogic corpus as there is no existing corpus of the language use in Engineering. Hence, this study focuses on analysing prescribed Engineering textbooks for vocational school students of different subject areas, namely, civil, electrical and electronics, Engineering technology and mechanical Engineering in upper secondary levels in Malaysia. The corpus developed based upon the prescribed textbooks provides critical insights into the type of language perceived to be field-specific to Engineering based on which an Engineering word list will be created. The analyses which will be carried out for the Engineering textbooks include identifying the most commonly used lexis specific to the prescribed Engineering textbooks. In addition, detailed comparative study on the use of English in the Engineering textbooks and non-Engineering texts (biology, chemistry, physics, general science, English) used in upper secondary levels in Malaysia will be carried out. Apart from that, the study determines the extent of lexical similarity and differences maintained in the textbooks.

## **1.7 General Aim**

The ultimate objective of this research is to develop a pedagogical corpus for the purpose of generating more effective learning of specialised vocabulary in a classroom for both teachers and learners. The development of a new word list specifically in the field of English for Engineering Purposes (EEP) is also one of the main goals of this research.

The production of the word list is aimed to be transferred to knowledge of specialised words and it could have an immediate effect on EEP classrooms for students who need the 'academic Engineering tools'. The creation of the electronic corpus and word list of English for Engineering Purposes (EEP) requires analysis of various Malaysian upper secondary Engineering textbooks.

This study also aims to determine the nature of Engineering English found in the prescribed textbooks by identifying its major characteristics and differences in the various disciplines of Engineering. Lemmas study is the thorough analysis of the language used in the prescribed form four and five Engineering textbooks which will be done in this study in terms of analysing the lexical patterns. More importantly, the study includes the identification of the building blocks of Engineering language in terms of lexis as the students need to comprehend and grasp the gist of Engineering content in the process of learning and adapting themselves to the Engineering community.

The language arbitrariness of the frequent structure of the compound nouns found in the Engineering corpus will also be discussed. The text coverage of these specialised Engineering vocabularies is also determined by comparing it to other established word lists, namely the General Service List (GSL) and the Academic Word List (AWL). This study uses the intact number of the KBSM Form Four and Five Engineering textbooks prescribed in Malaysia for vocational schools.

### **1.7.1 Objectives of Study**

The specific objectives of the study are as follows:

1. To develop a pedagogic Engineering corpus from the Malaysian KBSM Vocational Engineering Textbooks (MKVET).
2. To investigate the similarities and differences in the vocabulary loading or distribution patterns of the Engineering textbooks when compared to the Malaysian KBSM Sciences and English in vocational schools.
3. To develop a specialised Engineering Word List (EnWL) from the created corpus and to determine the lexical patterns of language use in the Engineering textbooks in term of noun compounds.

### **1.7.2 Research Questions**

These questions are formulated based on the research objectives outlined:

1. What are the lexical features that are evident in the individual Engineering textbooks leading to the building of the Engineering vocabulary corpus as compared to the Malaysian KBSM Sciences and English corpora?
2. What are the differences and similarities between the types of vocabulary distributions across the various Engineering disciplines textbooks in terms of

- the General Service List and Academic Word List when compared to the Malaysian KBSM Sciences and English corpora?
3. What are the lexical characteristics of the specialised Engineering word list (EnWL) developed for pedagogic purposes?
  4. What is the relationship between the word structure and its meanings of words in the noun compounds (noun strings) in the Engineering corpus?

### **1.8 Significance of Study**

The teaching of vocabulary is believed to be often neglected by teachers, let alone the teaching of specialised vocabulary (Sarimah Shamsudin, Noraini Husin & Amerrudin Abd. Manan, 2013) and this fact is a concern in Malaysia. The KBSM syllabus for Engineering used in vocational school has not outlined any word lists or syllabus key words to be recommended to students in the field of Engineering. However, the Curriculum Development Centre of the Ministry of Education Malaysia (2007) put strong emphasis on the importance of the teaching of vocabulary to students so that they are able to comprehend texts at acceptable levels. Thus, this study is significant in providing insightful findings, and is especially substantive in that, it involves the creation of an Engineering corpus for the KBSM syllabus outlined for vocational Engineering school students in the ESP context. Through the output of this study, a specialised Engineering word list would also be developed.

This study will produce the needed corpus of the lexicon typical of Engineering prescribed vocational textbooks in schools. The creation of this Engineering corpus is deemed necessary as it can provide immediate application for the English for Engineering and Engineering pedagogy classroom itself, especially at upper secondary level. As a part of the output of this study, developing such word list is required for various reasons. Mudraya (2006) created the Student Engineering English Corpus (SEEEC) of two million running words in size, which she further reduced to 1260 word families, consisting of 8850 types of words for technical Engineering students to learn. Her word list comprises sub-technical words of Engineering but she did not provide a list of Engineering-centric words as most of her recommended words are relatively basic in nature for learners to acquire. Another Engineering-based corpus which was transformed into a word list was developed by Ward (2009) for Thai learners who had very low English proficiency level to help them read Engineering specialist textbooks. Ward (2009) developed a Basic Engineering List (BEL) of 299 word types consisting non-technical terms in the field of Engineering using tertiary level Engineering materials. These two corpora were found to be unsuitable for the present ESL context in Malaysian schools as the Malaysian ESP students would have most of the basic knowledge of English inflections and derivations such as the plural-singular and comparable adjectives found in the lists. Besides, the two corpora were not developed to represent the language use in vocational schools at the secondary school level.

Looking at the Malaysian context, the Engineering Technology Word List (ETWL) (Ng et al., 2013) was one of its kinds, and it is the pioneering Malaysian Engineering word list published for researchers, educators and learners. However, the corpus created in the study was developed using the KBSM vocational school 'Engineering Technology'

textbooks used in Form 4 and 5 only. Hence, the corpus used in this study is rather limited although it is the first Engineering word list which does not contain any GSL or AWL. In the most recent study, Hsu (2014) compiled a corpus of 4.57 million running words of 100 college e-textbooks across 20 Engineering subject areas and created the Engineering English Word List (EEWL). EEWL consists of 729 word types and covers 14.3% of the tokens in the created Engineering corpus. However, once again, the tertiary level of Engineering was used as the target for analysis rather than the secondary school level materials, which is the focus of the present study.

The creation of the corpus and word list will become significantly useful and have an impact on ESP and EAP classrooms. The derived technical and semi-technical Engineering words with high frequency in the form of a word list would assist learners and teachers in the same manner. Prior to that, the word list will serve as an asset for English for Engineering Purposes (EEP). For the first time in Malaysia, there will be a word list in which English vocabulary for Engineering Purposes can be derived from. Finally, the word list and the corpus may enable students and educators to focus on lexical elements specific to engineering discipline in a more organized and vivid manner. This would facilitate the process of teaching and learning. To Nation (2001, p. 205),

The main purpose in isolating an academic or technical vocabulary is to provide a sound basis for planning teaching and learning. By focusing attention to items that have been shown to be frequent, and in the case of academic vocabulary of wide range, learners and teachers get the best return for their effort.

Basically, extensive disclosure of essential words is needed to provide better attainment and learning of vocabulary (Coxhead & Byrd, 2007; Tomlinson, 1998). Students learn better by understanding the authenticity or nature of Engineering language through using the frequently used specialised words in Engineering. The corpus has great potential to be a reference point for Engineering lexis and commonly appearing terminology used in the Engineering textbooks. The corpus created in this study would also help teachers to provide learners with essential features about the Engineering texts, with the hope of improving their text comprehension and decoding abilities. In addition, it is also hoped that the learners will be furnished with various meaningful contexts to use the Engineering vocabulary due to its significant text coverage throughout the materials.

Teachers might benefit from the results of this study and would be more lexically guided as to which lexis should be given emphasis. This would guide teachers in helping students elevate their comprehension skills in different ways through receptive vocabulary use. When students and teachers know what specialised lexical items to focus on to reap more text coverage benefits, their specialised knowledge will be enhanced through effective reading (Hsu, 2014; Ward, 1999). Besides utilizing the Engineering word list, the detailed comparison between the use of various EAP and general English word lists in a variety of corpora would also provide significant insight as to the extent to which the word lists cover the Engineering corpus as compared to the Malaysian KBSM. This can provide validated evidence as to the 'target' word lists learners and teachers need to use to boost their vocabulary coverage which in turn can assist them in comprehending texts better.



With the constructive insights recommended from the results of the present study, the lexical challenges encountered by Malaysian students in using specific vocabulary could be effectively addressed. Learning and mastering the right lexical items (with noun compounds) would assist both ESP teachers and students to achieve the appropriate knowledge in a better way. The findings of this study can also be noteworthy to curriculum planners, syllabus designers, as well as textbook writers. Teachers can be equipped with supplementary vocabulary activities to do in the classroom with more appropriate and effective strategies such as familiarising the student with the most frequently-used words. This would consequently result in students learning the most prevalent words in their academic domain and thus have adequate vocabulary knowledge to be able to read engineering texts.

Curriculum planners and syllabus designers would benefit from the findings of this study by determining the right content words or lexical items for the KBSM vocational school Engineering syllabus. Having been guided in terms of corpus and word list, they would rationally consider the types of words needed or lexical patterns to be introduced at different EEP educational levels. The curriculum syllabus presented in this study targets the fundamental needs of Malaysian students, especially in terms of vocabulary use. Lastly, this study would also benefit textbook or material writers. It provides essential information to textbook writers to decide what kind of information to relegate in textbooks and what vocabularies are essential for engineering students to learn.

In short, the corpus will be a practical reference and guide for teachers to teach Engineering vocabulary, also an indispensable reference for textbook publishers and EEP textbook writers to design the related materials more efficiently. Without the assistance of a word list, ESP or EAP materials designers might design books based on what they perceive as important, which could lead to ineffective use of the texts. The development of the corpus would also aid curriculum developers and material writers in re-designing the content of teaching materials in the future and this would consequently help maintain standardization of the language used in Engineering textbooks which are taught in Malaysia.

### **1.9 Scope of Study**

The corpus analysed in this research is pedagogic in nature as only the textbooks which were pedagogic were used in constructing the corpus. The corpus collected is meant only for secondary vocational use and further analysis is required to target a corpus of higher academic level. In other words, the findings and generalizations of this research are only limited to the upper secondary school context. This means that the corpus and word list created in this study are purely from KBSM materials and they may not be applicable in other situations to solve any other communication glitches or difficulties faced in the Engineering field per se. The scope of language being studied in this research is restricted to the students' linguistic competency (especially lexis) in the prescribed KBSM Engineering materials for vocational schools in Malaysia.

The process of building the word list is one of the ways suggested by experts in the field and the word list produced only refers to the comparison with a larger corpus method (Berber-Sardinha, 2002; Nation, 2001). Hence, this research aims to build a specialised word list and develop a pedagogic corpus in order to contribute to classroom pedagogy and provide valuable guidance for publishers as well as EEP textbook writers in selecting and arranging of vocabulary in EEP materials. The study attempts to investigate and analyse the Engineering materials linguistically with only resorting to the above-mentioned parameters. To many researchers, having the knowledge of collocation patterns would provide better understanding and coverage of vocabulary (Ward, 2007; Chung & Nation, 2003; 2004; Lewis, 1993; 1997).

This study also analyses the language arbitrariness which may arise from knowing the essential words in the field of Engineering. The analysis uses Sinclair's (1991) and Lewis's (1993) principle that meanings are usually conveyed by chunks of language which are less predictable – 'idiom principle'. Analyses are limited to the immediate 2-word lexical collocations meanings (noun compound) which are believed to be more manageable by students in classroom and the researcher due to feasibility issue (Menon & Mukundan, 2010; Sinclair, 1993; Trimble, 1985). The analysis is constrained to frequency-based approach collocations, taking into consideration the text coverage of the co-occurrence of words.

### **1.10 Limitations of Study**

Despite the significance of the current study, there are limitations to be addressed. First, there will not be a spoken corpus of Malaysian Engineering materials due to the time constraint, cost as well as labour intensiveness. Only a written pedagogical Engineering corpus for upper secondary level will be built. Another limitation of this corpus-based study is that this research focuses only on content analysis of the corpus. No lexicogrammar analysis will be carried out. This study focuses only on describing the linguistic aspect of the content analysis, especially lexis. Next, although the KBSM Engineering textbooks were written by local Malaysians who are not native speakers, it is assumed that their content knowledge in the area is sufficient. What the learners need to know and learn from the textbooks is assumed to be contained in the experiences and expertise of the textbook writers. The quality of the writing is also assumed to be on par with that of native authors in the field of Engineering. Since this study only focuses on the specialised Engineering English lexis, there are some corpus linguistics issues which need to be addressed and are outlined below:

1. Omission of the function words from the analysis  
Function words are indeed essential in the use of English as the frequency of occurrence of these words is high. However, in this study, function words are not taken into account because the main focus of this research is to determine the specialised words which are exclusive to the field of Engineering.
2. Keywords analysed  
The key words which were analysed thoroughly were ascertained as technical and semi-technical and specialised words because functional, general or academic words were not regarded as part of the Engineering word list. Specialised words in this study are defined as words which contain exclusive meaning specific to a particular field of research and their frequency of

occurrence in the corpus is indeed very significant (Chung & Nation, 2003; 2004; Nation, 2001). On another plane, , the academic word in this study refers to a word which is sub-technical in nature (Coxhead & Nation, 2001; Nation, 2001; Trimble, 1985) as well as a kind of word that is associated with the field under investigation (Chung & Nation, 2003; 2004). It is often grouped under the Academic Word List (AWL) (Hsu, 2013; 2014; Nation, 2001).

3. The lack of Malaysian English reference corpus  
The British National Corpus (BNC) was used by Menon (2009) in her study on lexical patterns in Science and English for Science and Technology (EST) textbooks in Malaysia. Menon (2009) believed that the most suitable corpus to use as a reference is the BNC corpus because “the acrolectal version of Malaysian English is similar to that of British English” (p.14). Furthermore, Malaysia is a member of the Commonwealth countries which upholds a common framework of values and goals. BNC is the most appropriate reference corpus to be used in this study because it consists of 100 million tokens. It exceeds the benchmark of having five times as many tokens as the target corpus proposed by Berber-Sardinha (2002).
4. Specific corpus size  
This research focuses only on Engineering textbooks written in English that are prescribed for Form Four and Form Five Engineering students in Malaysian vocational schools (8 textbooks in total). It does not include the texts from the Engineering textbooks written in Malay language (Bahasa Malaysia) which are also used in the vocational Engineering classrooms and their examination or test papers in class or at the national level of ‘Sijil Pelajaran Malaysia’ (SPM). Although there are only eight textbooks available in the construction of the target corpus, it represents the language use of KBSM Engineering textbooks in Malaysia.

### **1.11 Operational Definitions**

With the intention of easing the readers’ understanding of this study, definitions of specific terms that are used throughout this thesis are presented in this section.

#### **Corpus**

A corpus is simply defined as an association or a pool of texts often referred to as lexis (Nesi, 2013; Flowerdew, 2012; Nation, 2001; Kennedy, 1998; Tomlinson, 1998). Linguistically, a corpus is a collection of texts which can be converted into an electronic database, meaning that it must be machine-readable (Tognini-Bonelli, 2001). Corpus linguistics is the study of a language use on the basis of texts with source of evidence for linguistic description and argumentation (Kennedy, 1998: 7). Corpus linguistics is often described as the study of ‘real-life’ language use (McEnery & Wilson, 2001: 1). With all these definitions in mind, in this study, a term corpus refers to the combination of words, phrases and the language used in the whole text.

#### **Corpus-based approach**

Corpus-based approach is the study which uses a corpus (generated or adapted) as a collection of words (source) to examine the properties of a language (the frequency

and/or credibility of the language contained within a smaller data set). A corpus-based approach follows its predetermined set of rules, that is, it does not dispute pre-existing criteria and traditional description (Baker, 2006; Tognini-Bonelli, 2001; Sinclair, 1991).

### **Pedagogic corpus**

A pedagogic corpus can be defined as a corpus consisting of pedagogical materials of the target language which learners use and are exposed to in their academic endeavour. The Engineering textbooks used by the students of Form Four and Form Five in this study are considered pedagogic materials, in which the materials used become the core of the pedagogic corpus. To Hunston (2002) and Willis (1993), a corpus is considered pedagogic when it consists of course books or readers used in ESL/EFL classrooms.

### **Specialised vocabulary**

Words that are technical in nature are known as specialised vocabulary with systematically limited range of target topics and languages (Nation, 2001). Specialised vocabulary can be defined as a specialist domain of subject knowledge which is closely related to a particular subject area (Chung & Nation, 2003; 2004; Nation, 2001). However, in this study, specialised vocabulary is defined as the combination of technical and semi-technical terms. These terms are based on the following adapted criteria introduced by Menon and Mukundan (2010, p. 243) with definitions of the level or degree of technicality as follows:

1. Highly technical words – these are words which appear rarely outside its particular field such as ‘epithelial’ and ‘chromosome’ in the science and medical fields.
2. Sub-technical words – these are ‘context independent’ words (Cowan, 1974, p. 391) which occur with high frequency across disciplines – academic vocabulary.
3. Semi-technical words – these are words which have one or more general English language meanings and which in technical contexts take on extended meanings.
4. Non-technical words – these are words which are common and have little specialization of meaning, for example ‘hospital’ and ‘judge’.

(Ng et al, 2013, p.48)

### **Lexicology**

Lexicology is a branch of linguistics which studies the nature of words: the meaning of words, elements in words, relationships between words (semantical relations), grouping or segregation of words, and the signification and application of words.

### **Lexis/Lexicon**

Lexis is referred to as language chunks of both individual words and multi-word items (Lewis, 2001. P.7), whereas lexicon describes the words used in a language or by certain group of people. Lexicon refers to “all the words and phrases used in a particular language or subject; all the words and phrases used and known by a particular person or

group of people (Oxford Advanced Learner Dictionary, 2013). Lexicon can also be defined as “a list of words on a particular subject or in a language in alphabetical order” (Oxford Advanced Learner Dictionary, 2010). In this research, the term lexis and lexicon are used interchangeably.

### **Phraseology**

Phraseology is a branch of lexicology which is defined as the typical usage, fixed-structure or sequencing of a text. It is a type of word combination which includes noun compound (composite), phrasal verb, multi-word unit and idiom (Hyland, 2008; Hoey, 2007; Lewis, 2000).

### **Noun compounds (noun strings)**

Noun compounds consist of two or more nouns, sometimes necessary adjectives, verbs, adverbs which can be a part of noun strings (Trimble, 1985; Cowan, 1974). The whole idea is that noun compounds are regarded as a single unit and can be used to replace the long phrases that may be ambiguous in meaning (Menon, 2009). Noun compounds or noun strings are usually made up of prepositional phrases and relative clauses, in which they transform the complex ideas.

### **Types and tokens**

Every single word in the text counts as a token, whereas type refers to each dissimilar word in the text. For example, the words ‘engineer’, ‘engineers’ and ‘engineering’ are all considered as types, while token is the number of occurrence of these words in the text. Tokens are also known as running words, whereas types are often referred to as kinds of words.

### **Text or vocabulary coverage**

Text coverage is defined as the percentage of use of the lexical items in the corpus. It shows in details how the lexis is distributed and used across the analysed data. In other words, it refers to the percentage of running words in the text of a specific type of vocabulary. In this study, the terms vocabulary coverage and text coverage are used interchangeably.

### **KBSM**

Kurikulum Bersepadu Sekolah Menengah (KBSM) or the Integrated Secondary School Curriculum for English Language refers to the syllabus outlined by the Curriculum Development Centre (CDC) of the Ministry of Education Malaysia (MoE).

### **British National Corpus (BNC)**

The British National Corpus (BNC) is a 100-million word collection of samples of written and spoken language from a wide range of sources. It is designed to represent a wide cross-section of British English from late 20th century. The written part of the BNC (90%) includes extracts from regional and national newspapers, specialist periodicals and journals for all ages and interests, academic books and popular fiction, published and unpublished letters and memoranda, and school and university essays. The spoken



corpus (10%) consists of orthographic transcriptions of unscripted informal conversations (recorded by volunteers selected from different ages, regions and social classes in a demographically balanced way) and spoken language collected from different contexts, ranging from formal business or government meetings to radio shows and phone-ins (British National Corpus website). In this study, the BNC was used as the reference corpus to develop the word list.

### **Reference Corpus**

Reference corpus in general, ranges from thousands to millions of words, representing the nature of a target language in the form of samples which are used as a standard reference to measure claims about a language (Baker, 2006). Leech (2002) and Sinclair (1991) also assert that reference corpus is designed to provide holistic information about a language. It should be large and relevant enough to represent varieties of the target language and its characteristics. A reference corpus in a corpus-based approach should be at least 5 times as greater as the target or developed corpus for analysis (Berber-Sardinha 2002 & McEnery, Xiao, & Tono 2006). The selected reference corpus for this research is the BNC which was used in several corpus-based related studies (Ng et al., 2013; Mukundan & Ng, 2012; Al-Marooqi et al. 2011).

### **Auxiliary Corpora**

In this study, auxiliary corpora help to investigate the extent of coverage of the created Engineering word list and the comparative lexical properties. There are two types of auxiliary corpora used in this study, namely the General English language texts (KBSM Form Four and Five) (Mukundan & Aziz, 2007) and the Science texts (Form Four and Five Biology, Chemistry and Physics) (Menon, 2009). These corpora are adopted (see Menon, 2009 and Mukundan & Aziz, 2007) for the purpose of making a critical comparison with the target corpus due to their 'supporting' role in enhancing the data collection.

### **1.12 Summary**

This chapter provides the background and landscape of the study. The essence of this study lies on the premise that there is no specialized word list in ESP for Engineering at upper secondary level education in Malaysia. Thus, this study attempts to build an Engineering corpus from the pedagogic textbooks of Engineering and create a specialised Engineering word list. The current research focuses only on the lexical properties of the Malaysian Upper Secondary School Engineering textbooks, written in English. Preceding this, the information regarding the conceptual framework of the study is presented, followed by the description of research design used in the study. This chapter also deals with describing several procedures to enable the researcher to obtain the relevant data so as to answer the research questions asked. Finally, framework of analysis, including noun compounds identification and classificatory system of the bundles are presented and discussed.

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