From Nominal Compounds to Efficient Abstract Writing

Authors: Liliana Fortuny  
Silvia Sastre  
Susana Briones  
Martha Botto de Pocoví

Institution: Consejo de Investigación de la Universidad Nacional de Salta

Abstract

One of the most important issues in an abstract writing course is to teach how to produce nominal compounds to achieve higher lexical density and greater objectivity, to facilitate thematic progression, and to develop concise referencing and synthetic language. Nominalization is an essential resource for constructing scientific discourse. We will discuss the problems students face when producing nominal compounds to cope with them.

Key-words: nominal compounds, nominalizations, abstract writing, scientific discourse.

At present we are working on a research project on abstract writing. We believe that the abilities acquired through meaningful reading input may be transferred to abstract writing in English. Based on this assumption we have designed a methodology which is being applied in a course for researchers who have the ability to read academic texts in English, know how to write abstracts in Spanish, and are also acquainted with the rhetorical features of scientific discourse.

The methodology takes into account three aspects: reading of abstracts written by members of the scientific community our students belong to, learning grammar in relation to rhetoric, and the development of the composition process. Reading authentic texts helps the students in the following aspects:

- to analyze discourse structure in order to get acquainted with the formulas accepted by the academic community and the conventions that govern the organization and expressions of ideas in abstract writing;
- to analyze the function of nominalizations and compound nominals as an essential resource for constructing scientific discourse;
- to get acquainted with technical lexical items used in their fields of study;
- to review the elements of grammatical and lexical cohesion; and
- to review the morphology and syntax of L2.
Students practice progressive controlled-writing assignments through various types of exercises. They are given tasks that gradually lead them to the production of the different moves of the abstract: introduction, method, results and conclusion. The final goal is the non-guided production of a complete abstract applying the knowledge of the different aspects involved, that is, rhetorical and linguistic.

Among the difficulties encountered are nominal expressions, one of the distinctive features of scientific language. Bathia (1993: 148) considers three types:

1) **Complex nominal phrases:** their typical syntactic structure is (Modifier) Head (Qualifier) where (M) is realized primarily in terms of a series of linearly arranged attributes as follows: (Det) (adj) (adj) (adj) ... H (Q). Those structures are mostly used in advertising because they permit an attractive and detailed description of the product or service being promoted.

   e.g.: *The world’s first packless, cordless, lightweight, compact, integrated video light.*

   *Coherent, illuminating, thought-provoking and fascinating book.*

2) **Compound nominal phrases:** they usually have the following structure (M) (M) (M) (M) (M) ... H (Q) where (M) is realized in terms of a series of linearly arranged nouns, occasionally incorporating adjectives as well. It is the type most used in scientific writing.

   e.g.: *bond-rupture reaction time*

   *six soil-forming factors*

3) **Nominalizations:** they are very common in legislative provisions, since they need to be precise, unambiguous and all-inclusive. This linguistic device promotes coherence and condensation and saves the writer from repeating lengthy descriptions.

   e.g.: *No obliteration, interlineation or other alteration made in any will after the execution thereof shall be valid or have effect.*

   Nominalization is also used in all kinds of scientific research writing. In this paper we will refer only to compound nominal phrases (CNs) and nominalizations (Ns) because both have a high incidence in abstracts as the result of an increasing conceptual complexity together with economy constraints for publishing requirements.

   As it is well known, abstracts belong to ‘scientific English’. According to Bathia (1993: 78), it is a recognizable genre and has emerged as a result of a well-defined and mutually-understood communicative purpose that most abstracts fulfill, irrespective of the subject-discipline they serve. An abstract, as commonly understood, is a description or factual summary of the much longer report, and is meant to give the reader an exact and concise knowledge of the full article. It is so universally conventionalized that even in its cross-cultural realizations it rarely shows any variation. CNs are the main carrier of information in academic scientific writing. They communicate very specialized and precise knowledge to an audience who must share with the
writer the required level of knowledge of the subject discipline. The more technical and specialized the subject, the more frequent and complicated the CNs.

The language of science is, by its nature, a language in which theories are constructed and its characteristics are exactly those that make theoretical discourse possible. Scientific language uses two kinds of resources: lexical and grammatical. While the lexical resources are the technical terms that scientific disciplines constantly create, the grammatical ones are the constructions of CNs deployed so that they can be combined to construe a particular form of reasoning. Scientific discourse is a highly nominalized register since Ns contribute both to technical terminology and reasoned argument.

Here we will discuss only the problems students face when producing Ns and CNs in abstract writing, and the strategies developed to cope with them. As we know, the development of nouns that are nominal representations of processes, such as evaporation, distillation, reaction, and so on, is one of the features of scientific discourse. At the beginning of the course, students should be acquainted with the different ways of nominalizing, that is, by affixation and by conversion (Horsella & Pérez 1997: 106):

1) nominalization by affixation:
   - by Latin affixation
     e.g. to extend the extension
to investigate the investigation
   - by -ing affixation
     e.g. to begin the beginning
to process the processing
   - by other type of affixes
     e.g. to develop the development
to perform the performance
to continue the continuity

2) nominalization by conversion
   e.g. to change the change
to increase the increase

By reading authentic abstracts students understand the functional reasons why the language of science demands a very high degree of nominalization. These reasons are the need to be objective, to facilitate thematic progression, concise referencing and synthesis in scientific discourse:

- **Objectivity**: Ns produce a greater concentration of the experiential meaning and a smaller incidence of interpersonal elements, such as personal pronouns and modal verbs, thus presenting information in a less personalized way. As Halliday (1990: 19) points out, the writing of scientists between the sixteenth and eighteenth centuries changed from the use of a narrative style for describing experiments and their results (typically, I did this, then I
observed this) to the use of a reporting style (X happened, which caused Y to happen, and the result was Z) where the scientist was removed from the agentive role in discourse.

- **Thematic progression:** the use of Ns is not a static but a dynamic one, since it permits what Danes calls a “simple linear thematic progression”. According to Halliday, in Halliday & Martin (1993: 131):

  > The core of a scientific text is the development of a chain of reasoning ... in which each step leads on to the next. But in order to lead on to the next step it is necessary to be able to repeat what has gone before and is now being used as the springboard for the next move.

  The rheme of a clause functions as the theme of the following because the grammar “packages” the previous information by turning processes into nominal entities. Ns permit the thematic progression without tedious repetitions. Each clause consists of:

  1) a ‘taken for granted’ part, nominalizing what has been said before;
  2) a ‘new information’ part, pointing forward to what is to come; and
  3) the relation between them, in the form of a verb.

  E.g.: *The atomic nucleus** absorbs and emits** energy. Each** absorption** marks its transition to a state of higher energy, and each** emission** marks its transition to a state of lower energy.*

- **Concise referencing:** Ns act as powerful referents in discourse and serve as *ad hoc* names for concepts that will be referred to again, thus avoiding long descriptions; and

- **Summary:** Ns sum up the contents of a previous discussion before introducing new information.

As regards CNs, their teaching constitutes a very important issue in a scientific writing course. CNs can be defined, according to Trimble (1985: 130) as “two or more nouns plus necessary adjectives (and less often verbs and adverbs) that together make up a single concept”. Even to native English-speakers, complicated technical CNs are difficult to understand, except for an expert. Although our students have knowledge of the disciplines the abstracts belong to, CNs make a special problem for them, since Spanish does not present the same noun compounding mechanisms. In addition to this, CNs produce lexical density and syntactic ambiguity in scientific discourse, what makes things worse for the learner:

- **Lexical density** is a measure of the density of information, according to how tightly the lexical items, or content words, have been packed into the grammatical structure. Linguistic information is generally packed with a higher lexical density in science.

- **Syntactic ambiguity** happens because a great deal of semantic information is lost when clauses are replaced by CNs. The ambiguity arises especially in two places: in strings of nouns, leaving inexplicit the
semantic relations among them; and in the relational verbs, which are often indeterminate. Trimble (1985: 134) gives the following example: aisle seat speech interference level. He asks: Is it interference with speech taking place at an aisle seat? or interference from speech issuing from an aisle seat? (This expression was taken from an airplane manufacturing company report and refers to acoustic tests made to determine the level of interference with speech between the attendant and a passenger who is sitting in an aisle seat).

To train our students in producing CNs the following tasks are given during the course:

- **Recognizing CNs in the material selected, taking into account the differences between Spanish and English noun phrases.** Noun compounding is a characteristic of Germanic languages. In English, nouns can be used as modifiers in front of other nouns, as in charge transfer processes or a gas turbine, forming right-headed compounds. Even though Spanish presents left-headed compounds, as hombre araña and perro policía, these grammatical constructions are not as productive as their English counterparts, and in general are not used in the language of science. Instead, to give further information in the noun phrase about the person or thing referred to, Spanish uses:
  a) qualifiers called “noun complements” (complementos de nombre), introduced by means of prepositions after the headword, as in procesos de transferencia de carga; or
  b) relative clauses, as in una turbina que funciona a gas.

- **Analizing CNs into their component parts by “unpacking” them.** CNs are usually formed from:
  a) prepositional phrases (metal spring = a spring made of metal);
  b) relative clauses (an air pressure device = a device which signals the pressure of air); or
  c) nouns modified by gerund phrases (a fluid bed reactor = a reactor containing a fluid bed).

In general, a CN can be “unpacked” into one of these structures. For example, in a ball tube distillation oven, information can be expanded in the following way (Falcón L. & J. Markey 2000: 148).

- **oven** is the last word, therefore, it is the head of the CN;
- **distillation** is the next word to the last, so, it is an oven for distilling things;
- **tube** is the third word from the end, therefore it is an oven with a tube;
- **ball** is near tube, so it is modifying tube and not oven.

Therefore, this CN means:

*an oven for distilling things with a tube that has the shape of a ball*

- **Making explicit the relationship between the nouns that make up the CNs by “unpacking” information.** (Falcón L. & J. Markey. 2000: 150). This relationship can take many different forms, for example:
a) the first element designates the substance that the second element is composed of:
   e.g. sodium atom = atom of sodium
b) the first element designates the source of the second one:
   e.g. laser beam = beam of laser
c) the first element is the result of the operation described by the second:
   e.g. nitrogen fixation = fixation of nitrogen
d) the second element shows the manner or degree of composition of the first:
   e.g. oxide density = the density of the oxides
e) the first element indicates the purpose for which the second is used:
   e.g. a distillation flask = a flask for distilling
f) the first element indicates the manner of operation of the second one:
   e.g. a gas turbine = a turbine that works with gas
g) the first element indicates the cause why the second element is produced:
   e.g. friction losses = losses caused by friction
h) the second element indicates where the first one is made:
   e.g. a glass factory = a factory in which glass is produced
i) the first element indicates where the second one is:
   e.g. forest station = station in the forest
j) the first element indicates what the second element does:
   e.g. a glass producer = a person that produces glass
k) the first element indicates when the second element happens:
   e.g. wartime production = production during wartime

Practicing hyphenation in CNs with compound adjectives. Compound adjectives are made up of two or more words, usually written with hyphens between them. They may be qualitative, classifying or color adjectives.

The more common patterns for forming compound adjectives are the following:

a) adjective or number + noun + -ed
   e.g. open-ended research; two-edged tool
b) adjective or adverb + past participle
   e.g. low-paid workers; well-known bibliography
c) adjective, adverb or noun + present participle
   e.g. free-standing position; long-lasting effect; soil-forming factors
d) noun + past participle
   e.g. wind-blown region; ion-promoted reaction
e) noun + adjective
   e.g. blood-red solution; time-dependent reaction
f) adjective + noun
   e.g. present-day research; high-frequency transition
The use of hyphens avoids ambiguity:

- **double-layer capacity** means *the capacity of the double layer*, but, without a hyphen, this CN could also mean *the double capacity of a layer* (Falcón L. & J. Markey 2000: 151).

### Using singular nouns with plural meaning as noun modifiers in CNs.

It is usually used the singular form of a count noun as a noun modifier, even when more than one thing is being referred to, as in *seed catalogue (a catalogue of seeds)* or *tooth decay (the decay of teeth)*. In CNs when an adjective modifies a noun modifier, the latter can take a plural form, as in *critical loads approach*.

### Using proper nouns as modifiers in CNs.

(After Falcón L. & J. Markey 2000: 153). A proper noun referred to a person who made an invention can be used as a modifier in a CN. E.g.:

- **Kelvin scale** = *the scale invented by Kelvin*
- **Bohr atom** = *the atomic structure proposed by Bohr*
- **Bunsen burner** = *a burner invented by Bunsen*

Proper nouns are not used as modifiers in the names of laws, theories, theorems or diseases. Instead, the possessive genitive is used. E.g.:

- **Avogadro’s hypothesis**
- **Einstein’s theory**
- **Maxwell’s equations**
- **Chagas’ disease**
- **Fourier’s theorem**

The names of methods, techniques and reactions may be expressed either by means of a noun modifier or the possessive genitive. E.g.:

- **The Faraday effect**
- **Faraday constants**
- **Lavoisier’s experiments**

### Using either nouns or adjectives as modifiers.

For some nouns there is an adjective, for example, for *chemistry, chemical; for year, annual*. Nouns are used as modifiers in a similar way to classifying adjectives. E.g.:

- **agricultural problems** = *agriculture problems*
- **commercial papers** = *commerce papers*
- **scientific language** = *science language*
- **mental processes** = *mind processes*
- **educational matters** = *education matters*

Adjectives derived from nouns referring to the material of which something is made are often used figuratively. E.g.:

- a *gold jewel*, a *golden opportunity*
- a *lead pipe*, a *leaden sky*
Turning “unpacked” realizations into CNs. In forming a CN from a phrase, the nouns should be put in reverse order. For example:

- experiments concerning the transfer of heat = heat transfer experiments
- a device which controls (something) and which is automatic and self contained = a self-contained automatic controller device.
- the abatement of the emission of greenhouse gas = greenhouse gas emission abatement

Translating complete abstracts from Spanish into English “packing” information into CNs. The complexity of these structures in English makes it difficult to give precise rules for when to use a noun as a modifier or a prepositional phrase as a qualifier. In general, students should try to use CNs whenever possible. E.g.:


¿La decadencia de los bosques en relación con los contaminantes amenaza la sustentabilidad de los bosques?

El artículo examina la historia de la decadencia de los bosques y presenta un informe conciso de los programas de investigación y monitoreo del bosque europeo de los últimos 15 años. Se identifica el enfoque de cargas críticas como un mecanismo clave para tener evidencia científica para la formulación de políticas. Para los ecosistemas de bosques el enfoque es de particular importancia porque proporciona una quantificación del vínculo entre los inputs contaminates y la sustentabilidad biológica.

Does Pollutant-related Forest Decline threaten the Forest Sustainability?

The article examines the history of the forest decline, and presents a concise account of the European forest monitoring and research programs of the last 15 years. The critical loads approach is identified as a key mechanism for having scientific evidence for policy formulation. For forest ecosystems the approach is of particular importance because it provides a quantification of the link between pollutant inputs and biological sustainability.

The ability to write abstracts in English is something that can be improved through meaningful reading of authentic material and a lot of practice. Once students learn how to produce CNs they have already attained one of the most difficult aspects of scientific discourse in English.
Final considerations

Language and science go together and learning science is to learn a language created for codifying, extending and transmitting scientific knowledge. As Halliday expresses (1993: 200):

... in science, language is a fundamental tool. It is used to classify, decompose and explain, and to recount the investigations that form the basis of a scientific world view. It follows that to be illiterate in science is to be denied access to a crucial aspect of its technology. (...) Science cannot be understood ‘in your own words’. It has evolved a special use of language in order to interpret the world in its own, not in common sense, terms.

Nominalization, far from being an arbitrary feature, is an essential resource for constructing scientific discourse. Martin (in Halliday & Martin 1993: 172) says that Ns mean language “distillation”:

Technical terms, like alcoholic beverages, are both less voluminous products of, and different in kind to, the meanings/materials from which they derive.

“Distillation” means “condensation”. Ns reduce longer phrasal constructions, making scientific language more compact, more synthetic, more functional and direct to the specialist. Our concern is to help our students to handle the kind of language they need to write abstracts in English in order to meet the publication standards required, enabling them to face an increasing demand for academic writing competence in the new millennium.

References


Biographical note
The authors make up a research team working at the Consejo de Investigación de la Universidad Nacional de Salta. At present their research focuses on teaching abstract writing. They have carried out several research projects on different subjects related to EAP Reading at university level.