

A brief analysis of Characteristics and word formation of English vocabulary in science and technology

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Abstract. This paper analyzes the technical English (EST) vocabulary has three main features: technical terms, semi-technical terms and non- technical terms; In modern English, there are 3 main types of English words: base, derivative and compound; A method of English for science and technology: derivation, conversion, compounding, shortening and analogical creation.

Introduction

English for science and technology generally refers to the kind English that is used in natural science and engineering technology, scientific works, papers, textbooks, science and technology reports and academic lectures. With the development of science and technology and the gradual deepening of the global economic integration, English for science and technology is becoming more and more important, and more and more specialized technical words appear in English of science and technology. EST has its own unique vocabulary, and the composition of these words has its own special place. There are a number of specialized technical words, semi-technical words and quasi technical words which can be used in all fields of science, the special science field has its own special vocabulary. This paper attempts to make some tentative discussion on the characteristics of EST Vocabulary and the generation of EST Vocabulary, hoping to be helpful to the teaching of Public English and journals for science and technology.

General features of English vocabulary for science and technology

A large number of scientific and technological vocabulary in English for science and technology.

Technical terms. The so-called science and technology vocabulary refers to the words that are used only for a single subject and the meaning of the word is narrow. In many cases, people are the same as scientists, but scientists in this field don't understand the words in another field. For example, physicists may not understand the field of biology. And due to the development of science and technology, the term of science and Technology (vocabulary) is also increasing, these science and technology vocabulary are only understood by the field of experts or staff. If we read or translate some scientific and technological articles, we would be bound to understand professional terminology in the field, otherwise you wouldn't know what to say. Isotope (tong wei su) in the field of chemistry; photon (guang zi) in the field of physics ; and chromosome (ran se ti) in the field of Biology and so on. These are the words of the science and technology, their meaning is very easy to identify, it is not difficult to identify in the meaning of words by the tool book.

Semi-technical terms. Semi-technical words refer to general vocabulary in the common core of the language, science and technology are given in the semantic extension of the vocabulary of technical terms, that is to say, the language is different from the language of life, but there are different meanings of the words in different areas, also known as the general terminology, it can cross subject. For example, orbit has different meaning in different fields, it refers to the (yan

kuang) in the medical field, and it means (gui dao) in the field of Physics; Operation has also different meaning in different fields, it refers to (shou shu) in the medical field, it means (cao zuo) in the field of computer, and it means (gong si) in the field of business; "a huge multinational electronics operation" refers to (yun suan) in the field of mathematics.

Non- technical terms. Non-technical words refers to the general basic vocabulary in English language, The use of non professional vocabulary still occupies a large proportion in English for science and technology. But some functional words are used repeatedly in the article of science and technology, such as conjunction, preposition, qualifier. Due to the precision requirements of scientific and technological articles, it is very clear that the use of ordinary words in science and technology articles. Such as "with", according to the New English-Chinese Dictionary interpretation has thirteen meanings. The English vocabulary of science and technology is mainly used of seventh meanings that is tool or means.

Word formation of English for science and technology vocabulary

Three main sources of English vocabulary for science and technology. General English vocabulary, Borrowed from the foreign language, The newly created words and phrases as the main source of the three of English for science and technology vocabulary.

General English vocabulary. General English vocabulary is the use of daily English vocabulary to escape, and endow them with new lexical meaning. Such as power(li, quan li)escapes into power(dian neng, dian li, bei lv, mi); angel(tian shi) escapes into radar echo(lei da fan xiang); base (ji chu) in chemical escapes into alkali(jian), Base(ji chu) in medicine escapes into base(zhu yao); energy(huo li, jing li) escapes into energy(neng, neng liang).

Borrowed from the foreign language. From the point of view of the origin of the word, most of English for scientific and technological terms are derived from the classical Greek and Latin(Latin or Greek morphemes is more formal, less emotional color), this is one of the basic reasons why English for science and technology is more international than ordinary English. This kind of borrowed words and phrases, some of which are from Latin, still retain the original form of Latin. Such as acupuncture(zhen jiu), amnesia(jian wang), minimum(zui xiao de).

Some borrowed words and phrases are from the Greek, such as aerodynamics(kong qi dong li xue), phlebotomy(jing mai qie kai fang xue shu). And there are borrowed words and phrases from other countries, such as sputnik(ren zao wei xing) is derived from the former Soviet union, chiffon (xue fang chou) is derived from the french, tsunamic(hai xiao) is derived from japan, pongee(jian chou) is derived from chinese, bauhaus(jian zhu) is derived from German. It is easy to have the native language and the existing word combination, that is the so-called "denizens". Such as law(fa lv), sky(tian kong), fellow(huo ban).In the history of French, there are three concentrated periods of borrowed words: a large number of Latin and Greek in the period of 15th to 16th Century Renaissance is integrated into France; it uses a lot of English loanwords during the period of eighteenth Century enlightenment; after World War II, especially, American English Loanwords is full used in French. The first two periods of foreign words have been gradually transformed into French absorption. Today, French for science and technology loanwords are mainly third periods: it is the period of American English Loanwords after World War II. This is mainly because English is the dominant position in international affairs, on the other hand, after World War II, the United States the rapidly develop in the economic field of science and technology, comparing Europe devastated with it. Many new technologies and new concepts are produced in the United States. The French take "take-ism" for new science and technology vocabulary, some loanwords remain intact in the French, another part of the loanwords remain the part of French, but it still retains the many English mark. For example, the information technology industry to use a large number of borrowed from the foreign language. For example, hard disc(ying pan), the CD-Rom(guan qu), Audio-output(yin pin shu chu), Bluetooth(lan ya), data Data bus(shu ju zong xian), ect. The French to maintain their purity, trying to assimilate these words, but the effect is not obvious.

The newly created words. The vast majority of technology vocabulary is based on Latin and Greek of the two classical morphemes, some technology vocabularies put them together to form the required professional words. A morpheme and different morpheme combined can form many scientific words, composition range is not limited to a science and technology professional, but the science involved in many areas. For example, sub-(ci, ya) and son(sheng yin) are made up of subsonic(ci sheng) by the Latin morphemes. Di-(shuang, er) and -pter(yi, chi bang) are made up of diptera(shuang ci bang) by the Greek morpheme. Greek morphemes and Latin morphemes are made up of television(dian shi). English morpheme and Greek morphemes or Latin morphemes are made up of Weatherometer (nai feng shi ce ji) etc.

Structure of English words in science and technology

In modern English, there are 3 main types of English words: base, derivative and compound.

Base. This kind of word is made up of a morpheme (root morpheme)[1] independently. The words that contained in this kind of words can be used independently. There is a kind of root that can not use imdependently, and then it is only used by combining with other morphemes to form the word or vocabulary, such as sun, star, stone, ect. This a kind of root is a word itself. But these words have same significantly as roots like sol(tai yang), astro(xing), lith(shi), etc. It is not independently used. it is only used by combining with other morphemes to form the word or vocabulary. For example, sol changes into solarimeter(ri she biao), extrasolat(tai yang xi yi wai de), etc; astro changes into astro-chemistry(tian ti hua xue), astrophmeter(tian ti guang li ji), etc; lith changes into lithophyte(shi sheng zhi wu), aerolith(yun shi), lithology(yan shi xue), lithification(hua shi), lithoscope(jie shi jian yan qi), urolith(niao shi), etc. Above of these vocabulary are relevant to sol(tai yang), astro(xing)and lith(shi), but it is not to use sun, star, and stone. Thus,not until should we learn the second kind root apart from the first kind of base, until we could master a large number of scientific knowledge.

Derivative. Derivative is made up of a root word and one or two more derivational morphemes (prefixes and suffixes). Affix is extremely strong, extensive collocation expressing, at the same time, it also has great flexibility. This is because on the one hand, the basic meaning of the affix is relatively stable and clear, on the other hand, they are very strong adhesion, attached to the root word before or after the concept can be formed immediately. In technical terms, derivative from Greek and Latin roots creates accounted for a large proportion by derive methods, in particular, Latin and Greek affix that some express the degree, position, number, manner, etc. They play a great role in the Construction of science and technology words. For instance, the Greek prefix hyper(chao) plus the Greek roots piesis(ya) change into the new word hyperpiesis(gao xue ya); the Greek prefix endo-(nei) plus the Greek roots plasm(yuan jiang) change into the new word endoplasm(nei xi bao). Some of Greek affix express the number like a(wu), daca(shi), myria(wan, xuduo), ect. These affixes plus poda(wu zu dong wu) change into new noun apoda(wu zu dong wu), decapoda(shi zu dong wu), myriapoda(duo zu dong wu), etc. In medical terms, there are three common Greek suffix: -itis(yan), -oma(liu), and -osis(zheng)[2] . -itis is added to the name of any part of the body, it will express this part of the inflammation. put -itis behind gastr(wei) to become gastritis(wei yan); put -itis behind arthr(guan jie) to become arthritis(guan jie yan); put -itis behind appendic(lan wei) to become appendicitis(lanweiyan); put -oma on the Greek roots sarc(ying) to become sarcoma(rou liu); put -oma on the Greek roots scler(ying) to become sarcomasclerosis(ying hua zheng), etc.

Because most of the technology words are formed by the combination of basic morphemes, if we can grasp the basic morpheme words of science and technology, thoroughly understand these the meaning of morpheme composition, and know how to word formation, it is convenient to understand the meaning of ten thousands technical vocabularies. Many words of science and technology can use analytical method to precipitate the meaning, it is also to say the means of word formation rules. Firstly, it must resolve (precipitation morpheme and morpheme), after synthesis (the morpheme meaning to carry on the adjustment, the clusters), finally, a complete meaning of

word would be acquired.

Such as photo(guang)+morph(o-xing tai)+genesis(fa sheng)=photo- morphogenesis(guang xing tai fa sheng xiang xiang),oto(er)+rhino(bi)+laryngo(hou)=otorhinolaryngology(er bi hou ke xue),baro(qi ya)+thermo(wen du)+graph(ji lu qi) = barothermograph(qi ya wen du ji lu qi)[2]. In addition, different suffixes have different meanings, and the affix is divided into monosemic and polysemic. Morphological affix has its own special meaning. For instance, prefix “ re-” is means of the repeat, like the word reclose(chong xin jie tong, chong xin bi he), recombination(fu he, zai fu he); suffix “-asis(or osis)” is meanings of the disease, like the word filariasis(si chong bing), lithiasis(jie si bing), nephrosis(shen bing), etc.Affixes is the same difference as the words, one is monosemic and the other is polysemic. For instance, “anti-” is a kind of monosemic affix, anticyclone(fan qi xuan), antistickoff voltage(fan nian dian ya, kang zhi liu dian ya), antiproton(fan zhi zi), antireflection coating(fang fan fu she fu ceng). Lots of affixes are polysemous, for example, suffix “-er” is generally to express persons who are engaged in a certain profession in the noun, like baker(mian bao shi). Sometimes, it also express the objects that are some kind of action, like transmitter(fa bao ji). Suffix“-er”express both the people and the objects, like cutter(dao jiang/qie xue qi, li dao)。

Compound. The word composed of two or more than two words, it is called Compound[3] . Subordinate Compound Words. There are different logic relationship between root and stem in compound words is called Subordinate Compound Words, like beewax(feng la), darkroom(hei shi). Coordinate Compound Words. All Compound words, which between different root or stem in the sense of having parallel relationship, with equal status, is called Coordinate Compound Words. Like, dew-point(lu dian), blue-black(lan hei se de).

Formation of English for science and technology

The structure of scientific and Technological English mainly include derivation, conversion, compounding, shortening, and analogical creation.

Derivation. Derivation is also called the affixation. On a root (or stem) to add word-forming suffixes to form the words, is called the derivation. Common derivation methods are divided into three categories, suffix, prefix and foot-prefix-suffix (Table 1).

Conversion. Conversion is a word of a certain part of speech into words in another part of speech, while the word morphology is invariant and this kind of word-formation is called conversion. Conversion is mainly about converting nouns into verbs, and adjectives into nouns (Table 1).

Compounding. The way of combine two or more than two words (stem or root) to constitute a new word is called compounding. The word that is formed by compounding is the compound word. Compound words are written in (no hyphens) and sub-written (with a hyphen), such as fallout and hot-press. According to the different parts of speech, the compound words are divided into compound nouns, compound verbs, compound adjectives and adverbs, etc (Table.1). Compounding process is simple and generate power, and has a broad market. Most compound words of the scientific and technological in English are taken from the literal translation method, but avoid too literally translation because they are often not the simple com-positional meaning of combination.

Table.1 Derivation, Conversion and Compounding.

Derivation	e.g.
Suffixes prefixes Suffixes, prefixes	Planeto+ -logy= planetology Macro- + instruction=macroinstruction Co-oper+ -ate=cooperate
Conversion	e.g.
N. Adj. V.	Alloy- to alloy Round- to round To divide-divide
Compounding	e.g.
Compounding N. Compounding Adj. Compounding V.	Pulse-scaler Mushroom-shaped Criss-cross

Shortening. The original word will be shortened or the its contained components to be compressed[1] . Omitted to form new words called shorting. According to its structure, acronyms.

Clippings: there are three main situations: cut off head of a word, cut off a word and cut off both head and tail of a word (Table 1).

Blends: Two words are take in one part and constitute a new word. It is to say that two words in spelling or pronunciation is more suitable for the part in "before a word to cut off tail, a word to cut off head" with overlapping hybrid, after hybrid, new words have the meaning and forming of two old words. Like, condensation+trail=contrail(ning jie wei liu), copy+electron=copytron(dian zi fu xie ji shu), gravity+sphere=grav-isphere(yin li zuo yong fan wei)。 Acronyms: There are two kinds of forms in scientific and technological English. One is the acronym, that is to combine the first letter of the main words in a word into a new word, such as: ADP=Automatic Data Processing (zi dong shu ju chu li), FTP=File Transfer Protocol(wen jian chuan song xie yi), AC=Alternating Current (jiao liu dian). The other is to take the first letter of the word and another letter in the word or part of the letter to form a new technical English word, such as: DNA=deoxyribonucleic acid(tuo yang he tang he suan), TB=tuberculosis(wei jie he), SONAR=Sound Navigation and Ranging(sheng na). Acronyms shortened the wordy arrange of a group of related words, which has concise advantages in the process of communication, and has the advantages of economy, easy to spell and simple expression. It is positive effect for communication, but it should also pay attention to avoid causing the difficulties, or misunderstandings between the communicators.

Analogical creation. Using an existing morpheme to imitate another existing similar word to construct the corresponding word or approximate word is called analogical creation. In modern English, analogical words play a role in expanding and enriching the vocabulary of science and technology. This kind of word formation totally can be divided into five parts: the anti-sense analogy, the approximate analogy, the place and space analogy. The digital analogy, the color analogy (Table 2). Analogy is widely used in the composition of science and technology words, and it has become one of the most effective methods to grasp the morphemes with each other and improved the ability of using science and technology English vocabulary. For instance, geometry. Geometry(ji he xue) and photo-phone(guang du xue) is composed of forth different morphemes. By analogy It can both use our morphemes alternately and form two new words geophone (di zhen jian

bo yi) and photometry (guang du xue). Some words are made up of the same root that is added two meaning opposition of prefixes to antonyms. Like, tachy(ji su) and brady(xu huan) constitute to tachycardia(xin bo guo su), bradycardia(xin bo xu huan), tachypnea(hu xi ji cu) and bradypnea(hu xi xu huan), etc. Hetero(yi) and homo(tong) constitute to hetero-polar(yi ji de)and homo-polar(tong ji de); hetero-sphere(fei jun yun zhi ceng) and homo-sphere(jun zhi ceng),etc.

Table. 2 Shortening and Analogical creation

Shortening	e.g.
Truncation Drop-tail Truncation and Drop-tail	Helicopter-copter Microphone-mike influenza-flu
Analogical creation	e.g.
Anti analogy Approximate analogy Place space analogy	High-boiling Low-boiling Environment pollution Acoustical pollution Earthquake Moonquake

In addition to the above several main word formation, English for science and technology still use back-formation. Like, it is from typewriter to type-write, and from diagnosis to diagnose. In addition, many scientific nouns and terminology is borrowed from proper nouns (including personal names, place names, trade names, trademarks, institutions) to make words. Such as Chandler.s wobble (Chandra wave said) is based on the American astronomer Seth Carlo named Chan-Adler. Mace(mai si shen zhen ding ji) is the original trademark, now the trademark not only by the medical use, and also derive the verb to mace(pen yi mai si shen jing ci ji ji). Apocynthion(yuan yue dian) is from Cynthia`s name(yue liang nv shen) in Greek mythology. Uranium (you) from Uranus` name(tian wang xing) in the star.

Conclusion

With the rapid development of science and technology, a large number of scientific and Technological English new words are born at an amazing speed, so the scientific and technical professionals need a solid knowledge of foreign languages and need basic knowledge of science and technology. The study of EST Vocabulary can enable us to understand its source, word formation and its characteristics. This is not only conducive to the understanding of EST vocabulary and the translation of scientific and technological terms, help language learners to improve the ability of understanding the vocabulary, but also does it provide the study of other areas of language as a guide.

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