Teaching how to generate complex nominal phrases used to define New concepts or describe objects.

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Abstract

Teaching technical vocabulary is a task which requires special techniques and the use of a context. Scientific texts incorporate complex noun phrases as part of their communicative function within a concept-oriented theory. The occurrence of these combinations constitutes a common feature of the above-mentioned texts. The aim of this paper is to examine the different functions which underlie those phrases and how they generate depending on the information they convey. Based on the communicative approach, we present these nominal phrases to our students as a means to define and describe new objects and concepts. In order to produce reliable, well-formed and permissible compound nominal phrases, their complexity is analysed and the different chunks are split up to understand the way each element is added to convey new information. The semantic relationships between all the different elements, which are dependent upon the function these items perform within the complex phrase, are also studied.

Key words: complex nominal phrases, functions, semantic relationships.

Introduction

The world information technology market together with information in the area of science and technology require a constant use of the English language to inform about the latest achievements of research. Knowledge is conveyed throughout the world faster and more easily, though it is not available to all the inhabitants of the land. This need for communicating the latest findings has implied a constant effort to master the use of language by concentrating the information so that people can understand what researchers and scientists have discovered and reported.

Research articles define new concepts and objects in science and technology journals and magazines. These are used by undergraduate students, who have to use them as a constant source of knowledge. The complexity of these new concepts and the detailed descriptions of new technologies require the use of complex lexical items or compound nominal phrases, which often incorporate multiple modifiers, thus raising the possibility of ambiguity in their interpretation.

The purpose of this paper is twofold: first, to show how these complex nominal phrases can be interpreted by the students in the area of Agriculture and, at a second stage, to encourage them to produce such complex nominal phrases when they need to describe objects or, perhaps, define new concepts. When analyzing these complex structures we have to bear in mind that the semantic relation among the different modifiers of the head noun helps to understand the meaning of the whole compound nominal phrase (Levi 1983; Barker *et al*. 1998; Fan *et al*. 2003). Fabre (1996: 364), explains the interpretation of different determiners of complex nominals in the following way: "*Interpreting nominal compounds consists in retrieving the predicative relation between the constituents*". Later on she adds: "*We first describe this model showing how*

compound interpretation must rely on an accurate description of the predicative properties of nominal constituents".

Several proposals can be accepted for a better understanding of the way information is processed. Gärdendorfs (2000) developed the framework of conceptual spaces within the cognitive science. Compositionality of noun phrases can be explained by accepting and understanding the theory of concept spaces (Jensen et al., 2001). Cooper et al. (1996) present a basic model of concept combination, which is the basis for more complex noun phrases. Hill et al. (2000), referring to the learning of collocations, insist on the idea that the new language should be incorporated into the learners' mental lexicons, bearing in mind that these collocations or, in our case, complex nominal phrases, must be interpreted as elements of a large frame in which they all have different functions.

Clarity and condensation of information are two characteristics of scientific language. The following example shows how, by reducing the number of words and changing their position in the sentence, the information becomes condensed.

Ex: A hedgerow which is two years old, and which is 20 feet wide and 660 feet long
A hedgerow (which is) two years old, (and which is) 20 feet wide (and) 660 feet long.
A 2-year-old, 20-foot-wide-by-660-foot-long hedgerow.

In this process of sense generation, as new concepts are combined, there is a bottom-up input taken from lexical concepts, which are dependent on the different constituents of a phrase**.** Consequently, an output sense of the phrase is obtained, since there has been a more appropriate fit to the pragmatic context. Modifiers of noun phrases may change the semantic interpretation of one determiner since it possesses central attributes in some cases, but diagnostic attributes in others. For example, a wax harvester shows central attributes of wax objects, but only diagnostic attributes of real harvesters. However, in the case of the type of English used in science and technology, these changing attributes seem to be less frequent, as the terminology used conveys clear and condensed information, as mentioned above.

Complex noun phrases are made by the addition of multiple modifiers, and hence ambiguity may arise. This happens when modifiers are privatives, or when used metaphorically. In these cases, the pragmatic use of the modifiers, determined by context, will help the reader understand the relationship between all the constituents of a complex noun phrase.

Let us consider two examples to see how the different modifiers are added and how, according to their pragmatic use, acquire a specific contextualised meaning.

diet
powder-sugar diet
yeast-carrot powder-sugar diet
torula yeast-carrot powder-sugar diet

wheat bran
wheat bran food base
wheat bran food base production
wheat bran food base production system

In the previous examples all modifiers happen to be nouns, or chunks made up of nouns, which add new information. In the first case, the noun phrase has been reproduced leftwards, that is to say, adding determiners to the head word, whereas in the second, we have started with the most leftward position moving on to the right-hand position of the head word.

Material and Methods

In order to generate sense through complex noun phrases it is essential to understand how smaller units of meaning are grouped, giving rise to compound nouns, collocations, chunks or simply syntactic units. For this purpose, we have randomly selected different types of noun phrases from a larger corpus made up of 7,636. These included phrases with three elements, the most numerous group with 3,659, up to very complex nominal phrases with sixteen elements, the least recurring group. They, in turn, have been classified into three groups called *–ed* group, if one of the modifiers is an –ed verb form, *-ing* group, if one of the modifiers is an *–ing* verb form, and the third group, called *strings,* does not include any verb form.

We analysed several grammatical features according to the different pragmatic value within the phrase. At a very first stage, we started with noun combinations to make compound nouns as *root rot, crown rot, drip irrigation, degree-day,* and *degree-hour;* or adjective plus noun combination resulting in compound nouns as well. This is the case of *limonoid glucosides, somaclonal variation* or the more complex compound nouns such as *lead-free petrol* and *break-even analysis.*

The addition of other types of modifiers includes premodifying relative clauses, either active or passive according to the verb form. Typical examples of these complex noun phrases are: *wheat-growing areas, spring-sown crops, hydraulically-operated regulating door, laboratory-selected malathion-resistant population, fruit-mimicking 8-cm red spheres.*

In complex nominal phrases of this type, it is essential to group the different modifiers according to their pragmatic value. For example, *fruit-mimicking 8-cm red spheres* may be divided into three groups: first *fruit-mimicking (w*hich mimic fruit), secondly *8-cm* and finally, the head noun *red spheres.* For a better understanding of this generation process, some formulae were used. Following are examples of the three groups. Nominal phrases with three elements may have the following formulae (*ab+c*), (*a+b+c*) as we can see in examples *shearbolt-protected mouldboards* or *ground-dwelling arthropods* for the first formula and *lamb growth rate* for the second. Other formulae are possible but these are the most recurring. Nominal phrases made up of four different words include the following combinations, although others are possible. *Tractor-mounted boom sprayer, soil-infesting insect pests* match this formula, *[(a+b)+(c+d)*], whereas *four-wheel drive vehicle* is formulated in this way *[(a+b+c)+d],* and *daily-drip irrigated plants* correspond to this formula *[(ab+c)+d]*.

More complex nominal phrases generate a large number of different combinations. For this reason, we only analysed the most recurring ones. From the five groups, we selected the following examples: *laboratory-selected malathion-resistant plants* corresponds to this formula *[(a+b)+(c+d)+e*], and *NIR-predicted values* may be

formulated according to this one *[(abc+d)+e*]. This formula *[(a+b)+(cde)]* is repeated in several examples, as we can see in this one*: Flesh-eating screw worm fly*. From the *strings* group we selected only this formula *[a+(b+c)+(d+e)]* as the others are recurring, although with different grammatical forms. This example follows the formula presented above: *remote five-way volumetric valve*.

Nominal phrases with six or seven elements were analysed in the same way, resulting in similar but more varied formulae due to a larger number of words making up each phrase.

In order to produce these complex lexical items, we studied their function, both from the communicative and syntactic point of view. The majority of these complex nominal phrases describe objects or concepts. This function was studied from different criteria. First of all, the headword was related to the modifying verbs, which are either active or passive. In the cases where the headword performs an action, we selected the following examples: *Fruit-rotting fungi, cancer-fighting weapons* and *cattle-poisoning weeds* (phrases with three words); *soil-infesting insect pests, nectar-producing flowering plants, ground-dwelling predatory arthropods, spring-calving beef cows* and *higher-yielding commercial varieties* (phrases with four words); *late-blooming yellow starthistle flowers, flesh-eating screw worm fly* and *fruit-destroying Mediterranean fruit fly* (phrases with five words); *fruit-mimicking 8-cm red spheres, self-locking plastic electrical wire ties* and *free-living, non-plant-parasitic nematodes* (phrases with six words).

The headword may be preceded by a passive verb, which describes one action affecting the headword. These are the examples selected*: shearbolt-protected moulboards, September-planted cucurbits* and *hydraulically-driven discs* (phrases with three words); *tractor-mounted spray equipment, well-drained sandy loams* and *wind-carried white spores* (phrases with four words); *hand-held $C0_2$ sprayer, $C0_2$-pressurized backpack sprayer* and *field-caged potted apple trees* (phrases with five words); *20 randomly selected current-season shoots, simple tractor-mounted spray jet nozzle* and *field-collected, laboratory-reared tobacco aphids* (phrases with six words).

The headword may be described by determiners describing the following concepts. They may refer to measurements as in the following examples*: 6-inch potted plant; 24-inch in-row spacing; 80-inch between-row spacings; the 2,250-m^2 mass-rearing facility; single 6-inch-diameter well pumping; four 1-gallon-per hour pressure-compensating drippers; a 7.5-cm-diametre bucket sand auger; a 1.5 tonne capacity front-mounted seed hopper; single 52-ha center-pivot irrigated corn fields; an 18-cm-wide, straight-edged garden spade; a 10-nozzle side boom tractor-mounted sprayer; 4-inch-by-4-inch, 12-gauge, woven-wire field fencing.*

Quite often these complex nominal phrases include modifiers referring to properties. Some examples, taken from the analysed corpus, are shown: *deep, aggressive root system; disease-resistant turf seed; low-input sustainable agriculture; shallow-depth water flow; reduced electric power costs; tiny white-winged males; ornamental white-barked birch selections; a flattened cone-shaped inner rim; much deeper, drifting wind-blown sand; two low-humidity, hot-air treatments; smaller, pear-shaped secondary conidia pores; a healthy, actively growing cool-season grass; new early-growing mid-season perennial ryegrass; low-cholesterol, low-fat, freeze-dried meats; agronomically*

acceptable, insect-resistant, high-yielding hybrids; highly volatile, extremely toxic broad spectrum pesticide; other relatively weed-free, short-season field crops; a natural, clean label, smoky-bacon flavoured ingredient.

Discussions and conclusions

The generation in the studied nominal phrases is based on Franks' theory on how concepts generate. In our case, this applies to a more specific and restricted field, and thus to a particular way whereby words link in a logical manner to express concepts or define objects. This is one of the most common characteristics of the analysed phrases: they define or describe concepts or objects, thus making use of linguistic economy.

Sense generation depends on the semantic links, which underlie between all modifying constituents of these nominal phrases. These links may be understood by analysing the different semantic groups or chunks within the phrases described above by means of formulae. In the case of modifying adjectives, they behave in two different ways: the adjective standing in the most leftward position appears to be directly related to the headword. However, those standing in the mid position, except those in syndetic or asyndetic coordination, are usually linked to the word standing by, in order to form a compound adjective, a compound noun, or are hyphenated to express one concept which specifies the headword.

The teaching of these complex nominal phrases will always include a context, where the pragmatic meaning may be analysed. By recognising and understanding the way these complex nominal phrases generate, our students may finally be able to produce texts with meaningful functions in order to describe objects or define concepts.

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