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Variation in the Translation Patterns of English 'Noun + Noun' Compounds in ESP: The Case of Engineering Students

ABSTRACT

'Noun + Noun' compounds are among the most common and productive structures in modern English. Due to their complexity and potential ambiguity, they represent a challenge for English language learners, especially if such compounds are generally untypical and unproductive in the learners' mother tongue, as the case is with the Serbian. The aim of this research is to examine how engineering students understand and translate 'N+N' structures in the context of English for Specific Purposes, focusing on binominal compounds and compounds with more than two constituents. The research method is the analysis of a translation test from English to Serbian. The results show that students need to receive more input about the semantic and syntactic properties of these structures and develop learning strategies that would help them to fully comprehend this type of compounds and provide their correct translations, focusing on their meaning instead of form.

Keywords: English for Specific Purposes, engineering discourse, English language teaching, nominal compounds, translation procedures

Razlike v prevodnih vzorcih angleških dvosamostalniških zloženkih pri angleščini za posebne namene: primer študentov tehniških ved

IZVLEČEK

Zloženke, sestavljene iz dveh samostalnikov, so med zelo običajnimi in najpogosteje tvorjenimi strukturami v sodobni angleščini. Zaradi svoje kompleksnosti in potencialne dvoumnosti predstavljajo izziv za učence angleškega jezika, še posebej, če so takšne zloženke neznačilne za materni jezik učencev, kot je to v primeru srščine. Namen te raziskave je preučiti, kako študenti tehniških ved pri pouku angleščine za posebne namene razumejo in prevajajo zloženke, sestavljene iz dveh ali več samostalnikov. Raziskovalna metoda je temeljila na analizi prevodnega testa iz angleščine v srščino. Raziskava kaže, da morajo študenti prejeti več informacij o semantičnih in skladenjskih lastnostih teh struktur ter razviti učne strategije, ki bi jim pomagale v celoti razumeti to vrsto zloženkih in zagotoviti njihove pravilne prevode, pri čemer se morajo osredotočiti na njihov pomen namesto na njihovo obliko.

Gljučne besede: angleščina za posebne namene, tehniški diskurz, poučevanje angleškega jezika, samostalniške zloženke, postopki prevajanja



1 Introduction

A recent diachronic study by Biber and Gray (2011) shows that the scientific and academic discourse style has undergone significant changes over the past two centuries. One of the changes refers to the use of nominal compounds of the ‘Noun + Noun’ type, which have become much more frequent and productive, while their meaning, relationships, and functions have extended as well. More precisely, there has been a shift to a phrasal grammatical style characterized by complex noun phrase structures which make the modern professional and academic style “compressed”, more succinct and less explicit (e.g., *inoculation experiments* instead of *experiments that test the effectiveness of inoculation*; *pressure hose* instead of *a hose able to withstand pressure*; see Biber and Gray (2011, 180) for more). Within the transformational grammar framework, it is argued that nominal phrases are formed by contraction of their complex underlying structures and omitting of the functional words (e.g., *fish kettle* → *a kettle for (cooking) fish*, *oak door* → *a door (made) from oak*) (Krimer Gaborović 2017). Consequently, it is not always easy to understand the semantic relations between the compound constituents, and this poses a challenge for English language learners. This paper aims to identify some of the problems students deal with while translating this specific group of English compounds into Serbian.

2 Theoretical Framework

2.1 ‘Noun + Noun’ Compounds in English: Syntactic and Semantic Properties

Compounding or composition is “the formation of a new lexeme by adjoining two or more lexemes” (Bauer 2003, 40).¹ Compounding is known to be the main mechanism of forming new lexemes in many languages, including English, in which it is the most productive word-formation process (Plag 2003, 169).

Compounds are commonly analysed in terms of the hierarchical relations between the constituents, i.e., their modifier-head structure. In English, the general rule is that the right-hand element of a compound is the head while the left-hand element is its modifier. The head is the central unit of the structure and the whole compound inherits most of its syntactic properties from the head. According to word class of the head, compounds can be classified as nominal (*tomato sauce*, *computer program*), verbal (*deep fry*, *brain-wash*), adjectival (*knee-deep*, *deep-blue*) and so on (Plag 2003, 182). Compounds also inherit other grammatical features from the head, such as their number and gender (e.g., *movie actresses* is a feminine plural nominal compound). A special type of compounds are neo-classical compounds composed of constituents derived from Latin or ancient Greek roots which act as both bases (they have full lexical meaning and can combine with each other) and affixes (they act as bound elements), such as *bio*-|*-logy*, *geo*-|*-logy*, *bio*-|*-graphy* (Prčić 2016).

¹ Considering orthography, English is highly inconsistent in case of ‘N+N’ compounds. Bauer (1998, 69) observes that orthography varies even for a single ‘N+N’ collocation in different dictionaries (e.g., *girl friend*, *girl-friend* and *girlfriend*). In Serbian, on the other hand, the general rule is that compounds are written as a single word (e.g., *mesojed*, ‘carlivore’; *rukopis*, ‘manuscript’), while semi-compounds tend to be hyphenated (e.g., *uzor-majka*, ‘mother who is a role model’). However, it is strongly emphasized that orthography is not to be used for categorization in the word-formation process (Bauer 1998; Klajn 2002).

The compounds analysed in this paper are nominal compounds having other nouns as premodifiers ('N+N' compounds). The analysed compounds belong to the group of endocentric compounds, characterized by denoting a subclass of the entity denoted by the head (Bauer 2003, 42): *tomato soup* is a kind of soup, *paper bag* is a kind of bag. The head in these instances is thus central not only syntactically but also semantically.

The meaning of endocentric 'N+N' compounds is based on the combination of the meanings of its constituents. This principle is called semantic compositionality (Prčić 2016, 91). It implies that the sense of the lexeme is rule-governed, and that the decoder is able to interpret it by combining the senses of its individual elements. Yet, since 'N+N' compounds contain only content words and no functional words that would indicate the logical relations between the constituents (Biber et al. 1999), these compounds are mostly ambiguous in isolation, as there are often a number of meaningful semantic relations that can be established between the constituents. This phenomenon can be illustrated with the example *marble museum*, which can be taken to name either a museum (that is, a building) made of marble (as building material), or a museum (an institution) that exhibits marbles (objects) (Plag 2003, 192). Biber et al. (1999, 588) provide the example *elephant boy*, which could be interpreted as 'boy who resembles an elephant' or 'boy who rides on an elephant' or 'boy who takes care of elephants'. Plag (2003, 189–94) explains that possible and plausible interpretations of compounds are determined by the conceptual and semantic properties of their constituents (nouns). This is why, for example, the compound *computer surgery* is unlikely to be interpreted as 'surgery performed on computers', assuming the knowledge that computers are not treated the way human organs are, but rather to mean 'surgery performed with the help of computers'. In situations when there may be more than one possible compositional meaning of a compound, it is the context and our extralinguistic knowledge that provide the intended interpretation.

A transformational analysis of 'N+N' compounds presented by Levi (1978) indicated that the semantic relations between the constituents are systematic, suggesting that 'N+N' compounds can be read as compressions of their complex underlying structures. According to Levi, 'N+N' compounds are derived by the syntactic processes of deletion or nominalization of the predicate in their underlying structures. The deleted predicates include: *cause, have, make, use, be, in, for, from* and *about* (e.g., *tear gas* → *gas causes tears*; *picture book* → *book has pictures*; *honey bee* → *bee makes honey*; *horse doctor* → *doctor for horses*; *olive oil* → *oil (made from olives)*). Examples of nominalization are *dream analysis* (act nominalization), *student inventions* (patient nominalization), and so on.

Over the past several decades, a number of authors have provided taxonomic lists of the semantic relations between 'N+N' compound constituents (Downing 1977; Vanderwende 1994; Barker and Szpakowicz 1998; Biber et al. 1999; Adams 2001; Balyan and Chatterjee 2015). Biber et al. (1999, 590) provided a taxonomy accompanied by developed underlying structures of the 'N+N' compound types.² This study uses their taxonomy because of its comprehensiveness and clarity:

² In this paper the head noun is marked as N1, while the modifying noun is N2, while in cases of multiple nominal premodification, the nouns positioned to the left are marked with the following numbers (N3 and N4).

1. COMPOSITION: N1 is made from N2, N1 consists of N2: *glass window* – windows made from glass;
2. PURPOSE: N1 is for the purpose of N2; N1 is used for N2: *pencil case* – case used for pencils;
3. IDENTITY: N1 has the same referent as N2, but classifies it in terms of different modifiers: *women algebraists* – algebraists who are women;
4. CONTENT: N1 is about N2; N1 deals with N2: *algebra text* – a text about algebra; *currency crisis* – crisis relating to currency;
5. SOURCE: N1 is from N2: *irrigation water* – water that comes from irrigation;
6. OBJECTIVE: N2 is the object of the process described in N1: *egg production* – X produces eggs; or N1 is the object of the process described in N2: *discharge water* – water that has been discharged;
7. SUBJECTIVE: N2 is the subject of the process described in N1, N1 is nominalized from an intransitive verb: *child development* – children develop; or N1 is the subject of the process described in N2: *labour force* – a force that labours/is engaged in labour;
8. TIME: N1 is found at the time given by N2: *summer conditions*;
9. LOCATION: N2 is found at the location given by N1: *notice board* – a board where notices are found; or N1 is found at the location given by N2: *corner cupboard*;
10. INSTITUTION: N1 identifies an institution for N2: *insurance companies* – companies for (selling) insurance;
11. SPECIALIZATION: N2 identifies an area of specialization for the person or occupation given in N1: N1 is animate: *finance director* – director who specializes in finance;
12. PARTITIVE: N1 identifies parts of N2: *cat legs*.

2.2 Nouns with Multiple Nominal Premodification

Although noun phrases with multiple premodifying nouns were uncommon in English until the second half of the 20th century, today we more frequently find ‘N+N+N’ sequences, and even ‘N+N+N+N’ sequences, for example *peace treaties enforcement action* (meaning ‘activities carried out to enforce treaties intended to result in peace’), *emergency cabinet committee meetings* (‘meetings of a committee associated with a cabinet, called in an emergency’) (Biber and Gray 2011). The purpose of multiple nominal compounding is that it “offers an efficient way of condensing long meanings into just a few words, so it comes as no surprise that language users take advantage of that when in need of being succinct” (Wasak 2016, 129).

Since this study deals also with nominal compounds with more than two constituents, it is important to point out that regardless of the number of the constituents, compounds can be analysed as binary structures (modifier-head), since larger compounds follow the same structural and semantic patterns as compounds consisting of only two members. An example *university teaching award committee member* was provided and illustrated by Plag (2003, 171) in Figure 1:

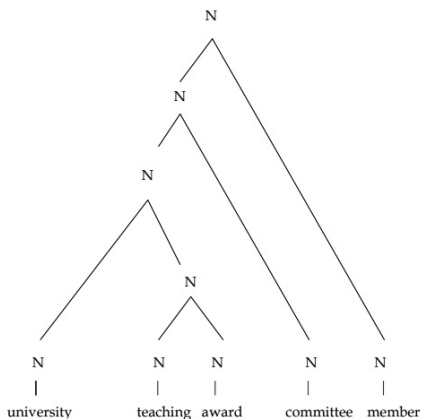


FIGURE 1. Hierarchical relations in a five-member nominal phrase *university teaching award committee member* presented through binary structures (Plag 2003, 171).

Theoretically, the number of nouns that may appear as premodifiers is unlimited, but it is uncommon to find more than four (Pastor Gómez 2010). Plag (2003) explains that extremely long compounds are used less, not for structural but for processing reasons. Namely, a higher number of constituents leaves more space for ambiguity, and Halliday ([1989] 2004, 169–70) provides an example of a four-noun phrase *lung cancer death rates*, which could mean ‘how many people die from lung cancer’ or ‘how quickly people die when they get lung cancer’ or even ‘how quickly people’s lungs die from cancer’ (for more examples see Kim and Baldwin 2013; Wasak 2016). The higher the number of constituents, the more relations implied, so the harder it is for readers to interpret the phrase and comprehend the text.

2.3 ‘Noun + Noun’ Compositions in Scientific and Academic Discourse

The scientific and academic discourse today is characterized by high lexical density (i.e., the density of information in a text, measured by the number of lexical words per clause). For example, in informal spoken language the lexical density tends to be about two lexical words per clause. The lexical density of written language tends to be higher, often around four to six lexical words per clause, while in scientific writing the lexical density may be considerably higher than that, frequently over 10 lexical words (Halliday [1989] 2004). A recent study by Biber and Gray (2011) pointed to a dramatic diachronic change in the written scientific and academic discourse style, reflected in an increasing tendency towards nominalization and complex noun phrase structures (Figure 2). They show that scientific and academic texts today rely heavily on nouns (accompanied by “the relative absence of verbs”) and on phrasal modification (accompanied by “the relative absence of clausal modification”) (Biber and Gray 2011). Indeed, a corpus-based study carried out by Biber et al. (1999) revealed that nouns as premodifiers account for around 30% of all premodifiers in academic prose.

Such high lexical density, arising largely from nominalization, often results in ambiguity and difficulties in comprehension of written texts. For example, in the statement, *increased responsiveness may be reflected in feeding behaviour*, it is not clear whether the feeding behavior is a sign or an effect; also, from the statement, *higher productivity means more supporting*

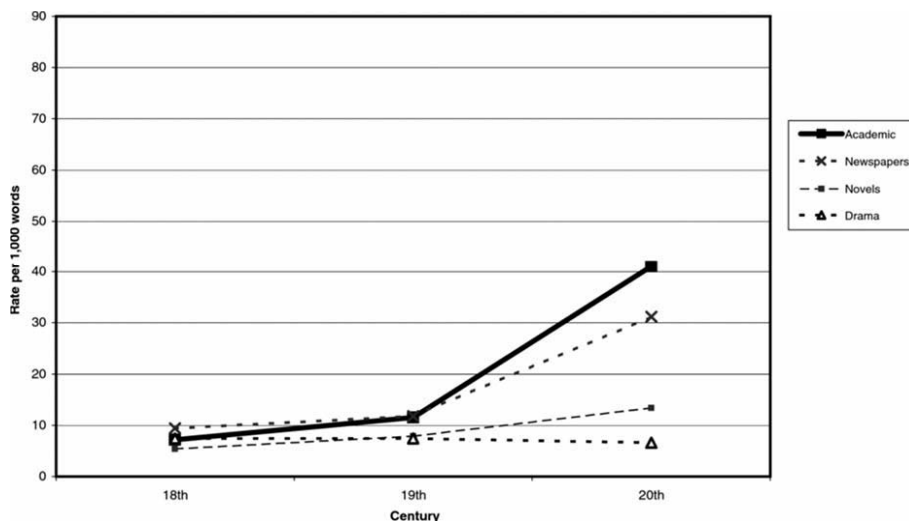


FIGURE 2. Historical use of nouns as nominal premodifiers (Biber and Gray 2011, 231).

services, we cannot tell if higher productivity is brought about by more supporting services, or if it causes more supporting services to be provided (Halliday [1989] 2004).

According to Halliday, the high lexical density and the ambiguity are both by-products of a process called grammatical metaphor. This concept refers to the substitution of one grammatical class or structure by another (e.g., *his departure* instead of *he departed*). However, Halliday argues that grammatical metaphors “are not just another way of saying the same thing”, but that in a certain way “they present a different view of the world” ([1989] 2004, 176). This kind of metaphor is particularly common in the scientific discourse, and it is suggested that this may be the context where grammatical metaphor evolved first. Namely, in order to describe “a new kind of knowledge” based on their experiments, scientists spontaneously created a new variety of English which would be suitable to describe the steps in their research, moving from what has already been established to what follows from it. Halliday explains that the most effective way to do this in English is to “construct the whole step as a single clause, with the two parts turned into nouns, one at the beginning and one at the end, and a verb in between saying how the second follows from the first” ([1989] 2004, 174). In this process, through nominalization, verbs with dynamic meanings are transformed into nouns with static meanings, either by derivational suffixes (e.g., *-tion* as in *publication house*, *-ance* as in *insurance companies*), or by conversion (e.g., *flow line*, *research fund*) (Biber and Gray 2011). Pragmatically speaking, with this substitution nominal premodification signals the permanence of the notion denoted by the noun phrase. In this way, nominal premodification does not merely describe the head noun, but also defines and restricts it, and by giving it the permanent and defining status, makes it suitable for conveying the authority of a scientific fact (Junker 1992; Pastor Gómez 2010).

However, a study aiming to find out to what extent nominal premodification is included in ESL-EFL grammar books (Biber and Reppen 2002) concluded that these texts focus on

attributive adjectives as the primary means of noun modification, and to a lesser extent on participial adjectives, and leave nouns as premodifiers largely neglected. Nominal compositions are underrepresented in English books and curricula, although their complexity and potential ambiguity represent a challenge for learners of English as a foreign language. This challenge is even more serious for learners of English for Specific Purposes who also face the specific complexities of scientific discourse. Moreover, there is scarce literature in the field of English language teaching that deals with the strategies students need to acquire in order to more easily understand and efficiently translate these types of compounds (e.g., Fries 2017; Alemán Torres 1997).

2.4 Translating English ‘Noun + Noun’ Compounds into Serbian

Although nominal compounds of ‘N+N’ type are the most common type of compounds in English (Plag 2003, 185), they are not typical in Serbian as the majority of such structures found in Serbian are borrowings from different languages, including Turkish (*sahat-kula*, ‘clock tower’, *čorsokak*, ‘dead end’) and German (*fusnota*, ‘footnote’, *hozentregeri*, ‘suspenders’) (Klajn 2002, 44–48). Since the mid-20th century, there have been an increasing number of borrowings from English (e.g., *rok-muzika*, ‘rock music’, *čarter-let*, ‘charter flight’), including raw Anglicisms such as *air bag*, *computer consultant*, and *web site*, lacking any orthographic adaptation in Serbian (Prčić 2019). Compounds in Serbian generally have a different structure, so, for example, many compounds in Serbian have interfixes such as -o- and -e- (e.g., *nosorog*, ‘rhinoceros’, *kišobran*, ‘umbrella’; *lovočvar*, ‘game warden’) not commonly found in English.

In order to analyse the translation patterns of English nominal compounds into Serbian, it is necessary to consider available translation procedures. According to Prčić (2019, 178–80), these are:

1. Direct translation: a procedure of direct translation of literal or metaphorical meaning from L1 to L2: e.g., *fish and chips* > *riba i pomfrit* (literal), *mouse* (‘computer device’) > *miš* (metaphorical meaning). If there are implied semantic features in L1, they are also transferred to L2: e.g., *mobile* > *mobilni* (implied semantic information – ‘phone’).
2. Structural translation (calque): literal translation of the elements in polymorphemic words (derived, complex or phrasal) from L1 by corresponding elements in L2: e.g., *print.er* > *štam.p.ač* (suffixation). English compounds are very frequently translated into Serbian as phrasal lexemes: e.g., *ice diving* > *ronjenje pod ledom* [diving under ice], *feasibility study* > *studija o izvodljivosti* [study about feasibility]. In these examples using ‘noun₁ + preposition + noun₂’ in the Serbian translation, the structure in L2 spells out the underlying structure of the expressions in L1 (e.g., the underlying structure of the compound *ice diving* is ‘diving under ice’). Prčić (2019, 179) also distinguishes a subclass in this translation procedure called partial structural translation (or partial calquing), where one element is translated using a corresponding element from L2, while the other element is borrowed from L1: *work.abolic* > *rado.holik*, *rado.holičar*.
3. Functional approximation is generally the most common translation procedure which refers to translating the content from L1 by lexical means available in L2, in order

to convey as accurately as possible the function of the referent from L1. One way of functional approximation is to maintain the original perspective or conceptualization: e.g., *skydiving* > *akrobacije u vazduhu* [acrobatics in the air], while the other method changes the original perspective or conceptualization: e.g., *jetlag* > *zonski sindrom* [the time zone syndrome], *showroom* > *prodajni salon* [sales salon].

Due to structural differences between the two languages, direct translation is not expected to be among the procedures used for translating 'N+N' compounds in this study³ (except in the case of borrowings, as mentioned above). It is expected that the compounds will be translated using either the procedures of structural translation or functional approximation.

According to the findings of contrastive studies (Krimer-Gaborović 2017; 2004; Šobot 2006), the most common Serbian translation equivalents of English 'N+N' compounds include:

- phrasal lexemes of the following patterns:
 - Adj + N, e.g., *bird nest* > *ptičije gnezdo*, *lace curtain* > *čipkana zavesa*
 - N₁ + Prep + N₂: e.g., *pepper mill* > *mlin za biber*, *ink blot* > *mrlja od mastila*
 - N₁ + N₂ in the genitive case: e.g., *copper mine* > *rudnik bakra*, *city centre* > *centar grada*

Other, less common, translation equivalents include (Krimer-Gaborović 2017):

- derivations (*woman servant* > *sluškinja*)
- monomorphemic lexemes (*alarm clock* > *budilnik*)
- semi-compounds of the 'N₁ + - + N₂' type (*member-country* > *zemlja-članica*)
- compounds of the 'N₁ + -o- + N₂' type (*water tower* > *vodotoranj*)
- compounds of the 'adjective + -o- + verb' type (*power cable* > *dalekovod*)
- compounds of the 'N + -o- + verb' type (*kitchen sink* > *sudoper*)
- neoclassical compounds (*soil science* > *geologija*)
- calques (*water cannon* > *vodeni top*).

3 Research Methodology

The research was carried out during the winter term of the academic year 2019–20, and it included 50 undergraduate engineering students from the Faculty of Agriculture and Faculty of Technology, University of Novi Sad. The students were in their final years of study (in their third or fourth years), with the language competence level of B2.⁴

³ For studies investigating the effect of the mother tongue on interpretation of English binominal compounds for various languages including Dutch, Spanish, German, and Chinese, see Zhang et al. 2012; Banga et al. 2013; De Cat, Klepousiotou, and Baayen 2015.

⁴ Language competence levels are determined against the standards of the Common European Framework of Reference for Languages – CEFR: <https://www.coe.int/en/web/common-european-framework-reference-languages/table-1-cefr-3.3-common-reference-levels-global-scale>.

The instrument used in the research is a translation test consisting of ten English sentences, which were taken and/or adapted from international scientific engineering journals (the list of the journals is provided in the Research Materials section). Each sentence included at least one nominal composition with one, two or three premodifying nouns ('N+N', 'N+N+N' and 'N+N+N+N' compositions). The number of nominal premodifiers in the test depended on their frequency in the corpus, such that the binominal compounds were the most frequent, followed by the three-noun compounds and then the four-noun compounds.

The aims of the research were as follows:

- to determine the prevalence of correct translations for the nominal compositions with one, two or three premodifying nouns, i.e., to determine the students' ability to understand and translate these compositions;
- to identify the difficulties students encounter in the process of translation;
- to determine whether the number of compound constituents affects students' ability to understand the compositions and provide correct and complete translations;
- to provide strategies that would help students to understand and more efficiently translate this type of compounds in scientific and academic texts.

The provided translations were first grouped into correct and complete translations and incorrect and/or incomplete translations. The quality of the translations was assessed in accordance with the first two criteria of the Chartered Institute of Linguists provided by Munday (2012, 49): (1) accuracy, i.e., "the correct transfer of information and evidence of complete comprehension", and (2) "the appropriate choice of vocabulary, idiom, terminology and register". The other two criteria, including (3) cohesion, coherence and organization, and (4) accuracy in technical aspects of punctuation, etc., were not taken into account because we analysed only the phrases and not the whole sentences. The correct translations were then analysed according to their translation patterns. The incorrect and/or incomplete translations were analysed to identify common mistakes and the skills and knowledge students would need to acquire to overcome the obstacles related to their comprehension and translation of the compositions. Finally, the results for the binominal were compared to the results for three-noun and four-noun compounds to determine whether the number of compound constituents affects success in comprehension and translation.

4 Research Findings

4.1 Translating Binominal Compounds

The translation of binominal compounds was the subject of the pilot study conducted by the authors (Komaromi and Jerković 2020). The study included five sentences containing the following six binominal compounds: (1) *meat products*, (2) *water pressure*, (3) *sample analysis*, (4) *research purposes*, (5) *food policy*, and (6) *cancer therapy*. The analysis showed that students translating binominal compounds from English into Serbian in the majority of cases face no difficulties, opting for one of the three most common translation patterns (according to Krimer-Gaborović 2017): Adj+N, N₁+Prep+N₂ or N₁+N₂(gen). For example, the compound

(1) *meat products* was translated either as *mesni proizvodi* (Adj+N) or *proizvodi od mesa* (N₁+Prep+N₂), (2) *water pressure* either as *pritisak vode* (N₁+N₂(gen)) or *vodeni pritisak* (Adj+N), (3) *sample analysis* as *analiza uzorka* (N₁+N₂(gen)), etc. However, in some instances, the translation procedure requires including certain elements not present in the surface but in the underlying structure of the original text, and this is the challenging part for students who largely attempt to follow one of the three translation patterns avoiding additions of any lexical words. For example, in the compound (6) *cancer therapy* the semantic relation between the constituents is PURPOSE (according to Biber et al. 1999), and the underlying structure is *therapy is used for treating cancer/cancer patients*. The results showed that the compound was translated by as many as 43% of the students as *terapija raka* (N₁+N₂(gen)). As genitive without preposition is generally not used in Serbian for expressing purpose, this did not seem like an acceptable translation. The given underlying structure indicates that in the process of contraction, the verb *treat* was deleted, and potentially also the object *patients*. As previously explained, Serbian translations commonly reflect the underlying structure of the English compounds (e.g., *sun protection* means ‘protection from sun’, translated as *zaštita od sunca*), and in order to provide the most appropriate and semantically comprehensive translation, in certain cases the elided element(s) should be brought back into the text of the translation. However, the translations *terapija za lečenje raka* (inserted verb) and *terapija obolelih od kancera* (inserted object) was provided by only 7% and 3% of the students, respectively. It can be concluded that students in most cases tend to follow the principles of surface translation (Prčić 2019, 53–57), focusing on the form instead of the meaning. The numbers of correct and incorrect translations (with percentages) are presented in Table 1.

TABLE 1. Numbers of correct and incorrect translations with percentages for binominal compounds (Komaromi and Jerković 2020).

	1. meat products	2. water pressure	3. sample analysis	4. research purposes	5. food policy	6. cancer therapy
Correct Translations	30 (100%)	29 (97%)	27 (90%)	28 (93%)	22 (73%)	17 (57%)
Incorrect Translations	-	1 (3%)	3 (10%)	2 (7%)	8 (27%)	13 (43%)

4.2 Translating Three-Noun Compounds

The following part of the test included sentences containing three-noun compounds which were translated into Serbian. The compounds included: (7) *olive oil consumption*, (8) *greenhouse gas emissions* and (9) *food supplement powder*. Table 2 presents the translation patterns with examples and the number of provided translations (percentages).

Table 2 shows that the first two compounds (7) and (8) were translated using exclusively combinations of the typical translation patterns above listed. However, the percentage of correct translations for compound (8) *greenhouse gas emissions* is quite low, which seems to stem not from the students’ lack of translation skills but from their unfamiliarity with

TABLE 2. Translation patterns with examples and the number of translations with percentages for three-noun compounds.

Translation Patterns	Examples of Translations of English Phrases					
	7. <i>olive oil consumption</i>	No of trans. (%)	8. <i>greenhouse gas emissions</i>	No of trans. (%)	9. <i>food supplement powder</i>	No of trans. (%)
$N_1 + (\text{Adj}_3 + N_2)$ (gen)	<i>potrošnja / upotreba / konzumacija maslinovog ulja</i>	40 (80%)				
$N_1 + N_2$ (gen) + N_3 (gen)			<i>emisije gasova staklene bašte</i>	24 (48%)		
$N_2 + N_3$ (gen) + Prep + N_1					<i>suplementi hrane u prahu</i>	6 (12%)
Adj(N_1) + Adj(N_3) + N_2					<i>praškasti dijetetski suplement</i>	4 (8%)
Adj(N_3) + N_2 + Prep + N_1					<i>prehrambeni suplement u prahu u praškastom obliku</i>	3 (6%)
Adj(N_1) + N_2 + N_3 (dat)					<i>praškasti dodatak ishrani</i>	5 (10%)
$N_2 + N_3$ (dat) + phrase + N_1					<i>dodatak hrani u prahu / u vidu praha / u formi praha</i>	8 (16%)
Incorrect Translation	<i>maslinovo ulje u potrošnji; upotrebljeno maslinovo ulje</i>	3 (6%)	<i>efekat zelene bašte i emisije gasova; emisija zelenih gasova; staklene bašte za emisiju gasova; gasova zelenih kuća, koji vrše emisiju</i>	7 (14%)	<i>prašak prehrambenog suplementa; prah kao dodatak hrani; prašak suplement hrani; hranljivi dodatak pudera; puder suplement ishrani</i>	12 (24%)
Omitted One or All Parts of the Phrase		7 (14%)		19 (38%)		12 (24%)

the notion of *greenhouse gas*,⁵ as a significant portion of the students translated this phrase incorrectly (as *gasovi zelenih kuća*, *zeleni gasovi* etc.) or simply omitted one or more parts of the compound.

⁵ The compound *greenhouse gas* has a high degree of compactness, as it is highly stable (having its own definition in dictionaries, e.g., Oxford Learner's Dictionaries 2021: *greenhouse gas*).

On the other hand, compound (9) *food supplement powder* is rather specific, as its translations into Serbian included not only the typical translation patterns, but also the dative case (as in *dodatak hrani u vidu praha, praškasti dodatak ishrani*). If we analyse the compound following its binary structure {{food supplement} powder}, the semantic relation in the first part of the compound *food supplement* is OBJECTIVE (X supplements food). Likewise, the dative case in Serbian can be used to express objective functions, which justifies the use of dative.

Another interesting observation for compound (9) is related to the treatment of its head noun. The semantic relation between N_1 *powder* with the rest of the compound is COMPOSITION, and in most cases it was translated either with a prepositional phrase *u prahu / u vidu praha / u formi praha*, showing the underlying structure of the English compound and implying the sense of composition. Another option was expressing it with the adjective *praškast* or with the phrase *u praškastom obliku*. It is interesting that, although the word *powder* is N_1 in English, the word *supplement* was translated as the head noun in all correct translations. On the other hand, among the incorrect translations, we can see students' attempts to make the word *powder* the head noun, generating translations such as *prašak suplement hrani, puder suplement ishrani, prah kao dodatak hrani, prašak prehrambenog suplementa*. In the first two examples, the students provided translations containing nominal predetermination in nominative with the pattern $N_1(\text{nom})+N_2(\text{nom})+N_3(\text{dat})$, which is considered to be an unjustified Anglicism⁶ (Prčić 2019) and thus an incorrect translation. The translation *prah kao dodatak hrani*, on the other hand, does not clearly imply the semantic relation of COMPOSITION. To conclude, the change of the head noun in this case is considered justified and the use of a prepositional phrase or an adjective (e.g., *u prahu, praškasti*) can be accounted for by Serbian morpho-syntactic and semantic means of expressing COMPOSITION. As was the case with binominal compounds, the need to change the form of the phrase in the target language results in the lower number of correct translations (52%).

4.3 Translating Four-Noun Compounds

In the last part of the translation test, the sentences contained four-noun compounds: (10) *water quality analysis procedures* and (11) *food product development stages*. Table 3 shows the translation patterns with examples and the number of translations (percentages) provided by the students.

The correct translations provided for the four-noun compounds consisted of the typical translation patterns in different combinations, including the structure with three genitive forms of nouns in a row (which is not uncommon in Serbian), or even a combination of all three translation patterns.

However, the analysis showed that as many as 74% and 44% of students provided incorrect and incomplete translations for compounds (10) and (11), respectively. Unlike compound

⁶ Prčić (2019, 131) explains that Anglicisms are unjustified if the content can be translated using productive morpho-syntactic and semantic means of the target language.

TABLE 3. Translation patterns with examples and the number of translations with percentages for four-noun compounds.

Translation Patterns	Examples of Translations of English Phrases			
	10. <i>water quality analysis procedures</i>	No of trans. (%)	11. <i>food product development stages</i>	No of trans. (%)
$N_1 + \text{prep} + N_2 + N_3(\text{gen}) + N_4(\text{gen})$	<i>procedure za analizu / u analizi kvaliteta vode</i>	8 (16%)	<i>faze u razvoju proizvoda / proizvodnje hrane</i>	6 (12%)
$N_1 + N_2(\text{gen}) + N_3(\text{gen}) + N_4(\text{gen})$	<i>procedure analize kvaliteta vode</i>	5 (10%)	<i>faze razvoja proizvoda / proizvodnje hrane</i>	7 (14%)
$N_1 + \text{prep} + N_2 + (\text{Adj}(N_4) + N_3)(\text{gen})$			<i>faze / stupnjevi u razvoju prehrambenog proizvoda</i>	10 (20%)
$\text{Adj}(N_2) + N_1 + \text{prep} + N_3(\text{gen}) + N_4(\text{gen})$			<i>razvojne faze / etape u proizvodnji / proizvodnje hrane</i>	5 (10%)
Incorrect Translation	<i>kvalitet vode analizira proceduru / analiza procedura kvaliteta vode</i>	3 (6%)	<i>hranjivi produkti u fazi razvitka / razvojni hranjivi produkti / produkti hrane u razvijanju, čiji se stadijumi(...)</i>	8 (16%)
Omitted One or All Parts of the Phrase	<i>analiza kvaliteta vode / utvrđivanje zdravstvene ispravnosti vode</i>	34 (68%)	<i>stanje prehrambenih proizvoda / razvojni produkti hrane / proizvod hrane u razvoju</i>	14 (28%)

(8) *greenhouse gas emissions*, where students encountered problems related to the meaning of the constitutive words or phrases, or (9) *food supplement powder* where the compound could not be translated without considerably changing its form in the target language, it seems that with the four-noun compounds (10) and (11) students struggled with the determination of the semantic relations between the words. This can be illustrated by incorrect translations such as *kvalitet vode analizira proceduru* for compound (10) or *hranjivi produkti u fazi razvitka* for compound (11), showing that the students understood individual words and applied the common translation patterns, but could not determine the head and establish proper semantic relations between the head and other nouns.

The research results for all compounds are summarized in Figure 3, which presents the distribution of incorrect answers for the analysed compounds depending on the number of constituents, and Figure 4, which shows the mean values of these answers.

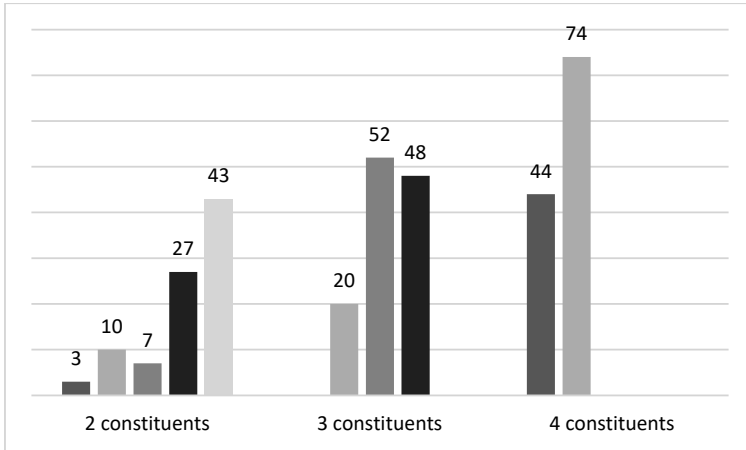


FIGURE 3. Percentage distribution of incorrect answers in compounds with different numbers of constituents.

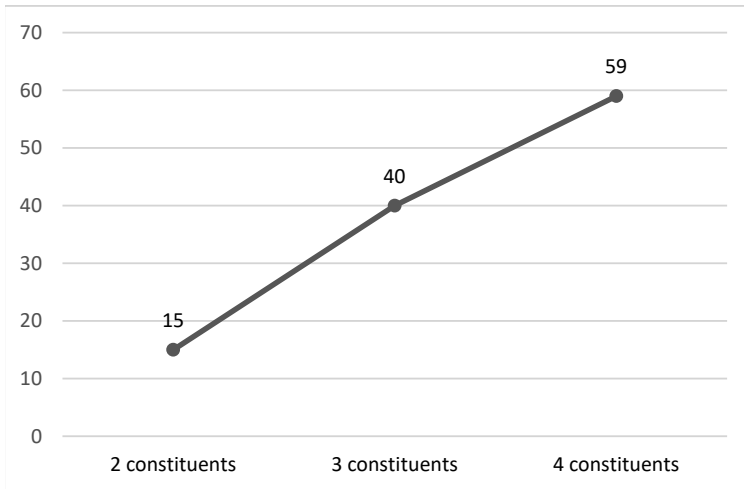


FIGURE 4. Comparison of the mean values of incorrect answers in compounds with different numbers of constituents.

5 Conclusions and Pedagogical Implications

As English classes at the tertiary level are predominantly classes in English for Specific Purposes, it is of great importance that the focus of such classes be not only on expanding the students' professional and technical vocabulary, but also on raising their awareness of the particular features of the academic or scientific discourse, which differs significantly not only from the conventions of oral communication, but also from the conventions of other written discourses. Recent studies have revealed that one of the distinctive features of modern academic and scientific writing is extensive nominal predetermination, which generates complex nominal phrases of the 'N+N' type. Considering that these nominal phrases lack

the functional words which would explain the semantic relations between the nouns, these structures present a challenge for English language learners. This especially refers to those learners who are unfamiliar with such syntactic mechanisms in their mother tongue, as is the case with the users of Serbian.

The results presented in this paper show that students had the greatest success in translating binominal compounds, less preparation for translating three-noun compounds, and the least skill when it came to four-noun compounds (15%, 40% and 59% of incorrect answers, respectively). In most instances, their translations used one or a combination of the common translation patterns (Adj+N, N₁+Prep+N₂ and N₁+N₂(gen)) outlined by Krimer-Gaborović (2004; 2017).

It should be noted, however, that although the students included in the research had a high level of language competence (B2 level), the percentage of incorrect translations for the compounds reached as high as 43%, 52%, and 74% for certain binominal, three-noun, and four-noun compounds, respectively. The analysis of the incorrect and incomplete translations provided an insight into the problems that engineering students encounter when translating nominal compounds into their mother tongue in a professional context. The results showed that major difficulties in translation arise in three situations: (1) when it is not possible to translate a compound using only the abovementioned common translation patterns, and it is necessary to insert lexical words which are part of the underlying structure of the compound; (2) when the number of the compound constituents is higher, as a higher number of constituents means more of the implied semantic relations and consequently more difficult interpretation of the meaning; and (3) when difficulties arise from the interference of the English language.

In light of the obtained results, it can be concluded that nominal compounds should be integrated more thoroughly in the ESP curricula at the tertiary level. This integration would allow students to deepen their knowledge and develop better strategies for understanding these types of compounds and providing more accurate translations. The results of the current study and the findings of Alemán Torres (1997) suggest that learning materials that would bring about better translations of 'N+N' compounds should familiarize students with the semantic and syntactic properties of the 'N+N' compounds and the translation procedures available for translations into the target language. These strategies should include the ways of identifying the compounds in a sentence; distinguishing the compound head; determining the direction of translating starting from the last constituent of the identified compound (which is not the absolute rule); determining the semantic relationships between the constituents, etc. (for a more detailed description of pedagogical strategies, see Alemán Torres 1997, 21–22). In addition, Fries (2017), who also investigated this issue in the context of ESP for engineering students, suggests that the explicit learning through a morphosyntactic approach (i.e., explicit training in grammar) should be combined with implicit learning which refers to using one's extralinguistic knowledge (i.e., the expertise in students' specialized fields) in order to resolve ambiguities; providing repeated exposure to key lexicalized compounds in a given specialized domain; understanding the compounds by representing them graphically, and so on (for more detailed description, see Fries 2017, 97–99). Finally, attention should also be devoted to the

use of unjustified Anglicisms, in this case using nouns in the nominative as premodifiers, which is not common in Serbian (e.g., *prašak suplement hrani*, *puder suplement ishrani*), as otherwise their occurrence could be expected to increase in future under the strong influence of English (e.g., *internet veza* or even raw Anglicisms such as *Internet provider*, *business plan*; Prčić 2019, 177).

Further research in this field should include more students of different levels of language competence, as well as a larger number of translation tasks. It would also be useful to investigate students' capacity to use 'N+N' compounds in language production tasks such as writing abstracts and oral presentations in the context of ESP. Finally, since the learning strategies were only briefly given in this study as pedagogical implications, further studies should investigate the effectiveness of applying different strategies (explicit and implicit) for translating and learning 'N+N' compounds in ESP classes.

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