

Scientific and technical English examples

Compounds usually represent shorthand versions of the following:

1. *Prepositional phrases*: a differential time domain equation= the time domain of a differential equation.
2. *Strings of prepositional phrases*: momentum transfer experiments= experiments of the transfer of momentum.
3. *Nouns modified by relative clauses*: automatic controller action= controller action which is automatic.
4. *Nouns modified by gerund phrases*: a fluid bed reactor= a reactor containing a fluid bed.
5. *Combinations of the above*: an air pressure device= a device which signals the pressure of air; a quiescent state fluid bed reactor= a reactor containing a fluid bed which/that is in a state of quiescence.

Appendix 3

COMPOUNDS CATEGORIZED BY LENGTH AND DIFFICULTY OF PARAPHRASING

I. Simple

1. *Metal shaft*= a shaft made of metal.
2. *Metal spring*= a spring made of metal.
3. *Metal cutter*= not a cutter made of metal but an instrument used to cut metal.

II. Complex

1. *Liquid storage vessel*= a vessel for storage of liquids/for storing liquids (not as some non-native students would have it, a liquid vessel used for storage).
2. *Transport sector investment*= investment in that sector of the economy which

concerns transport-- the movement of goods and people.

3. *Automated nozzle brick grinder*= a grinder of nozzle bricks (a type of brick) (not a grinder of bricks, the grinder having a nozzle which is automated).

III. More complex

1. Aisle seat speech interference level.
2. long-term surveillance test planning.
3. Swine salted viscera.

IV. Very Complex

1. Full swivel steerable non- retracing tail wheel overhaul.
2. Heterogeneous graphite moderated natural uranium fueled nuclear reactor.
3. Split damper inertially coupled passive gramy gradient satellite attitude control system.

(Adopted from: Louis Trimble, English for Science and Technology, 1985, PP. 130-133)

Foot notes

1. Using native language for teaching purposes in classroom.
2. Demonstrating the semantic concept of one language via another language.
3. The role of English in countries where it is taught as a subject in schools but not used as a medium of instruction in education nor as a language of communication within the country.
4. An abbreviation for Teaching English as a Second Language. It is the role of English for those who learn language in English-speaking countries.

carried through a section of the processing cycle.

Appendix 2

'Rules' FOR UNDERSTANDING AND PRODUCING COMPOUNDS

General English examples

1. A compound is a group of two or more nouns, plus such other parts of speech as are necessary, which expresses a 'single noun' idea.

Compounds are usually formed from prepositional phrases or relative clauses and many can be back-formed into one or the other of these.

However, many other compounds do not yield, either to back-formation or to translation into any 'logical' phrasing.

2. The simplest type of compounds are those formed from prepositional phrases with *of*: *a desk drawer*= *a drawer of a desk*; *a table top*= *a top of a table*.

3. In forming a compound from a phrase, the nouns in the phrase are put in reverse order: *an advertisement (1) in a magazine (2)*= *a magazine (2) advertisement(1)*.

4. In a compound, if the noun (or nouns) that becomes the modifier is in the plural in the original phrase, it becomes singular in the compound: *a shelf for books*= *a bookshelf* (not a bookshelf as many non-native speakers would have it).

5. Prepositional phrases with *for* also are often the basis for compounds. When these relate to activities either the compound or the base form or both usually contains a gerund: *a device for opening tins*= *a tin opener*; *a*

program for building roads= *a road-building program*.

6. Some compounds come from relative clauses: *a book binder*= *a person or machine) that binds books*; *a shoe store*= *a store in which shoes are sold*.

7. Some compounds cannot be logically back-formed, nor can they always be simply translated: *a department store*= *a store containing several different departments for selling different types of merchandise*.

Back-forming this would give us 'A store of departments', which is not a useful back-formation (nor a logical one) in that it fails to provide much information. The translation is obviously awkward and certainly not 'simple'. In the compound 'symphony music' we also have a problem with either back-formation or translation: if we try to back-form it, we get 'Music of/from a symphony', which is inaccurate; if we translate, we can get 'Music which is of the type called "symphonic", but then we need to define 'symphonic'.

8. Compounds that lend themselves to translation can be translated in several ways. Some common ways are: *a boat trip*= *a trip by/in a boat*; *labratory equipment*= *equiptent used in a labratory*; *mathematics problem*= *a problem in mathematics* (not of mathematics); *physics labratory*= *a labratory where/in which experiments in physics are performed*. (Even non-native students whose performance is well above average may need to be reminded that both 'mathematics' and 'physics' are singular nouns and so keep their *s* when acting as modifiers in compounds.)

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Appendix 1

SAMPLE SUB-TECHNICAL TERMS

1. Base

Botany: The end of a plant member nearest the point of attachment to another member, usually of a different type.

Chemistry: A substance which tends to gain a

proton. A substance which reacts with acids to form salts.

Electronics: Part of a valve (Us "tube") where the pins that fit into holes in another electronic part are located. The middle region of a transistor.

Navigation: In a navigation chain, the line which joins two of the stations.

2. Dog

Construction: A steel securing piece for fastening together two timbers.

Machining: A lathe carrier.

Mechanical engineering: An adjustable stop used in gears.

Petroleum engineering: A clutching attachment for withdrawing well-digging tools.

Railroading: A spike for securing rails to sleepers (Us "ties")

3. Fascia

Architecture: A board decorating a gutter around a building.

Automobile: The instrument panel.

Zoology: The connective tissue bands that join the fasciculi of a muscle.

4. Fast

Medicine: Resistant to.

Mining: A hard stratum under poorly consolidated ground.

Paint: Said of colours not affected by light, heat, damp.

5. Transport

Business: Any mechanical means of moving goods.

Literary: Enrapture (archaic).

Nuclear: The rate at which desired material is

reconsidered and re-thought in terms of the students mother tongue.

2. The pure Translation Approach in EST

Within the academic work of science and technology, students are often called upon to translate some contents of their authentic materials into their mother language to be used as term papers, thesis, dissertations, lectures, and so on. Naturally, the communicative language teaching approach by discarding the mother tongue from the classroom activities is not apt to lead the EST/ESP students to a deeper awareness of the semantic complexity of EST/ESP discourse. To increase the learners ability to decode the technical and scientific phenomena of the English discourse and express them in their own language, a pure translation approach is required to be applied to EST programs. It provides students with the ability to express the technical/scientific concepts of target language by the equivalent elements of their mother tongue where not only superficial semantic equivalents are sought but also a maximum of implied meanings and rhetorical and expressive effects are practiced. This enables students to synchronize the source language and target language with syntactic, semantic, and lexical knowledge of both L_1 and L_2 and gives them guidelines to decode and interpret their authentic materials correctly.

Conclusion

The application of native language both through pedagogical and pure translation approach leads EFL students to a deeper awareness of the complexity of EFL materials and enhances their ability in developing

techniques to comprehend the scientific and technical writing. Unless students are able to interpret the EST complex terms and expressions in their own language, they will be unable to produce effective comprehension in their interlingual technical and scientific communication. Although competence in translation may not in itself indicate significant ability in the communication of a target language, in EST programs, translation may be considered a sort of supercompetence marked off from the four monolingual language acquisition skills. It is a demanding skill requiring specialized training and guidance. It is for the effectiveness of this skill that both pedagogical and pure translation become relevant to the EST teaching process and bring a pleasing improvement in the linguistic competence of many elements of EST discourses.

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appendixes 2 and 3 which summarize the rules for both (a) general compounds, (b) scientific/technical compounds, and (c) compounds categorized by length and difficulty of paraphrasing (Trimble 1985).

These compound nouns often present difficulties to non-native students if are taught by approaches other than translation techniques which ignore to give mother-tongue equivalents to those intricate lexical structures of target language. For example, some compounds cannot be logically back-formed, e.g., *a metal cutter: arreyé felezbor* is a saw used to cut metal.

Back forming this would give us a "cutter metal" which is not a useful back-formation nor a logical one, in that it fails to provide accurate information. *Automated nozzle brick grinder: sangé sonbaadeyé aajoré motakhalkhel* is an example of complex compounds. It is a grinder of nozzle bricks (a type of brick) not a grinder of bricks, nor the grinder having a nozzle which is automated. Most readers initial response is to assume that "nozzle" is part of the grinding machine, not a type of a brick.

"Aisle-seat speech interference level", meaning in Persian as "enkaassé goftaaré mihmaandaar va mosaafer dar havaapeimaa" is still another example of English more complex compounds taken from an airplane manufacturing company report and refers to acoustic texts made to determine the level of interference with speech between an attendant and a passenger who is sitting in an aisle seat on an airplane. As is so often the case with compounds of this type, the problem here is one of ambiguity. On first reading one wonders

if there is *interference with speech taking place at an aisle seat* or *interference with speech issuing from an aisle seat* (Trimble; 1985).

As a second language (ESL), it is reasonable to say that the acquisition of these complex elements usually occurs as learners acquire more of the language without being in direct contact of their mother tongue. This means that once students have mastered a number of communicative strategies, they get the best of the intricate elements of the technical discourse as well. However, in countries where English is taught as a foreign language (EFL), opportunities for communicative acquisition are few. In these countries, classroom work is not backed up by more intensive practice outside the classroom and therefore is not activated by the naturalistic acquisition of language (Heltai, 1989). Under these conditions, my experience has shown that the role of using mother tongue in classroom to elaborate the source language equivalents will be obviously much more pleasing and informative.

For example, if the compounds such as *a metal cutter, automated nozzle-brick grinder, and aisle seat speech interference level* are to be taught to Persian students, they are better taught by indicating their Persian equivalents as: *arreyé felezbor; sangé sonbaadeyé aajoré motakhalkhel; and enkaassé goftaaré mihmaandaar va mosaafer dar havaapeimaa* respectively.

The remaining example shown in appendixes 2 & 3 all illustrate different constructions which may pose learning difficulties if are not taught by translation pedagogical approach. This approach provides a careful analysis of technical elements of target language and allows them to be

are indicated in Appendix 1.

What we learn from the study of these sub-technical terms is that while the more technical of their extended meanings are usually learned quickly in technical courses, the majority are seen in reading before they are heard or discussed either in language or subject-matter class-room. In addition, their meanings usually fluctuate from discipline to discipline depending on the semantic variations involved. For example, a *dog* in the field of construction means: *a steel securing piece for fastening together two timbers* which may be called in Persian as *geidé alvaar*; in machining, *a lathe carrier: hammaleyé mashiné taraash*; in mechanical engineering, *an adjustable stop used in gears: khaaré gaablé-tanzim*; in petroleum engineering, *a clutching attachment for withdrawing well-digging tools: aazaadkoné sarmattheyé chaahkani*; and in railroad engineering, *a spike for securing rails to sleepers: mikhé traavers*.

The result too often is that the students go to a bilingual dictionary and find no definitions that make sense in the context containing the words. When, due to the nature of definitions of these technical and scientific terms, they do not get any help from a monolingual dictionary either, they usually ignore the particular piece of text and so lose the information the unidentified terms or their surrounding context can give them.

My personal experience is enlightened by the idea that in an EFL⁽³⁾ environment, the most practical approach in teaching such technical terms is to state their mother-tongue equivalents when they are taught in a non-English speaking country like Iran.

An approach like this is undoubtedly a valuable pursuit, as it forces students to explore resources of lexicon in their own language and this, in turn, helps them to develop source-language analyzing techniques--a fundamental stage in EST learning process.

Nominal Compounds

Nominal compounds are defined by Trimble (1985) as *two or more nouns plus necessary adjectives and less often verbs and adverbs that together make up a single concept identified as a single noun*.

Since compounding is frequently given in intermediate and advanced EFL/ESL⁽⁴⁾ classes, the majority of students coming into a tertiary-level of EST class can handle most two-word compounds by analysing them into their constituents. However, no matter how well students learn to analyze compounds into component parts, there are compounds that do not yield to this procedure. As indicated in appendix 2, while a *travel book: raahnomaaye safar* is most likely to be a book about travel, a *telephone book: ketuabcheye telefon* is not a book about telephone, but a book indicating telephone numbers. *Copper wire: simé messi: and steel wire: simé foolaadi* are wires made of copper and steel respectively, but we cannot say the same about *piano wire: sime piano*.

When we look at more complex compounds in scientific and technical discourse, we can see that problem is magnified to the point where many are impossible of being taught by pure communicative approach unless the students learn their translation equivalents. Good examples of problems with these sorts of compound nouns are illustrated in

controversial component, depending on prevailing objectives and teaching preferences. It was an indispensable element of the learning and testing process in the grammar-translation approach. Direct method theorists denied it as a learning device and excluded it from early instructions as much as possible, while admitting it as an art if learned as an end product (Nadstoga, 1988). With the introduction of the audio-lingual method the use of the native language was either excluded from the foreign-language classroom or was highly restricted (Silvia, 1988). Later on, the view of language learning as a conscious and intellectual process within the cognitive-code learning theory provided a strong argument in favour of translation (Nadstoga, 1988). Today, there is adequate evidence to stress the necessity of translation both as a pedagogical device and a pure skill.

In the following study these two approaches are investigated separately in relation to teaching English for science and technology.

1. Pedagogical Translation Approach in EST Characteristics of Technical and Scientific Context

Technical and scientific texts are primarily distinguished from other forms of writing by terminology. Their characteristics and grammatical features such as passivization, nominalization, empty verbs, etc., diverge with other varieties of language in frequency and register (Newmark, 1988). They are usually free from the emotive language, potentially non-cultural, and originally written for the benefits of science and technology rather than for a certain speech community (Fallahi, 1990).

In spite of all these variations, the present study is focussed on the property of terminology only because it is the central difficulty in technical and scientific reading.

Terminology of Science and Technology

The dictionary definition of the term *terminology* is the *system of terms used in a specific field*. Our meaning; however, is somewhat more restricted, referring only to the following three lexical areas:

1. Technical vocabulary, 2. Sub-technical vocabulary, and 3. Nominal compounds which are sometimes called noun strings (Trimble 1985).

Technical Vocabulary

Technical vocabulary by itself does not pose much problem for the majority of non-native students to need special attention in the classroom. Therefore, it seems rather pointless for a teacher to apply translation as a pedagogical device for learners who have already acquired the highly-specialized lexis of target language in their subject-matter courses and when they can find their equivalents in bilingual technical dictionaries if there are any.

Sub-technical Vocabulary

Sub-technical vocabulary is defined by Dr. Ronayne Cowan of the University of Illinois as "context-independent words which occur with high frequency across disciplines" (Trimble, 1985). These words have one or more "general" meanings and in technical contexts take on specialized extended meanings in some fashion. Some examples of these lexical items

The Role of Translation in Teaching English for Science and Technology (EST)

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واژه ترجمه در مورد فرآیندهائی که اهداف و طبایع متفاوتی نسبت به همدیگر دارند مفهوم چندان شفاف و روشنی را از خود ارائه نمی دهد. به خاطر مقاله حاضر دو مقوله جدا از هم را می توان از ترجمه استنباط نمود. اولین مقوله اصول برگرداندن نماد معنایی یک زبان به زبان دیگر است و دومین، استفاده ابزاری از زبان مادری به نام ترجمه به منظور آموزش زبان انگلیسی برای دانشجویان علوم مهندسی و تکنولوژی می باشد. بنابراین می توان گفت که بین نقش ابزاری ترجمه برای آموزش زبان و مقوله محض ترجمه که به عنوان یکی از مهارت های زبان محسوب می شود تفاوت فاحشی وجود دارد. این مقاله به نقش ابزاری ترجمه در آموزش زبان علوم مهندسی و تکنولوژی عنایت دارد.

Abstract

Translation is very much a blanket term for procedures different in nature and consequence. However, for the sake of this study, we assume two separate issues to be considered. One is the "pure" issue of the principle of semantic demonstration of one language via another language, the other is the "applied" issue of the pedagogical function of the mother tongue in teaching English for science and technology to speakers of other languages. Thus a distinction can be made

between the role of "Pedagogical Translation"⁽¹⁾ used for teaching a language, and the "Pure Issue of Translation"⁽²⁾ which is concerned with translation as a skill in its own right.

This article is intended to investigate the role of translation through both approaches in teaching scientific and technical discourse.

Introduction

In the teaching of languages, translation has been at different periods either an accepted or