DISEÑO INSTRUCTIVO DE UNA UNIDAD DE APRENDIZAJE EN UN CURSO VIRTUAL DE INGLÉS CIENTÍFICO

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ABSTRACT

Within the framework of internet as a learning tool, pioneering e-learning experiences are taking place nowadays at the university context. We believe that teaching ESP courses through virtual learning platforms can be a great opportunity to promote these subjects. The instructional design of didactic materials is one of the main bases for a successful development of the on-line learning environment, so that it can help students develop their own self-learning processes. In this paper we present the instructional design of a learning object which belongs to a virtual course on Reading Scientific English Texts in order to offer an alternative of how the instructional design of didactic materials can be organized within the e-learning context.

KEY WORDS: Internet, e-learning, virtual platform, instructional design, learning object.

RESUMEN

Dentro del contexto de internet como herramienta para la docencia, actualmente en el ámbito univesitario se están llevando a cabo experiencias didácticas pioneras mediante la virtualización de asignaturas. Nos parece que la incorporación de cursos de Inglés para Fines Específicos a plataformas virtuales de teleformación supone una gran oportunidad para potenciar estas materias. El diseño instructivo de materiales didácticos constituye uno de los pilares básicos para que la enseñanza virtual pueda desarrollarse con éxito y facilitar al alumno su labor activa de autoaprendizaje. En este sentido, el objetivo del presente trabajo es ofrecer una alternativa de cómo estructurar el diseño instructivo de materiales didácticos en una unidad de aprendizaje perteneciente a un curso virtual sobre lectura de textos científicos en lengua inglesa.

PALABRAS CLAVE: internet, virtualización, teleformación, diseño instructivo, unidad de aprendizaje.

1. INTRODUCCIÓN

Dentro de la actual reforma de los planes de estudio que se está llevando a cabo en la universidad española, el uso de *internet* como herramienta para la docencia constituye no sólo un canal de transmisión de información sino un medio en sí mismo con un enorme potencial educativo, ya que ofrece la oportunidad de conjugar texto, imagen y sonido, al tiempo que incorpora interactividad y personalización. En este nuevo contexto educativo, dentro del proceso de adaptación al Espacio Europeo de Enseñanza Superior, la Universidad de Granada está ofertando la posibilidad de virtualizar asignaturas a través del CEVUG (Centro de Enseñanzas Virtuales de la Universidad de Granada). Nos parece que la incorporación de cursos de Inglés para Fines Específicos a plataformas virtuales de teleformación supone una gran oportunidad para potenciar estas materias y todo un reto para los profesores que decidan adecuar sus materiales e impartir sus cursos *on-line*. En este campo merecen destacarse las aportaciones recientes de Aguado y Gil *et al*.

Uno de los aspectos fundamentales de cualquier curso virtual lo constituye el diseño instructivo de materiales didácticos, el cual se puede definir como el conjunto de elementos que posibilitan la coherencia didáctica y organizativa de los contenidos. Se trata de la adecuación de un simple texto electrónico a un recurso hipertextual que esté adecuadamente organizado y que presente un equilibrio entre los recursos de aprendizaje, ayudas al estudio y actividades. Todo diseño instructivo para que sea efectivo debe estructurar sus contenidos en torno a unidades de aprendizaje (*learning objects*), definidas por Wiley como "...elements of a new type of computer-based instruction grounded in the object-oriented paradigm of computer science" (3). "Object-orientation highly values the creation of components (called "objects") that can be reused (Dahl & Nygaard) in multiple contexts...". En dichas unidades de aprendizaje debe existir una interacción entre texto y recursos multimedia que faciliten el aprendizaje del alumno y deben estar integradas por la explicación teórica de los contenidos, práctica adecuada de los mismos mediante actividades, ejercicios de autoevaluación, glosario, fuentes bibliográficas y una serie de herramientas de comunicación —foro, *chat*, correo electrónico, *web* personal, pizarra virtual— que harán más fácil, ameno y dinámico el tiempo del estudio del alumno y a su vez evitarán el aislamiento que se suele sentir en el entorno virtual. No olvidemos que en el nuevo modelo pedagógico de enseñanza *on-line* el alumno se convierte en el eje central del proceso de aprendizaje y él mismo va a gestionar su propia formación con la ayuda de los materiales virtuales diseñados por el profesor.

A continuación presentamos una propuesta de cómo realizar el diseño instructivo de una unidad de aprendizaje sobre las diversas estructuras de premodificación en el inglés científico.

2. UNIDAD DE APRENDIZAJE: ESTUDIO DE LAS ESTRUCTURAS DE REMODIFICACIÓN

Esta unidad pertenece a un curso de lectura de textos científicos y, como toda unidad de aprendizaje requiere, posee un carácter independiente y, por lo tanto, podría ser insertada en otro curso. De acuerdo con el nuevo concepto de crédito en la enseñanza virtual y siguiendo las recomendaciones del *ECTS* (*European Credit Transfer System*), esta unidad correspondería a 10 horas de trabajo del alumno, que incluyen tanto el tiempo dedicado al estudio de los contenidos (se estima que se pueden asimilar entre tres o cuatro páginas por hora) como la realización de las actividades en la plataforma (consulta de enlaces *web*, autoevaluación, participación en foros y *chats*, etc.).

Partiendo de la base de que leer texto en pantalla resulta más duro que leerlo impreso —según investigaciones de Nielsen, en una pantalla de ordenador se lee un 25 % más despacio que sobre papel—, el diseño instructivo de materiales didácticos debe cumplir una serie de requisitos mínimos de redacción: extensión adecuada, claridad, concisión, coherencia interna del contenido, etc. Para lograr estos objetivos las plataformas de comunicación establecen unas recomendaciones estilísticas generales. La plataforma de teleformación canadiense *WebCT*, una de las más implantadas y utilizada por la Universidad de Granada, entre sus normas de estilo propone lo siguiente: emplear frases sencillas y párrafos cortos, escribir el texto a interlineado sencillo y separar los párrafos con doble espacio, utilizar letra Arial o Verdana así como distintos tamaños de letras (11 puntos para teoría y 10 para actividades), no utilizar sangrados, cursivas ni mayúsculas, marcar con negrita los términos que se recogen en el glosario, indexar los textos debidamente, presentar los contenidos mediante cuadros y esquemas, insertar páginas manuales para facilitar la visualización de los contenidos en pantalla, etc. Nos hemos ceñido a dichas recomendaciones al presentar nuestro diseño instructivo con el objeto de plasmar fielmente cómo resultaría este diseño en la pantalla del ordenador. Las actividades, la autoevaluación, el glosario, las fuentes bibliográficas *on-line* y los documentos confeccionados con programas de representación gráfica, del tipo *Power Point*, se insertarían mediante hipervínculos de modo que el alumno disponga de todos aquellos recursos que van a facilitarle su aprendizaje en el entorno virtual. En relación con las actividades, la mayoría se han diseñado con el objetivo de que el alumno las entregue al tutor para su corrección personalizada, evaluación del progreso y resolución de dudas. En esta unidad las actividades obligatorias son: 2, 5, 7, 8, 9, 10. El resto se consideran complementarias, y, por tanto, optativas, dependiendo de las necesidades del alumno.

Presentamos a continuación las diversas secciones de las que consta nuestro diseño instructivo:

2.1. Contenidos y actividades

La primera página de la unidad consta de un índice general que ofrece una visión global del contenido de la misma:

SUMMARY OF THE CONTENTS

1. *Introduction*

The language used in scientific writing contains a set of structural "patterns" that are more recurrent than others, even if they are not specific from Scientific English. One of these structural patterns is represented by "premodification structures," which are considered one of the most characteristic structures in scientific discourse.

The nominal phrase is the main carrier of information in academic scientific writing (Bhatia 151), whose major concern is to communicate a specialized and precise knowledge to an audience, who is supposed to share with the writer the required knowledge level of the subject-discipline. In order to communicate this knowledge, scientists constantly need to refer to technical concepts and they use premodification structures because they help to describe their subjects in a complete, accurate and detailed manner.

Premodification constitutes a special problem for the majority of non native students, since this construction, characteristic of Germanic languages, is not common in most other languages, including Spanish. The following table summarizes the differences between English and Spanish constructions:

Language	Word order	Type of construction
English	Right to left	"synthetic" (unbroken) piling up elements with no explicit markers: Premodification.
Spanish	Left to right	"analytic" (broken) explicit markers: use of prepositions and relative clauses.

2. *Types of premodification structures*

2.1. Noun-noun construction

"Nominal compounds" (also called noun strings) are most typically associated with scientific writing and they are defined as "two or more nouns plus the necessary premodifiers that together make up a single concept" (Trimble 130).

Attempts to interpret and classify nominal compounds have been carried out from different perspectives (descriptive studies, generative grammar, psycholinguistic approach, cognitive grammar and schema theory, etc.). All these attempts have shown the complexity of the task, even for native speakers, since comprehension can be impeded by a lack of transparency in the headnoun/premodifier relationship.

> Any given "CN" form is inherently ambiguous over a predictable and relatively limited set of possible readings; although any one of these readings may be used more frequently than the others, in a given speech community and during a certain period, the potential ambiguity still remains part of a speaker's competence... (Levi 50)

In relation to the often "complex nominals" found in scientific discourse, the extralinguistic information required to achieve a correct interpretation comes from the knowledge of the subject discipline and the meaning which has been assigned within the speech community.

Horsella & Pérez (125-138) in their study of nominal compounds in the field of Chemistry proposed a taxonomy of categories according to the relationship between premodifier and head ("PM" - "H"), which is summarized in the following table:

Category	Detailed explanation	Example
Constituent	PM: Constituent of the entity indicated by H	chlorine atom
Process	PM: Entity subjected to the process indicated by H	alcohol dehydration
Purpose	PM: Purpose of application of the entity indicated by H	test tube
Eponym	PM: Name of a scientist associated to a discovery or invention	Einstein theory
Location	PM: Location of the entity or event indicated by the H	surface reaction
Property	PM: Entity that has a physical or chemical property indicated by the H	water temperature
Result	PM: Result of a process indicated by the H	decomposition temperature
Cause	PM: Cause of a process indicated by the H	fungus disease
Similarity	PM: Entity to which an H is similar	cage structure
Manner	PM: Manner in which the process indicated by the H occurs	multistage partitioning
Means	PM: Means by which the entity indicated by the H takes place	friction brake
Convention	PM: Convention to which the H adheres	d orbitals

It is important to notice that in some cases a nominal compound does not fit exactly into a category and there are also exceptions that make interpretations

quite difficult. For instance, *resonance effects* constitutes a typical example where the commonsense interpretation "effects produced by resonance" (cause) is incorrect since, in fact, it is the effects that produce resonance (result). Only experts can decide whether the active or passive paraphrase is correct and, so, if it belongs to the category CAUSE or RESULT.

Activity 1. Choose the correct answer:
soil microorganisms ☐ location ☐ result ☐ similarity ☐ eponym ☐ manner
a steel cylinder ☐ process ☐ cause ☐ property ☐ eponym ☐ constituent
a steam engine ☐ manner ☐ means ☐ convention ☐ process ☐ similarity
an iodine solution ☐ similarity ☐ convention ☐ constituent ☐ process ☐ location
a hydrogen molecule ☐ property ☐ cause ☐ similarity ☐ manner ☐ constituent
nitrogen pollutants ☐ result ☐ constituent ☐ process ☐ cause means
egg structure ☐ process ☐ cause ☐ similarity ☐ eponym ☐ convention

In nominal compounds with more than two elements [PM PM (...) H] possible ambiguities arise when trying to recognize the relations between premodifiers and head, since there are different possible combinations:

Adj + Noun + H:

a)	[PM + (PM H)]	complex ion mechanism	complex ion-mechanism
b)	[(PM PM) + H]	high mass peaks	high-mass peaks

Noun + Noun + H:

a)	[PM + (PM H)]	methyl side chain	methyl side-chain
b)	[(PM PM) + H]	honey bee colony	honey-bee colony

Look at the following diagrams to see the relationships between PM and H:

complex	ion mechanism
high mass	peaks
methyl	side chain
honey bee	colony

Use of the "hyphen." It is essential to be aware of the importance of the hyphen in scientific writing: to avoid ambiguity and to delimitate unit premodifiers in premodification structures.

Example: a small-car factory: a factory which produces small cars
a small car-factory: a small factory which produces cars

It is also important to learn to identify "unit premodifiers" when there are no hyphens, since the use of hyphenation recommended by style manuals is not always followed by science writers.

2.2. Premodification with "-ing" and "-ed forms"

Several patterns of this type of premodifying structures have a high degree of occurrence in scientific texts and so they must be analysed.

2.2.1. *Premodification with -ing*

A) When an -ING form preceeds a noun (H) it is usually equivalent to a "relative clause (active voice)."

increasing curvature (PM H) = curvature which increases

When these forms are preceeded in turn by nouns, adjectives or adverbs, we find premodification patterns which are equivalent to inverted relative clauses. The resulting unit premodifiers of these structures, very frequent in scientific prose, cause a great deal of confusion because the word order is the opposite to Spanish.

Structure	Synthetic Form	Analytic Form
N + Ing + H	nitrogen-fixing bacteria	bacteria which fix nitrogen
Adj + Ing + H	radial-expanding network	network which expands radially
Adv + Ing + H	sexually reproducing species	species which reproduce sexually

Activity 2. Identify the -ING forms functioning as PREMODIFIERS.
Use a relative clause to explain their meaning

Example: Nitrogen-fixing bacteria take part in the nitrogen cycle.
Bacteria which fix nitrogen....

1. A desert-living mammal constantly faces the problem of water conservation.
2. Each individual in a sexually reproducing species inherits two alleles for each gene, one from each parent.
3. Each stamen is usually differentiated into a stalk (filament) and a spore-bearing portion (anther).
4. We consider how this can be done through dietary considerations by adding cholesterol-lowering ingredients.
5. Fentanyl, a very short-acting drug about 100 times as potent as morphine, is extremely important in medicine today.

6. Starch is the energy-storing carbohydrate of plants.
7. This biologically damaging, high-energy radiation can cause skin cancer, injure eyes, harm the immune system and upset the fragile balance of an entire ecosystem.
8. A mineral is a naturally occurring homogeneous solid with a definite chemical composition and a highly ordered atomic arrangement.
9. Using new brain-scanning technologies, researches have identified the prefrontal cortex as the seat of "working memory" —the place that holds mental representations.
10. The ways in which scientists experiment on animals have been hotly controversial for decades. An animal-loving public despises inhumane abuses of creatures, yet it also values the biomedical progress that results.

NOTE: Similar patterns are developed with an adjective in the position of -ING:

N + ADJ + N: nitrogen-hungry algae = algae which feed on nitrogen
microbe-rich fertilizers = fertilizers with contain a lot of microbes

B) It is also possible that an -ING form preceeds a noun (H) with a nominal value. In this case, it is not equivalent to a relative clause and so it cannot be "paraphrased" as such.

drying techniques (PM H) = techniques used for drying
NOT= techniques which dry

Activity 3. Use a relative clause to indicate the relationship between PM and H:

1. an animal-loving public =
2. radiation-absorbing species =
3. water-soluble polymer =
4. the characteristic burning behaviours of nylon fibres =
5. naturally occurring phosphorus compounds =
6. specific binding forms =
7. fire-resistant polymer =
8. non-egg-laying females =
9. limited sampling sites =
10. combining methods for protein separation =

2.2.2. *Premodification with -ed*

A) When an -ED form preceeds a noun (H) it is usually equivalent to a relative clause ("passive voice").

specialized mechanisms (PM H) = mechanisms which are specialized

Activity 4. Fill in the table below. Find the similarities with the -ING form constructions and send your contribution to the forum so that they can be discussed		
Structure	Synthetic Form	Analytic Form
	virus-caused disease	
	Heat-treated samples	
	highly ordered arrangement	
	mosquito-borne disease	
	Best-studied comet	
	El Niño-related disturbances	
	wind-blown rain	

Activity 5. Identify the -ED forms functioning as PREMODIFIERS.
Use a relative clause to explain their meaning

1. Hale-Bopp was the most photographed and best-studied comet in history.
2. As predators on mosquito larvae, fishes help curb malaria and other mosquito-borne diseases.
3. In 1938 the German-born physicist Hans Bethe proposed the first satisfactory theory of stellar energy generation based on the fusion of protons to form helium and heavier elements
4. Human-made chemicals called chlorofluorocarbons (CFCs) have been used in spray cans, foam packaging and refrigeration materials.
5. We have to supplement the natural supply of nitrogen compounds by manufacturing ammonia-based fertilizers.
6. Soil-borne microorganisms produce nitrogen oxides as a decay product.
7. El Niño-related weather disturbances reduce fish population.
8. Miniaturized detection schemes based on electrochemical, laser-induced fluorescence detection and, more recently, mass spectrometry have shown great promise in analyzing cellular components including peptides and and proteins in single cells.
9. All Arctic terrains are sensitive to human-induced thermal disturbance.
10. Most foliage invaders are spread from plant to plant by wind-blown rain or dust.

B) It is also possible that an -ED form preceeds a noun (H) with the meaning [Having something / Having the characteristic of]. In this case, the -ED form is a suffix added to a noun and it is always paraphrased as [which have / has] or [with].

barbed stings (PM H) = stings which have barbs / stings with barbs

Adj + ED + N: small-scaled fish = fish with small scales
N + ED + N: thread-waisted wasp = wasp whose waist is as thin as a thread

Activity 6. Rewrite the -ED structures as it is illustrated in the example below

Example: A rabbit is a long-eared animal.
A rabbit is an animal with long ears (= which has long ears)

1. Two of the most commonly prescribed tranquilizers -librium and valium- contain seven-membered heterocyclic rings.
2. Heat must be eliminated to avoid harmful elevation of body temperatures in warm-blooded animals.
3.The jellyfishes and coral animals have a rudimentary cavity in their two-layered bodies.
4. The term fish is applied to a variety of cold-blooded aquatic vertebrates.
5. When fishes colonised the land habitat, they became four-legged land vertebrates.
6. Half the lichen associations contain species of trebouxia, a single-celled green alga.
7. We find coarse-grained rocks and fine-grained rocks.
8. White-tailed deer and white-footed deer mice are found in a range of climates.
9. Feldspar crystals have blunt-pointed ends.
10. When they are well formed, quartz crystals come as six-sided prisms.

2.3. More complex premodification

In constructions with four or more elements, segmentation of premodification structures into smaller units and subunits which are hierarchically organized is required. Each unit is composed of words that are bonded together. These structures involve possible combinations of the previous patterns:

Look at the following diagrams representing the hierarchical relationship between PM and H:

1. [carbon rich] giant stars
2. [steeply curved] spherical transparent layer
3. [[screamingly fast] moving] [atom fragment]
4. [highly charged] [glass forming] cations
5. [highly efficient] [water retaining] kidneys
6. [energy yielding] [glucose oxidising] metabolic processes
7. [[high molecular] weight] [complement fixing] antibodies
8. [[nuclear [magnetic resonance]] spectroscopy] literature survey
9. [[ring junction] carbon] environment differences

The more elements we find, the more complex the structure, especially when the proportion of nouns is higher.

Activity 7. Underline the premodification of the following CNs and circle the head. Mark the hierarchical relations between the elements

1. ...small carbon fragments blown out of giant red stars in interstellar space...
2. ...a moderately to highly toxic sweet-smelling, colourless, explosive gas...
3. ...an exceptionally intense mass spectral peak at the very high mass of 720...
4. ...four iron containing ring structures chemically bonded to a large protein...
5. ...novel piano-stool shaped manganese carbonyls...

6. ...a screamingly fast-moving atom fragment that packs all the concentrated wallop of a hard-thrown rock...
7. ...A group of scientists carried out an extensive nuclear magnetic resonance spectroscopy literature survey...
8. ...Somax's Powerbelt's two side-mounted plastic fins increase resistance to hip rotation...
9. ...The Naval Post-graduate School's Pelican houses scientific instruments in its enlarged nose cone and body and has probes under both wings to measure temperature...
10. ...Dow AgroSciences is one of the largest research-based agricultural and specialty product companies in the world...

Activity 8. Insert premodification structures for the underlined nouns using the information given in square brackets. Insert a hyphen where appropriate

1. Nucleic acids are compounds. [compounds of phosphorus which occur naturally]
2. An alkaloid is any product, often with a complex structure and significant pharmacological properties. [product which is basic, is found in plants and contains nitrogen]
3. Animals must take in compounds.[compounds which are chemical and which contain energy]
4. Many pathogenic bacteria in soil are eaten by protozoa or killed by extracellular toxic products of other organisms. [other organisms which inhabit soil]
5. Disturbances reduce fish population. [disturbances in weather which are related to El Niño].

Some of these structures are considered as excessive premodification (Kirkman 32), which constitutes a particularly disturbing feature of technical writing, since an excessive way of piling up premodifiers is unnatural language behaviour. This is well illustrated in an example given by this author. The nominal phrase "a new green leather suede-lapelled patch-pocketed tie-belted jacket" would never be used in an everyday context. However, this type of structure is frequent in science. For that reason, style manuals recommend inserting punctuation marks (hyphens and commas) and breaking long chains with prepositions in order to make them easier to understand. Once hyphens and punctuation marks have been inserted, the linguistic construction becomes clear and the comprehension problem is focused on the content knowledge of the specific subject-matter:

high molecular weight complement fixing antibodies
complement-fixing antibodies of high molecular weight

The example given below demonstrates the process of formation of synthetic structures.

[Context: The author wants to make a statement about two polycyclic organic compounds that are similar but differ in the way two rings are fused together].

Results are not strictly comparable because of [*ring junction carbon environment differences*]
...differences "in" the [*ring junction carbon environment*]

...differences “in” the environment “of” the [*ring junction carbon*]
...differences “in” the environment “of” the carbons “at” the [*ring junction*]
...differences “in” the environment “of” the carbons “at” the junction “of” the rings
...[*environment differences*] “of” the [*ring junction carbons*]
...[*environment differences*] “of” the carbons “at” the [*ring junction*] (Schoenfeld 21)

SUMMARY

The problems of interpreting premodification structures seem to arise from two main sources:

– The linguistic construction.
– The lack of knowledge of the subject matter.

And can be summarized under four main headings:

– Noun-Noun construction (lack of explicitness).
– Premodification with -ING / -ED forms as inverted relative clauses.
– Ambiguity (two or more premodifiers).
– Excessive premodification.

3. *TEXTUAL ANALYSIS OF PREMODIFICATION*

The analysis of “text-patterning” adds interesting information about the relation between the writer and the audience, that is, why the author writes in a specific way in a particular text type and what linguistic structures he uses in order to fulfil his purpose.

Premodification structures and nominal compounds are typically associated with scientific writing. But scientific writing cannot be considered as a whole, it comprises a great variety of texts, and there is a difference in the use of nominal compounds in each text type.

There is a relation between the frequency and complexity of nominal compounds —both in linguistic construction and conceptual abstraction- and the different text types:

> Compound nouns occur frequently in scientific and technical writing... Indeed, the more technical and specialized the subject, the more frequent and more complicated the compound nouns... Generally speaking, scientific journals contain more CNs than university text-books, and university text-books contain more than school-books. (Swales 129)

In their study of nominal compounds in the field of Chemistry, Horsella & Pérez confirmed that both the conceptual complexity and the occurrence of nominal compounds increases as the knowledge structure is built up during academic studies, due to the increase in conceptual abstraction. They proved that the frequency of the categories depends on the level in the knowledge domain, as the table:

High occurrence (category)	Level in knowledge domain	Text typology
Constituent		
Eponyms	basic levels	typical college textbooks
Process Purpose	intermediate to high levels	textbooks, papers, monographs
Conventions	high levels	highly technical papers

Authors such as Dubois and Bhatia have carried out a very interesting analysis of the use of nominals in the research article, and they have found a great proportion of complex nominals to refer to technical concepts and, what is more interesting, a progressive increase in the quantity and complexity of these structures within the article, from the introduction to the concluding section. In the introductory section, new knowledge is converted into known technical concepts for further reference. In the concluding section, the writer assumes that the reader has acquired the relevant knowledge and therefore there is a greater density of complex nominals. So here we are concerned with the process of creation of compounds, the way a scientific writer creates new nominals as he goes on building up new information for his readers.

For example, Dubois compares the structure between sentences (a) and (b) below. The second one is more synthetic and contains a greater proportion of premodifiers, so it would be more likely to appear in the later parts of an article:

> (a) *Studies of the oxidative NADP in enzymes in Drosophilla melanogaster* have concentrated on the *relationship of gene dosage to the in vitro tissue enzyme level.*
>
> (b) *Drosophilla melanogaster oxidative NAPD-enzymes studies* have concentrated on the *gene dosage to in vitro tissue enzyme level relationship.*

Activity 9. (Introduction of a research article: <http://www.llnl.gov/tid/lof/documents/pdf/229802.pdf>)

Underline the compounds and complex nominals (synthetic constructions). Are the same concepts expressed with analytic constructions in the previous paragraphs? Underline them.

Activity 10. (*Abstract* of a research article: <http://www.llnl.gov/tid/lof/documents/pdf/229802.pdf>)

Underline the compounds and complex nominals in the abstract of this article and try to explain their meaning.

2.2. ACTIVIDADES EN EL FORO

Durante el desarrollo de esta unidad se enviarán las siguientes propuestas al foro:

1. Form groups of three students and identify five examples of the -ING form as premodifier with nominal value and five with verbal value (equivalent to an inverted relative clause) in scientific texts from <http://www.sciam.com>. One group will be in charge of collecting all the contributions and the results will be discussed in the forum.

2. Look for three complex premodification structures in scientific texts from <http://www.sciam.com> where the "head" is premodified by 5 or more words. Write down a correct explanation for each by using paraphrases and send them to the forum for discussion.

3. Students are divided into three groups (1, 2 y 3) and look for articles of the following journals: *Advances in Environmental Research*, vol. 8, March 2004 and *Analytical Biochemistry*, vol. 330, July 2004, from <http://www.ugr.es>.

   a) Group 1 will look for premodification structures in the *abstracts*.
   b) Group 2 will look for premodification structures in the *Introductory Sections*.
   c) Group 3 will look for premodification structures in the *Concluding Sections*.

The following questions will be discussed:

   – Which section presents more premodification structures?
   – Could you compare the complexity of the structures in each section?

2.3. SESIONES DE CHAT

Se organizarán sesiones de *chat* específicas cuando el tutor lo considere oportuno, por ejemplo sobre dudas relacionadas con un aspecto concreto de la unidad y compartidas por varios alumnos o sesiones en las que los alumnos debatirán en tiempo real su progreso y las dificultades que vayan encontrando. Estas sesiones deben anunciarse con la debida antelación.

2.4. AUTOEVALUACIÓN

Las actividades de autoevaluación se han formulado para que automáticamente salga en pantalla la respuesta correcta. Por tanto, hemos elegido ejercicios de elección simple o múltiple, relleno de huecos e inserción de guiones.

Activity 1. Choose the correct paraphrase for the phrases below:

1. plastic soft drink bottles
   - ☐ plastic bottles containing soft drinks
   - ☐ bottles containing plastic soft drinks
   - ☐ plastic soft bottles containing drinks
   - ☐ drink bottles made of soft plastic

2. a polyethylene-like polymer
   - ☐ a polyethylene similar to a polymer
   - ☐ a polymer made of polyethylene
   - ☐ a polymer like polyethylene
   - ☐ a like polymer of polyethylene

3. nitrogen-trapping wetlands
   - ☐ trapping wetlands filled with nitrogen
   - ☐ nitrogen which traps wetlands
   - ☐ wetlands which contain nitrogen-trapping
   - ☐ wetlands which trap nitrogen

4. the oceans' huge heat capacity
   - ☐ the capacity of the oceans to retain huge heat
   - ☐ the huge capacity of the oceans to retain heat
   - ☐ the capacity of the huge oceans to retain heat

5. the powerful solubilising ability
   - ☐ The ability that solubilises powerfully
   - ☐ The ability that is powerfully solubilised
   - ☐ The powerful ability of solubilising

6. the underlying concept behind photonic-crystal materials
   - ☐ materials composed of photonic crystals which are behind an underlying concept
   - ☐ the concept which underlies behind materials composed of photons and crystals
   - ☐ materials which are behind photonic crystals according to the concept which underlies
   - ☐ the concept which underlies behind materials composed of photonic crystals
   - ☐ materials composed of photons and crystals which are behind an underlying concept

Activity 2. Choose the correct answer

1. Lakes which are made by men
   - ☐ man-making lakes
   - ☐ making-man lakes
   - ☐ man-made lakes
   - ☐ made-man lakes

2. Ultraviolet radiation which causes cancer
   - ☐ cancer-caused ultraviolet radiation
   - ☐ cancer-causing ultraviolet radiation
   - ☐ ultraviolet-cancer causing radiation
   - ☐ ultraviolet-caused cancer radiation

3. A substance which absorb moisture
   - ☐ a moisture absorbed-substance
   - ☐ a moisture-absorbed substance
   - ☐ an absorbing-substance moisture
   - ☐ a moisture-absorbing substance

Activity 3. Insert a hyphen in the appropriate position to form unit premodifiers:

1. ...Smoke detector technology is no use for CO detection...
2. ...I was hired by Exxon as a catalyst expert in a long range research group based near Houston...
3. ...My idea was to construct small molecule catalysts having stable structures and a single catalytic site...
4. ...A new type of fire resistant polymer could improve your chances of survival in a plane crash...
5. ...Crutzen's work spotlighted how microbe rich agricultural fertilizers might lead to reduced ozone levels...

6. ...Ice cream scientists use the freezing point curve when formulating ice cream recipes...
7. ...These techniques have led to important advances in our knowledge of cellular mechanisms of ion transporting epithelia...

Activity 4. Below you have word groupings which are underlined.
Cross out the ones which do not form a premodifying structure

1. The proposed structure turned out to be correct and five years later methods were developed for producing this new form of carbon.
2. Unfortunately, miniaturization results in circuits with increased resistance and higher levels of power dissipation.
3. When polished, all metals shine owing to reflection of photons by external valence electrons dynamically forming metallic bonds.
4. Adding fluorine atoms to a polymer chain is used to make some tough, smooth and chemically inert materials.
5. Reducing cholesterol in our diet therefore has only a modest effect on lowering blood cholesterol levels.
6. Cholesterol-lowering spreads are some of the first functional foods on the market, but scientists are continually identifying ingredients that have potential health benefits.
7. Their method, presented by Dr Eugenia Valsami-Jones, at the BA festival of science, in London in September, involves 'immobilising' polluting metals as insoluble phosphates.

Activity 5. Complete the text with correct premodification structures
formed from the phrases given in the box below:

(1) diabetics who depend on insulin
(2) a chronic high level of sugar in the blood
(3) results of the trial
(4) skin which is grown in the laboratory
(5) molecules which form long chains
(6) research on science and engineering
(7) chemists who lived in the nineteenth century

In April 1997 Dr. Frank Baker, an emergency medicine specialist from the Chicago area, took part in a clinical trial to test a form of artificial skin for treating (1)_____ whose tissue had been degraded by the secondary effects of (2)_____.

Baker, who has had diabetes for more than four decades, was in danger of losing a foot because of hard-to-heal skin ulcers. For him the (3)_____ were close to miraculous: the (4)_____ didn't just cover and protect his wound, it released chemicals that caused his own tissue to grow back much faster.

Artificial skin grown in the laboratory on scaffolding made of (5) _____ called polymers can help heal the wounds of patients with ulcers caused by poor blood circulation.

The National Academy of Sciences, located in Washington, is a society of distinguished scholars engaged in (6) _____, dedicated to the use of science and technology for the public welfare.

(7) _____ also determined that it was possible to synthesize so-called organic compounds.

2.5. ACTIVIDADES COMPLEMENTARIAS

Look at the following web sites where you can find additional information about the content of this unit. There are also several exercises which can help you practice with nominal compounds.

<http://www.nanomechanics.com/sci_eng>
<http://membres.lycos.fr/jcviel/contents.htm>
<http://www.edufind.com/english/grammar/NOUNS4.cfm>
<http://www.ucl.ac.uk/internet-grammar/adjectiv/nominal.htm>
<http://exchanges.state.gov/forum/vols/vol41/no3/p02.htm>

2.6. BIBLIOGRAFÍA COMPLEMENTARIA

The following bibliographical sources deal with specific aspects related to the contents of this unit. Read them in order to improve your knowledge about premodification structures.

BHATIA, V.K. *Analysing Genre: Language Use in Professional Settings.* London: Longman, 1993.

DUBOIS, B.L. "The Construction of Noun Phrases in Biomedical Journal Articles". Paper presented at *LSP Conference*. Copenhagen, August 1981.

HORSELLA, M. & F. PÉREZ, F. "Nominal Compounds in Chemical English Literature: Toward an Approach to Text Typology." *English for Specific Purposes* 19 (1991): 125-138.

KIRKMAN, J. *Good Style: Writing for Science and Technology*. London: E & FN SPON, 1992. Chapters 2.7 and 2.8.

LEVI, J. *The Syntax and Semantics of Complex Nominals*. New York: Academic,1978.

PAQUETTE, A. & ROEHNER, B. *Science in English: el inglés de los textos científicos*, Larousse, 1996. 187-190.

SCHOENFELD, R. *The Chemist's English*. Weinheim: VCH, 1986. Chapters 6 & 7.

SWALES, J. *Writing Scientific English*. London: Thomas Nelson, 1974.

TRIMBLE, L. (1985). *English for Science and Technology: A Discourse Approach*. Cambridge: Cambridge UP, 1985.

2.7. GLOSARIO

"ANALYTIC." A structure which is broken into its constituent elements, by means of prepositions or relative clauses. (Opposite to "synthetic")
Example: a mouse <u>that</u> live <u>in</u> fields

"CN." short for "complex nominals."

"COMPLEX NOMINALS." Nominal compounds which have a specific complexity. (See "nominal compounds")
Example: city water chemical contamination monitoring programme.

"-ED FORM." The past participle of verbs used like adjectives. (See "-ING form")
Example: developed countries. It also includes irregular verbs, example: frozen water.

"H." SHORT FOR "Head." The principal noun of any nominal compound. (See "M")
Examples: air filter (filter = H) ; acid nitrate deposition (depositon = H)

"HYPHEN." A punctuation mark (-) used between parts of a premodification structure.
Example: long-chain fatty acids, soy-based formulas.

"-ING FORM." The present participle of verbs used like adjectives. (See "-ED form")
Example: developing countries, freezing point of water.

"NOMINAL COMPOUNDS." Combination of words or groups of words functioning as a noun. (See "complex nominals")
Example: water purification system.

"PARAPHRASE." Express the same message in different words for the purpose of clarification.
Examples: non-egg-laying females = females which do not lay eggs.
furnace gases = gases produced or located in a furnace.

"PATTERNS." Grammatical models used to organize a group of words in a text.

"PM." Short for "premodifier."

"PREMODIFICATION STRUCTURES." Any structure which is composed of a Head (Noun) and one or more premodifiers. These premodifiers are always placed in front of the Head.

PM PM PM H
Example: fine particulate air pollution

"PREMODIFIER." One or more words that preceed a noun (Head) and qualify its meaning. (See "H")

PM PM PM
Examples: air filter; acid nitrate deposition

"RELATIVE CLAUSE." A clause that provides additional information about a preceeding noun, often beginning with a relative pronoun, such as "who," "which" or "that."
Example: compounds which occur naturally.

"SYNTHETIC." A structure which is not broken into its constituent elements and forms a whole. (Opposite to "analytic")
Example: a field mouse.

"TEXT-PATTERNING." Different models of organization depending on the text type: textbooks, scientific articles, etc.

"UNIT PREMODIFIER (U PM)." Two or more premodifiers which form a single unit of meaning. They are usually linked by a hyphen, but not necessarily.

U PM U PM
Example: nitrogen-containing compounds fully grown bee

2.8. DISTRIBUCIÓN DE HORAS

Teoría	3
Actividades obligatorias	4
Debate en el foro	1,5
Autoevaluación	1
Sesiones de *chat*	0,5
TOTAL	10

Las actividades complementarias y la lectura de la bibliografía complementaria no se han contabilizado puesto que están diseñadas para refuerzo.

3. CONCLUSIÓN

A lo largo de este trabajo hemos ido presentando los diversos recursos que se pueden utilizar en el diseño instructivo de una unidad de aprendizaje. Como se puede observar, llevar a cabo adecuadamente este tipo de diseño requiere un gran esfuerzo por parte del profesor, que, además de estructurar los contenidos en la plataforma, tiene que constituirse en facilitador del aprendizaje y motivador del alumno mediante una labor continua y personalizada de tutorización *on-line*, así como actualizar y evaluar el material periódicamente y adaptarse a las exigencias de las nuevas tecnologías. Aunque todo ello supone una labor ardua, animamos a los profesionales que trabajan en el campo de IFE a realizar experiencias de este tipo que, sin duda, van a contribuir a fomentar el proceso formativo del alumno ya que, frente a la enseñanza tradicional presencial, el modelo educativo virtual incorpora más posibilidades didácticas, es más exigente y de mayor calidad.

Esperamos que nuestra propuesta pueda servir de orientación para realizar cursos similares y consideraríamos de gran interés la intercomunicación de experiencias que se vayan llevando a cabo en la enseñanza de las lenguas de especialidad.

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DAHL, O.J. & NYGAARD, K. "SIMULA: An Algol Based Simulation Language." *Communications of the ACM* 9.9 (1966): 671-678.

GIL, L., C. SOLER & K. STUART. "A Software Application for Language Learning." International Conference on Network Universities and E-learning. Valencia. <http://www.upv.es/menuconf/CD%20MENU%20CONFERENCE/3C% 20Software/luz_gil.pdf]>. 2003.

NIELSEN, J. *Designing Web Usability*. Indianapolis: New Readers, 2000.

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WILEY, D. The Instructional Use of Learning Objects. <http://www.reusability.org/read/chapters/wiley.doc]>. 2000.