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Augmented Linguistic Analysis Skills: Machine Translation and Generative AI as Pedagogical Aids for Analyzing Complex English Compounds¹



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Abstract

At a time when language trainers need to determine how best to integrate new digital tools that provide students with linguistic information, our aim in this article is to assess the potential value of information provided by two types of tools now widely used by students: machine translation via online translators and state-of-the-art generative AI platforms such as ChatGPT. In particular, the aim is to explore whether access to such information can help students develop their linguistic analysis skills to improve their understanding of the language prior to performing a translation task. Our case study deals with the analysis of complex English compounds—a known challenge for French learners of English as a second language—and involves two distinct cohorts: students in their third and final year of an undergraduate program in applied foreign languages, and students in their second and final year of a master's program in professional translation. We evaluated the participants' ability to identify head nouns—a necessary skill for comprehending complex noun phrases—under two conditions: (i) without access to any additional information and (ii) with access to machine translation outputs provided by a generic online translator. Subsequently, we explored the capabilities of advanced generative AI tools—in this instance ChatGPT—in correctly identifying head nouns. Our results show that students may benefit from the presence of machine translation outputs, albeit with varying degrees of success. However, our experimentation with ChatGPT suggests that generative AI tools may be more effective

¹ We would like to thank the students at the University of Lille for taking part in the different tasks necessary for the experiment. We also would like to thank Emily Holt for her help in having the students perform the different tasks in her classes.

in helping students analyze and understand complex noun phrases in English, in particular since the launch of ChatGPT-4o.

Keywords: linguistic analysis, complex noun phrases, online translators, machine translation, generative AI

Introduction

Complex Noun Phrases

Since English is a Germanic language and French is a Romance language, compounding in general, and complex noun phrases, in particular, have a reputation for being difficult for L1 French learners of English as a second language. For the purpose of the present study, a noun phrase (NP) is defined as a phrase with a noun or a pronoun as its head, and one or more determiners, premodifiers (adjectives, nouns, numerals) and/or postmodifiers (-EN/-ING/infinitive/relative clauses and prepositional phrases). According to Huddleston & Pullum (2002), NPs consist of a head noun, either alone or accompanied by one or more dependents in the form of a pre-head (*a linguistics student*) or post-head (*a report on the crash*) dependents, which can be complements (*a flower seller, the journey to Rome*) or modifiers (*the defeated army, her recently published article*) (pp. 326ff). These can be nouns, adjectives, genitives, prepositional phrases, or non-finite clauses such as relative or -EN/-ING participle clauses.

According to Keizer (2007), the head of a noun phrase is its most important part and traditionally exhibits a number of properties: (i) obligatoriness; (ii) distributional equivalence between nouns and noun phrases; (iii) determination of subject-verb agreement when the subject is a noun phrase; (iv) inflection within the noun phrase; (v) stress distribution; and (vi) pronominalization in subsequent discourse (p. 9). Note that there is not a general consensus on the issue: for instance, in generative grammar the head is considered to be the determiner, and therefore the phrase is a determiner phrase or DP (see Martinez-Insua & Perez Guerra, 2011, pp. 204–207). We shall not enter into the debate here; in this article the noun is considered to be the head of the noun phrase, as its identification is crucial for learners to understand its reference.

For the purposes of this study, an NP will be considered to be complex when the head is surrounded either by both pre- and post-modifiers or by at least two modifiers, which can themselves be phrases (stacked modification). Examples are provided in (1), where the NP appears in bold and the head is underlined. Different types of constraints, more or less rigid, then govern the order of modifiers in such NPs.

- (1) a. The cowboy, **the enduring symbol of virility, affluence and rugged Americana**, is himself a cattle farmer.
- b. Many of the perks that are now being cut were designed for **a pre-pandemic world of long weeks in full offices**.

According to Huddleston & Pullum (2002), such NPs are referential, as they “pick out some independently distinguishable entity, or set of entities, in the real world (or in some fictional world)” (p. 399). Very often, readers need to make inferences on the syntactic and semantic relationships of the modifiers with the head noun. Both contextual and encyclopedic knowledge then play an important role, as exemplified by the Noun+*story* associations provided in (2):

- (2) a. horror story (story that inspires you with horror)
- b. ghost story (story about ghosts)

- c. bedtime story (story told at bedtime)
- d. cover story (story that appears on the cover of a newspaper or magazine)
- e. Christmas story (story that takes place around Christmas time)

All of these issues make complex NPs challenging for students, who need to “unpack NPs to construct meaning” (Pampillo & Lauría, 2022, p. 117). In particular, “head recognition is key to comprehension,” that is to say identifying the head is necessary for students to understand the referential properties of the noun phrase. While this is a challenge for L1 Spanish learners of English, as claimed in Pampillo & Lauría (2022), the difficulty is similar for L1 French learners of English, since French and Spanish are both Romance languages. In these languages, the head of a complex NP is generally at the beginning of the phrase (left-headed languages) while in English, a Germanic language, the head is at the end (right-headed language), with some complex NPs including both pre- and postmodifiers, meaning the head is not necessarily the first or last word in the phrase. Furthermore, the relationship between the different elements in the NP is made explicit in Romance languages through the use of prepositions, whereas in English, the relationships are often implicit with no prepositions.

Complex NPs pose a challenge to L1 French speakers when translating from English into French, partly due to the fact that it can be difficult to identify the head in a phrase where information is compacted (Kübler et al., 2018). As explained in Kübler et al. (2022), the difficulty for these speakers lies both in the structure of the noun phrase and in the semantic relationship between its different elements; while the latter is often implicit in English, it has to be made explicit in French. This is something we have noticed through our experience in teaching English-French translation: an incorrect analysis of the structure of a complex NP in English, particularly the identification of the head, leads to an erroneous translation because access to the meaning of the NP in the source language is not possible. Many English-French translation textbooks specifically address complex NPs as one of the challenges that students have to deal with (see e.g. Chuquet & Paillard, 1987, pp. 185–188 or Vinay & Darbelnet, 1995, pp.157–159).

The Omnipresence of Online Translators and Generative AI

In recent years, two new tools have been real game changers and have challenged language teaching in higher education: online translators (OTs) that provide machine translation (MT) output (e.g. Google Translation, DeepL) and advanced artificial intelligence (AI) language models that generate human-like texts, with OpenAI’s ChatGPT probably being the most famous among them.

Since the advent of neural machine translation (NMT) in the second half of the 2010s, studies have shown that 80% to 100% of students from various backgrounds use popular online translators on a regular basis for a variety of tasks (Briggs, 2018, Alm & Watanabe, 2022; Delorme Benites et al., 2021; Dorst et al., 2022; Loock & Léchauguette, 2021; Loock et al., 2022). Among the tasks are translation, of course, but also comprehension, spelling and grammar correction, and pronunciation. In a previous study (Loock et al., 2022), we found that while 80% of students report using OTs for translation, 1 student out of 2 uses them as writing aids, and the same proportion uses them for help with understanding texts, while 1 student out of 6 uses OTs to complete grammar exercises. Alm & Watanabe (2022) even reported regular use of OTs to check the pronunciation of words.

Generative AI tools such as ChatGPT only started becoming available to the general public in late 2022. However, such large language models (LLMs), which aim to provide responses to instructions (prompts) and stimulate human-like interaction, have already become extremely popular and have triggered numerous discussions in relation to language teaching and learning (see e.g. Baskara & Mukarto, 2023 for the implications for language learning in higher education). According to Amin (2023), chatbots such as ChatGPT allow for personalized language learning and can transform

evaluation techniques with instant feedback for instance. We lack precise statistics for the moment on the actual use by students, but an online survey on more than 400 students by *Varsity*, the independent newspaper for the University of Cambridge, showed that in 2023, 47.3% used ChatGPT or other similar chatbots for their studies, with a fifth admitting to using such tools for graded work (Hennessey, 2023). This has led to interrogations from trainers and institutions on whether to allow or ban them, and on how to introduce them in their lectures. Generative AI is here to stay and is only becoming stronger and more capable, with the release of ChatGPT-4o in May 2024 as the latest example illustrating this trend. For teachers of translation, the debate is actually very similar to the one on OTs.

While both chatbots and OTs are technically quite easy to use—inputting text or uploading files for DeepL and writing prompts for ChatGPT—knowing *how* to make efficient use of the information they provide is actually much more difficult. In particular, understanding what kind of information is relevant for users depending on the language task they want to accomplish is a key issue. And yet, as shown for online translators, most of the time students receive no specific training and use them without supervision, leading to problematic confusion with other online tools such as dictionaries or glossaries. This has also resulted in students typing words instead of full sentences and created difficulties in identifying and correcting errors, as students assume they are capable of correctly analyzing the provided information (Loock & Léchauguette, 2021). This is particularly critical since OTs do play a role in language acquisition (see e.g., Resende & Way, 2021; Alm & Watanabe, 2022; or Klimova et al., 2022 for a systematic review on the application of NMT in foreign language learning). As a consequence, students need to develop their “MT literacy,” a concept put forward by Bowker & Buitrago-Ciro (2019), which includes not only technical aspects but also a critical stance toward the technology: understanding when (not) to use it, the extent to which MT output can be trusted and needs correction (e.g., existence of algorithmic or gender biases, as well as “machine-translationese”), using the information provided by OTs to perform a linguistic task successfully, and, last but not least, ethical and deontological considerations. In this article, the aspect of MT literacy to be investigated is the link between MT outputs and language skills, particularly morphosyntactic analysis and comprehension prior to translation. Our aim is to check the extent to which MT outputs can help students perform linguistic analyses, which can, in turn, provide language trainers with insights into how to introduce OTs in the classroom. Consequently, this article focuses not on information *retrieval*, but on information *use* (see below). As for AI tools such as ChatGPT, although studies on its use are only beginning to appear (see Abbas et al., 2024; Alm & Oalsi, 2024), it seems that the challenges are very similar. While technically easy to use, such AI tools may require the development of critical skills among students to effectively retrieve relevant information and make efficient use of it. These skills include knowing how to write an effective prompt, understanding that the tool’s responses are not always accurate, being aware of the linguistic properties of generated texts (as is the case for machine-translated texts), and evaluating the usefulness of the information for a specific task.

Aim of the Study

The aim of this study is to evaluate the usefulness of information provided by online translators and AI-based large language models in second language acquisition as tools for linguistic analysis. In particular, we aim to determine whether information provided by OTs or ChatGPT can help advanced L1 French learners of English analyze English complex noun phrases by identifying their heads. As mentioned above, this is a prerequisite for correctly identifying the referent depicted in the NP and quite a challenge for L1 French speakers. The study is not focused on students’ use of these tools *per se*, but rather on whether the information provided by these tools is useful for students in completing a specific language task (translation). This allows for a reflection on the relevance of integrating these tools in translation classes and their capacity to provide relevant information to assist students in the analysis of complex NPs.

First, two tasks performed in class one week apart allowed us to confirm that analyzing English complex NPs does indeed pose a challenge to our students. Next, via a subsequent task the third week, we checked whether the information provided by an OT could help students improve their linguistic analysis skills. Finally, via different types of prompts, we assessed the potential of ChatGPT, both in its 3.5 and 4o iterations, to correctly identify the heads in complex NPs, and therefore to assist students in translation tasks.

While the use of online tools for second language acquisition and translation has been the object of a lot of academic research, their use for linguistic analysis, in this case morphosyntactic analysis of complex phrases, is not well documented. To the best of our knowledge, OTs have been studied for their role in language acquisition for a variety of tasks, including grammatical correctness, but not for linguistic analysis *per se* (even though reading and translation necessarily involve some level of linguistic analysis, even if on a subconscious level). This is not the case for AI-based generative tools. A recent study, for example, investigated the use of ChatGPT as an assistant to help answer questions traditionally asked on the final exam of an introductory linguistics class in a German university (Ronan & Schneider, 2023). The authors fed questions related to syntax, morphology, and phonetics/phonology into ChatGPT-4. The results were quite successful, particularly in phonetics/phonology (transcriptions), while others were more mixed. For instance, ChatGPT was quite successful in identifying parts of speech and morphological processes such as blending or suffixation, but not as successful in identifying the different morphemes of a word. The authors conclude that “ChatGPT reaches human-level competence and performance without any specific training for the task” (Ronan & Schneider, 2023, p. 12). Another recent study (Curry et al., 2024) focused on the possible use of ChatGPT-4 for three different types of corpus-based analyses for discourse studies: (i) semantic categorization, (ii) concordance analysis, and (iii) function-to-form analysis. The authors concluded that while ChatGPT’s performance is generally correct, it fails to provide relevant concordance lines, discriminate between direct and indirect questions, and even count the number of words in questions. According to the authors, “using ChatGPT for automated qualitative analysis [is] a perhaps problematic prospect, as using the tool (in its current state) is likely to undermine the rigor and integrity of a study” (Curry et al., 2024, p. 7), and “ChatGPT is presently unable to meet the standards of the human analyst” (Curry et al., 2024, p. 8).

This study is meant to contribute to the debate on the possible benefits of online translators and generative artificial intelligence tools such as ChatGPT for linguistic analysis by students. Our main research question is the following: can OTs and/or generative AI tools such as Chat-GPT help students perform linguistic analyses of complex NPs? This line of questioning emerged after witnessing our students’ difficulties in analyzing, and therefore understanding and/or translating, complex NPs, combined with their widespread use of these tools. As mentioned above, the focus is not on the use of the tool itself (students did not *manipulate* any online tools but were *provided* with MT outputs retrieved from an OT for the first part of the experiment, and ChatGPT was used without student involvement for the second part). Instead, the focus is on whether the information provided by the two types of tools can assist students in a linguistic analysis task that is known to be difficult. The experimental setting and the three tasks that the students were given are described below.

Methodology

The participants in the experiment were all enrolled at the University of Lille for the 2023–2024 academic year, and belonged to two distinct cohorts: (i) undergraduate students enrolled in their third and final year of an applied languages program (henceforth BA3 students, $n =$ from 74 to 101 depending on the task), and (ii) students enrolled in the second and final year of a master’s program in professional translation (henceforth MA2 students, $n = 20$). For all of them, English is their major second language, while they also study a third language (Spanish, Italian, German, Dutch, Chinese,

Swedish, etc.). For most of them, French is their native language (L1). In addition to studying two languages, BA3 students also attend economics, law, management, and communication classes, while the MA2 students are training to become professional translators or translation project managers. It is important to mention that in France, students enrolled in “applied languages” programs (*langues étrangères appliquées*) receive no training in linguistics; there are no classes dedicated specifically to linguistic analysis (morphology, syntax, semantics, pragmatics, phonology), although grammar classes provide some basics for the purposes of second language acquisition. As a result, these students are particularly vulnerable when it comes to complex sentences, where morphological and syntactic parsing are necessary for understanding. The conspicuousness of their difficulties in analyzing English complex NPs in translation classes triggered this experiment.

The experiments were conducted on two cohorts with different levels, as we wanted to (i) check whether the ability to analyze English complex NPs is correlated with students’ language/translation proficiency (the MA2 students benefitted from two extra years of training at the time of the study, with a strong focus on translation skills), indicating that complex NPs are indeed a challenge that needs to be addressed, and (ii) see whether information provided by OTs benefits students differently depending on their language level. If so, we can conclude that information related to the linguistic analysis of complex NPs (head identification in our case), as provided by OTs and ChatGPT, is relevant, and such tools can be used by students for linguistic analysis. The hypotheses before the experiment were that (i) press titles would be more difficult to analyze than sentences; (ii) MA2 students would analyze English complex NPs better than BA3 students, and consequently, (iii) the latter would benefit more from the information provided by OTs. If confirmed, this would mean that teaching students how to use MT outputs provided by OTs is relevant. In the case of limitations, it is important to determine whether another tool, ChatGPT, can provide the relevant information, specifically the identification of the head in a complex NP.

The experiment, which took place in the fall of 2023, consisted of a series of three tasks that students completed online but in class under the supervision of their teachers to control the conditions under which the tasks were completed (no tools were allowed; only MT outputs were provided in task 3). The three tasks were taken at one-week intervals, which explains the variation in the number of respondents for the BA3 group. This can be considered a limitation of the study (see conclusion), but our goal was not to monitor individual progress. Before starting each task, students were given a definition of a complex noun phrase and instructions on how to identify the head noun in the phrase. A series of examples was also provided to ensure they understood that the head was not always the noun in the final position (3). Full instructions are available in Appendix 1.

- (3) a. the Los Angeles student film festival
- b. the Los Angeles student short film festival
- c. the Los Angeles student short film festival in the summer of 2023
- d. Los Angeles’ international festival of student films in the summer of 2023

For the first task, students were shown a series of sentences in which a complex NP was shown in bold. They then had to select the answer among a series of words (nouns but also adjectives) that appeared in the complex NP (two examples are provided in (4)). A pop-up window immediately alerted them whether their answer was correct or not, and an explanation was provided in French, as shown in (5) for the examples (4a/b):

- (4) a. Why do right-wing adherents engage in more **animal exploitation** and meat consumption?
 - animal
 - exploitation

- b. The cowboy, **the enduring symbol of virility, affluence and rugged Americana**, is himself a cattle farmer.
- enduring
 - symbol
 - virility
 - affluence
 - rugged
 - Americana
- (5) a. On s'intéresse à l'EXPLOITATION des animaux, donc *exploitation* est le nom tête. (The focus is on the EXPLOITATION of animals, therefore *exploitation* is the head noun.)
- b. Le cowboy est considéré comme le SYMBOLE de différentes choses, c'est donc *symbol* le nom tête. (The cowboy is considered as the SYMBOL of different things, therefore *symbol* is the head noun.)

Some of the NPs were quite complex, but others consisted of a head noun with only one premodifier (*animal exploitation, meat consumption*).

For the second task, students were provided with the same exercise, but with titles taken from press articles. Our first hypothesis was that the analysis of complex NPs in press titles would be more difficult, as these can sometimes be complex and cryptic (see e.g., Moncomble, 2018, on the characteristics of so-called headlines). From our teaching experience, students find complex NPs harder to translate in titles, where they are often very complex for reasons of concision (cramming as much information as possible into as few words as possible) and thus harder to process. A morphological analysis with identification of the head and modifiers is even more crucial in such cases. The experimentation aims to confirm this hypothesis, so that our teaching can be fine-tuned. If confirmed, special attention needs to be paid to the translation of NPs in titles, and this is where students might need to resort to online tools to assist them in morphological analysis. To increase readability, the titles were presented both as text and as screenshots that showed them in context with their accompanying images. Two examples are provided in Figures 1a and 1b, with the complete list of items available in Appendix 2.

This time, students were not told whether they had selected the right answer or not, as the third task used exactly the same data (titles and pictures) accompanied with an MT output in French provided by DeepL, the well-known online translator used by most of our students (around 80%, compared to 30% for Google Translate, according to Loock et al., 2022).

In this third task, the aim was to check whether providing the MT output in French for each of the items in task 2 improved the results. The students were shown the same questions (press titles with a list of possible heads to choose from), but the MT output provided by DeepL was shown directly under the English title with the mention "Prétraduction par DeepL" (*pre-translation by DeepL*), as exemplified in (6). Note that, as mentioned above, the students did not manipulate the OT themselves but were provided with MT outputs, ensuring that all students had access to the same information.

- (6) a. **Nose-picking health workers** more likely to get Covid, study shows
Prétraduction par DeepL: Une étude montre que les travailleurs de la santé qui se piquent le nez sont plus susceptibles d'attraper le Covid
- nose-picking
 - health
 - workers

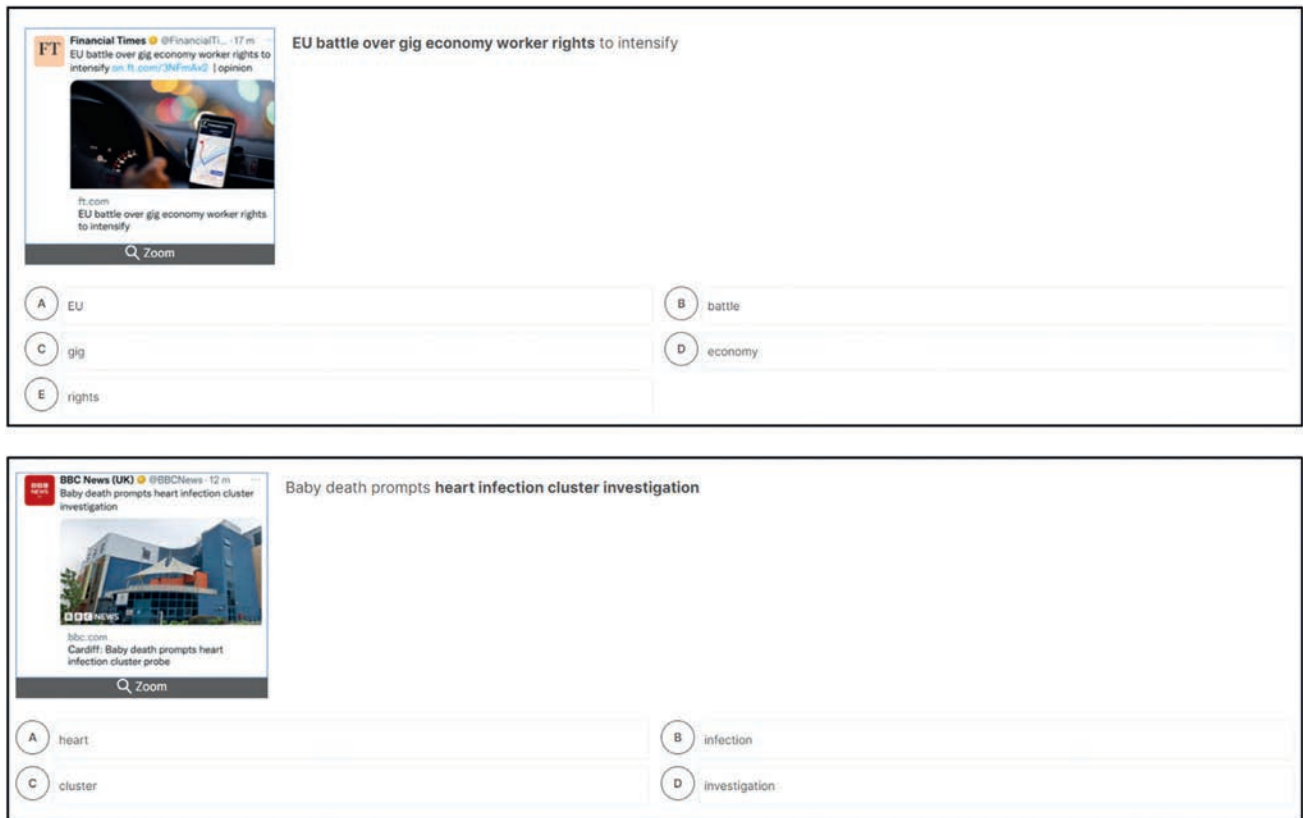


Figure 1a: Financial Times tweet: "EU battle over gig economy worker rights to intensify". The image shows a person's hands holding a smartphone displaying a news article. Below the image are five options: A EU, B battle, C gig, D economy, and E rights.

Figure 1b: BBC News (UK) tweet: "Baby death prompts heart infection cluster investigation". The image shows a modern building, likely a hospital. Below the image are four options: A heart, B infection, C cluster, and D investigation.

Figures 1a/b Two Examples of Items Presented to Students for Task 2.

b. Norfolk committee rejects **mental health bosses' account of report changes**

Prétraduction par DeepL: La commission du Norfolk rejette la version des patrons du secteur de la santé mentale concernant les changements apportés au rapport

- health
- bosses
- account
- report
- changes

All results were collected via the online tool www.socrative.com, which allows for the creation of quizzes that students can take on their own devices (laptops, tablets, smartphones). Results were fully anonymized, and students were not given any credit for completing the different tasks.

Results

General Results: Sentences vs. Titles

Figures 2a/b show the general results for the analysis of complex NPs in full sentences ($n = 15$) and press titles ($n = 23$), that is to say Tasks 1 and 2 for BA3 and MA2 students.

In line with our first our hypothesis, we notice that students from both groups are better at analyzing complex NPs in full sentences than in press titles, with an average successful identification rate (symbolized by X) of 72.16% (about 11 items out of 15) for BA3 students and 81.05% (more than 12 items out of 15) for MA2 students, as opposed to 46.92% (about 11 items out of 23) for BA3



Figures 2a/b Results (in %) of Correct Head Identification in Complex NPs, in Full Sentences (blue) and in Press Titles (Orange) Without Any Aid.

students and 74.13% (about 17 items out of 23) for MA2 students for press titles. The differences correspond to a drop of 25.2 and 6.9 percentage points respectively.

Our second hypothesis was confirmed as well, because MA2 students obtained better average results than BA3 students. This is true in spite of an outlier in the MA2 population with very low scores (33.33% for sentences and 34.78% for press titles). This difference is particularly pronounced for titles, with an average successful identification rate of 74.13% for MA2 students and 46.92% for BA3 students, representing a difference of almost 30 percentage points. Combined with the first result, these overall findings confirm the need to dedicate class time to the analysis of complex NPs in press titles, and suggest the potential need for the assistance of online tools.

A detailed analysis of the results reveals a lot of variation, with some examples correctly analyzed by most, if not all, students (7)—this was especially the case for 2-word examples like *animal exploitation*—and other examples that were clearly difficult to analyze (8).

- (7) a. “The Lion Diet” has been gaining traction on social media, where shirtless men proudly display **their meals of steak, grassfed-cow butter, and duck eggs**. (correctly identified by 85% of BA3 students and 84% of MA2 students)
- b. Avoiding **a commercial real estate crash** requires some imagination (correctly identified by 75% of BA3 students and 100% of MA2 students)
- (8) a. When I took my device into an Apple store, the technician kindly informed me that the problem I am having is **a repeated, known one with 13-in MacBook Pro laptops** and that Apple has a service programme that offers to fix these affected screens for free. (correctly identified by 27% of BA3 students and 58% of MA2 students)
- b. **Leicester maternity units review** urged after baby deaths (correctly identified by 27% of BA3 students and 45% of MA2 students)

Figures 3a–d show radar charts with results for each of the items (15 sentences, 23 titles) shown to the BA3 and MA2 students respectively, and reveal the existence of such variation.

Results with Access to Machine Translation Outputs

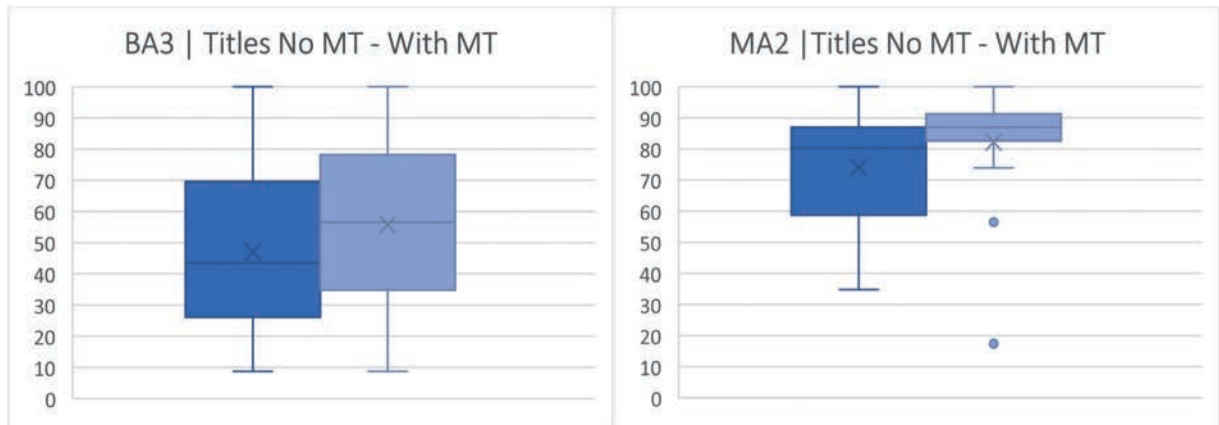
The third task was meant to check whether providing the MT output in French helped students analyze the complex NPs in the press titles presented to them. MT outputs were provided directly underneath



Figures 3a–d Detailed Results (in %) for Each Item of Correct Head Identification Complex NPs, in Full Sentences ($n = 15$) and in Press Titles ($n = 23$) Without Any Aid.

the title in English, and the 23 stimuli were similar to those in the second task. The results are provided in Figures 4a/b.

The range of results did not really change for BA3 students, with results for correct head identification ranging from 8.7% to 100% in both conditions. For MA2, success rates ranged from 34.78% to 100% without MT outputs, and from 17.39% to 100% with MT outputs. The lower score in the MT condition suggests that one student may not have understood the instructions. If we exclude this outlier, then the success rates for MA2 students with the help of MT outputs range from 56.52% to 100%, suggesting that such information narrows the range for the MA2 group but not for the BA3 group. Our third hypothesis is therefore not validated. Nevertheless, the presence of MT outputs led to a general



Figures 4a/b Results (in %) of Correct Head Identification in Complex NPs, in Press Titles Without (Dark Blue) and With (Light Blue) Machine Translation in French Provided.

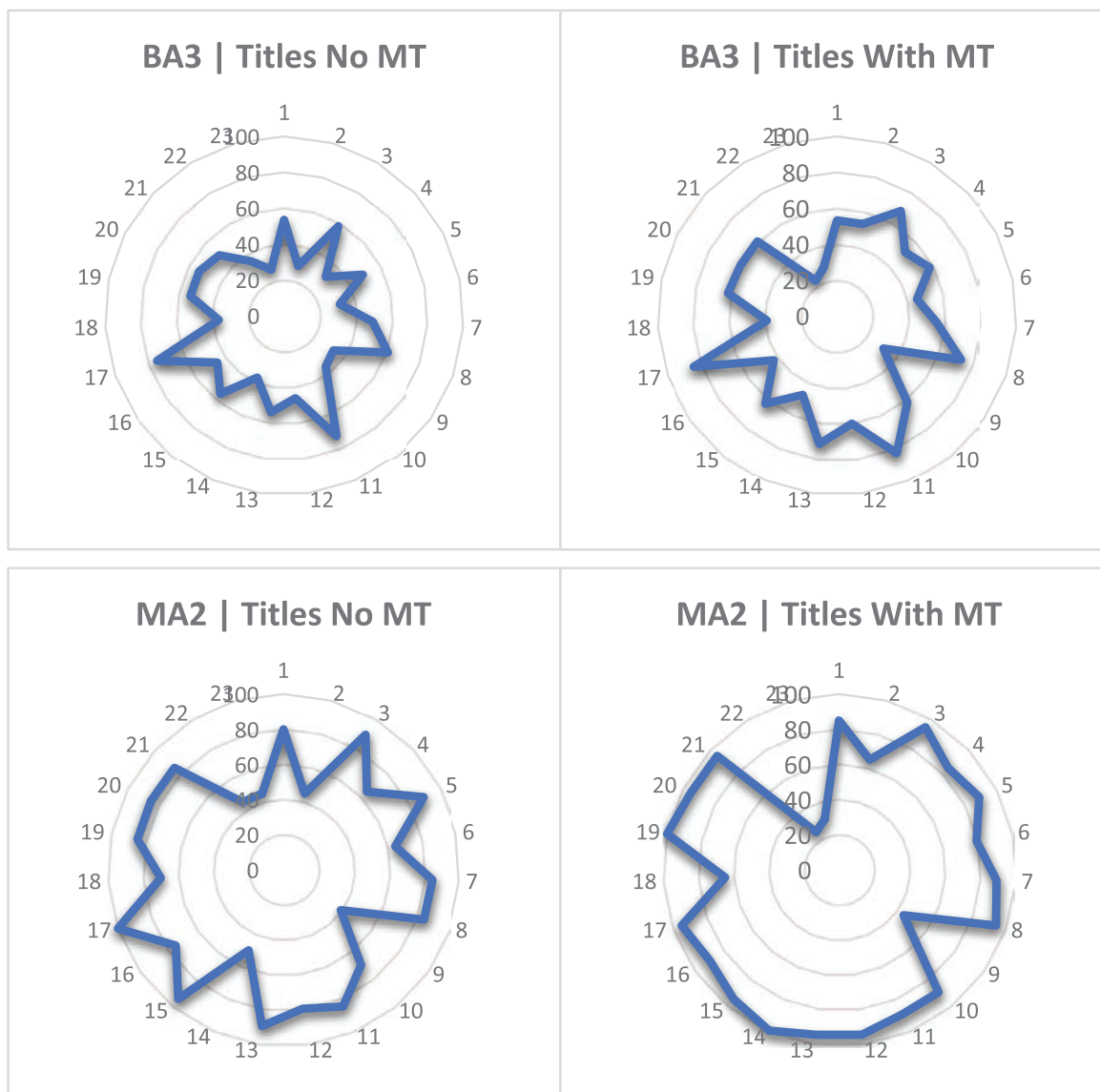
improvement for both cohorts, with averages (X) increasing from 46.92% to 55.75% for BA3 students, and from 74.13% to 82.17% for MA2 students.

What we can conclude is that, in general, having access to MT outputs provided by an OT improves students' analysis of complex NPs by enabling them to better identify the head noun, making the use of OTs relevant for this pre-translation task. However, if we zoom in on the results, we still see a lot of variation, with the provision of MT outputs enabling better analysis of some examples but worse analysis of others, contrary to what we might have expected. These detailed results are provided in Figures 5a–d.

Providing MT outputs appears to have led to markedly improved results in some cases. For example, we observed an improvement of 26 points in the results of BA3 students (from 36% to 62%) when it came to identifying the head in the title in (9) accompanied by its MT output in French. This represents a 72% increase. Example (10) saw an improvement of 25 points (from 28% to 53%), representing an 89% increase:

- (9) a. **Dog show pulled over ear crops** moved to new venue
 Prétraduction par DeepL: L'exposition canine est déplacée pour cause de cultures auriculaires
 – dog
 – show
 – ear
 – crops
- b. **EU battle over gig economy worker rights** to intensify
 Prétraduction par DeepL: La bataille de l'UE sur les droits des travailleurs de l'économie parallèle va s'intensifier
 – EU
 – battle
 – gig
 – economy
 – rights

For MA2 students, significant improvements were also observed, with an improvement of 50 points for example (10a) thanks to the use of MT, which saw the identification rate go from 50% to 100%,



Figures 5a–d Detailed Results (in %) for Each Item of Correct Head Identification Complex NPs, in Press Titles Without Any Aid and With Access to MT Output.

representing a 100% increase. Three other examples, one of which is provided in (10b), saw an increase of about 20 points:

- (10) a. **Donald Trump election probe court** files criminal charges
 Prétraduction par DeepL: Le tribunal chargé de l'enquête sur l'élection de Donald Trump porte des accusations criminelles
 – Donald Trump
 – election
 – probe
 – court
- b. **UK Brexit checks on fresh food from EU** delayed for fifth time, reports say
 Prétraduction par DeepL: Les contrôles britanniques sur les aliments frais en provenance de l'UE dans le cadre du Brexit sont retardés pour la cinquième fois, selon certaines sources

- UK
- Brexit
- checks
- food
- EU

Note that for BA3 students, examples (10a) and (10b) showed increases of 10 and 20 percentage points respectively in the correct identification of the head.

However, providing MT outputs might also be surprisingly counterproductive. This is the case for item 23, provided in (8b) above, where the presence of the MT output did not help students identify *review* as the head of the complex NP. When no MT output was provided, BA3 and MA2 students correctly identified the head at rates of 27% and 45%, and when the MT output was provided, their success rates changed to 28% and 30% respectively. It is interesting to note that whereas the output (*Les maternités de Leicester doivent être révisées après la mort de bébés, Maternity units in Leicester need to be reviewed after the death of babies*) had almost no effect on the BA3 students' scores, it seems to have particularly confused the MA2 students, whose scores dropped by 15 points. The MT output, while semantically quite correct—although the calque *révisées* for *reviewed* is not terminologically correct—does not facilitate a correct linguistic analysis of the NP because it suggests that the head noun is *maternités*. Another example where students seem to have been led astray by the MT output is example (11), where a 13-point drop was noticed in the results for BA3 students and a 20-point drop for MA2 students:

(11) **Safety fears over drop in police road traffic officers**

Prétraduction par DeepL : La baisse du nombre d'agents de la police chargés de la circulation routière suscite des craintes en matière de sécurité (*The decrease in the number of police officers assigned to road traffic duty causes fears related to safety*)

- safety
- fears
- drop
- police
- road
- traffic
- officers

As for example (8b), the MT output, which is semantically correct and provides students with access to the *meaning* of the sentence, does not facilitate a correct linguistic analysis.

Using ChatGPT to Perform the Linguistic Analysis

The results provided above showed that having access to MT outputs provided by an online translator can help students achieve a better understanding of complex NPs, but only to some extent. We are also aware that since OTs, by definition, provide translations of input text, students might use the translation without correctly analyzing the source segment—in this instance, the complex NPs. This goes against one of the aims of our curriculum, which is to improve students' understanding of source texts, especially when the source language is an L2 (in this case English). We therefore decided to check whether another type of online tool currently popular with students (see e.g., data from Hennessey, 2023), that is, new generative AI tools such as ChatGPT, could be used to help students perform a linguistic analysis of complex NPs. In the interest of ecological validity, which in this context means using the same tools as our students (e.g., the free version DeepL in the first part of our study), we utilized two different versions of ChatGPT: the freely available ChatGPT-3.5 and ChatGPT-4o, which

was launched in May 2024 and is available for free with limited access. As was done in Ronan & Schneider (2023), we tested two different types of prompts, one succinct (12) and one more elaborate (13), with an explanation of the task before asking ChatGPT to identify the head of the complex NPs in our two tasks (in sentences and in titles).

(12) In each of the following sentences, please identify the head in the compound in square brackets:

1. Why do [right-wing adherents] engage in more animal exploitation and meat consumption?
2. Why do right-wing adherents engage in more [animal exploitation] and meat consumption?

...

(13) I have a linguistics exercise for you. English compounds need to be analysed into different parts: the head and the modifier(s). For example, in the compound “student film festival”, it’s important to understand that the main noun, known as the head noun, is festival. It is this word that is the most important while the others are modifiers: it is a festival of student films.

Compounds can be more or less long:

the Los Angeles student film festival

the Los Angeles student short film festival

the Los Angeles student short film festival in the summer of 2023

Los Angeles’ international festival of student films in the summer of 2023

In all these cases, festival remains the leading noun. It’s not always the last word.

In the exercise below, I am asking you to identify the head of the compounds that appear between square brackets.

Here is an example 1: STIFF is [an international festival dedicated to student and debutant films].

=> The head is festival.

And now comes the exercise: for each of the following sentences, please identify the head in the compound in square brackets (the head should only be one word):

1. Why do [right-wing adherents] engage in more animal exploitation and meat consumption?
2. Why do right-wing adherents engage in more [animal exploitation] and meat consumption?

...

When using ChaGTP-3.5, prompt 1 yielded very poor results, with only 5 out of 15 heads correctly identified in sentences (33.33% success rate) and none in titles (see results provided in Table 1 with no spelling or case modifications on our part). Most of the time, ChatGPT-3.5 provided heads with multiple words.

Once an additional prompt—“The head is supposed to be only one word”—was added, results improved significantly (see Table 2), with 13 heads out of 15 correctly identified in sentences (86.67% success rate) and 20 out of 23 for titles (86.9% success rate)—18 if we consider the singular/plural distinction. Remaining problematic cases (marked with * in Table 2) were the identification of the heads in the NPs *the enduring symbol of virility, affluence and rugged Americana* and *a repeated, known one with 13-in*

Table 1 *Initial Results Provided by ChatGPT-3.5 with Simple Prompt*

right-wing adherents	Nose-picking health workers
animal exploitation	EU battle
meat consumption	Mystery sea urchin deaths
enduring symbol	UK Brexit checks
Meals	his student debt forgiveness plan
grassfed-cow butter	Pregnancy test damages claims
duck eggs	Mum of arson death children
Popularity	heart infection cluster investigation
meat industry's marketing campaigns	Warning of summer water shortages
meat industry	Dog show
Backlight	Monaghan school dance crash
repeated, known one	UK foreign aid cuts
Undercutting	The Alabama senator's military promotions blockade
Rates	Donald Trump election probe court
pre-pandemic world	US air conditioning capacity
	Rail ticket office mass closure consultation
	a commercial real estate crash
	mental health bosses' account of report changes
	French dark store ban
	Railway station's £150m revamp plans
	cancer warning signs in young people
	Safety fears over drop in police road traffic officers
	Leicester maternity units review

MacBook Pro laptops for sentences, and *nose-picking health workers*, *Donald Trump election probe court*, and *railway station's £150m revamp plans* for titles. Interestingly, for sentences, the heads that were misidentified were actually outside the NP in square brackets (*cowboy* and *problem*).

With the more elaborate prompt (13), results improved to 100% correct answers for both sentences and titles, which shows that ChatGPT-3.5 can provide a correct morphosyntactic analysis of complex NPs, provided an appropriate prompt.

As for ChatGPT-4o, the use of the simple prompt was sufficient for providing results that were 100% correct. The results were also presented in a more reader-friendly way, with each item repeated and followed by the identified head, as opposed to the simple list format used by ChatGPT-3.5:²

- (14) [Donald Trump election probe court] files criminal charges
Head: court

² After obtaining these results from ChatGPT-4o, which is freely available but only for a limited number of requests per day – users are then back on the 3.5 version –, we tested again the different prompts on ChatGPT-3.5 and obtained results that were very similar to those obtained in the first place. While not completely identical, most results with the simple prompt consisted in multi-word heads.

Table 2 Results Provided by ChatGPT-3.5 with Additional ‘One-word’ Prompt

Adherents	Healthworkers*
Exploitation	Battle
Consumption	Death
cowboy*	Checks
Meals	Plan
Butter	Claims
Eggs	Mum
Popularity	Investigation
Campaigns	Warning
Industry	Show
Backlight	Crash
problem*	Cuts
Undercutting	Blockade
Rates	Probe*
World	Capacity
	Consultation
	Crash
	Account
	Ban
	Revamp*
	Signs
	Fear
	Review

Discussion

The aim of our experiment was to determine whether recent language technology such as freely available online translators and generative AI-based tools could help students perform linguistic analyses. More precisely, our main research question was: can OTs such as DeepL and/or generative AI tools such as Chat-GPT help L1 French students perform linguistic analyses of complex NPs in English?

Our results provide mixed results. First, the availability of MT outputs produced by online translators helped our students to better identify the head in complex noun phrases, but not in all instances. In some cases, having access to the MT output of the title in their L1 had little to no effect, and in other cases it actually worsened the results, with more misidentifications. As for AI-based conversational tools such as ChatGPT, our experimentation shows that students can obtain the correct answers with a simple prompt while using version 4o, or with or an appropriate, elaborate prompt while using version 3.5. We predict that as generative AI technology advances, the need for users to write precise, elaborate prompts to achieve the desired results will decrease.

Concerning MT outputs provided by DeepL and the ability of such tools to help our students identify head nouns in complex NPs, it seems as though they are most useful when they translate not only the meaning but also the structure of the language. By and large, the automatic French translations that led to improvements were those that put the head noun first, aligning with the left-headedness that our students are accustomed to in their L1. Automatic translations that correctly translated the

meaning but did not place the head noun first were not as useful in helping our students carry out linguistic analysis, and sometimes resulted in lower scores. This is reminiscent of the “priming effect” described in particular by Carl & Schaeffer (2017), that is the influence exerted by the MT output which explains why students are better at identifying accuracy errors than fluency errors (Loock & Léchauguette 2021: 214). Here, such a priming effect seems to apply to the influence of the MT output on students’ analysis of the MT input, revealing a lack of morphosyntactic analysis. Such an effect calls for particular attention among teachers to the use of OTs by lower-level students, particularly when the tools are used for language learning. As shown by Alm & Watanabe (2022: 151–152), only advanced language learners are capable of a more critical use. The question of right- and left-headedness and how structure affects both comprehension and students’ ability to carry out linguistic analysis merits further exploration. If our goal is to develop students’ MT literacy (see definition above), caution needs to be taken and students need to be made aware of this limitation of online translators.

Concerning ChatGPT and its ability to complete the same linguistic analysis task that we asked of our students, our study showed that the results depended on the prompt and on the version used. While a simple prompt is sufficient for ChatGPT-4o, ChatGPT-3.5 requires a more elaborate prompt with a definition, examples, and clear instructions (the head should be one word only). In other words, ChatGPT might be a better tool than OTs for assisting students in identifying the head in a complex NP and, therefore, in understanding such NPs. Interestingly, the latest version of ChatGPT shows that it is not even necessary for students to be able to carry out the linguistic analysis themselves prior to turning to ChatGPT for help. This result complements Ronan & Schneider (2023)’s study, which found that ChatGPT-4 was capable of identifying parts of speech and morphological processes but had difficulties in identifying the different morphemes within a word. It turns out that the identification of the head in complex NPs, even in incomplete sentences such as titles, is a task that the tool can perform effectively. This is an interesting result at a time when both students and teachers are trying to define the different possible uses of generative AI tools (Alm & Ohasi, 2024).

Conclusion

After setting out to explore the extent to which DeepL and ChatGPT, two tools widely used among university students, could help students carry out a specific type of linguistic analysis particularly useful when translating from English to French, our results showed that the information provided by these tools can indeed help in some instances but cannot entirely replace human judgment. We therefore conclude that caution needs to be taken when introducing such tools in the classroom; trainers need to help students develop specific digital literacies related to the tools they use. Rather than forbidding the use of recent and cutting-edge technology in the language classroom, it seems more appropriate to discuss their strengths and shortcomings and to teach students how to make the most effective use of them.

As far as online translators are concerned, such an approach has taken the form of “MT literacy” development (Bowker & Buitrago-Ciro, 2019, see above), and has proved to be a fruitful approach (see Loock et al., 2022 for a similar approach with BA3 students or Cotelli Kureth & Summer, 2023). Our experimentation shows that OTs, while providing semantically correct translations, do not always help students correctly analyze the source text and thus do not always allow students to develop their language skills in the source language. A relevant component of MT literacy is therefore awareness of the limits of AI (Levin & Ollion, 2024), especially at a time when online translators are used for language acquisition (see references mentioned in the introduction).

A similar approach with ChatGPT-like tools, whose use is rapidly spreading among students, would be relevant. In particular, teaching students how to write appropriate prompts (prompt engineering) is a

skill that would help students use the tool more efficiently and effectively. This has already been shown when assigning translation tasks to ChatGPT. Depending on the prompt, the tool will provide more or less fine-tuned, context-appropriate translations (Yamada, 2023; Jiao et al., 2023). This means that a certain “ChatGPT proficiency” is necessary, meaning the ability to provide information regarding the translation task, the context domain, the existence of a style guide, or the intended audience. However, in order to write an effective prompt, the user needs to understand exactly what they are asking, meaning that the tool, as least for now, may only be as effective as the person using it.

There are some limitations to our study. First, as mentioned above, we evaluated the usefulness to our students of information provided by two types of digital tools, not the actual use of the tool. As far as OTs are concerned, this has been done in previous work and has shown that students do not always use the tools optimally, hence the development of specific training to develop students’ MT literacy (Loock et al., 2022). As far as ChatGPT is concerned, our experimentation was not carried out with the students; this is left open for future research. Also, we measured the progress of two cohorts (BA3 and MA2 levels) in general, but not of individuals. As the tasks were performed in class to monitor the use of tools by the students, the number of students varied according to weekly attendance and resulted in an uneven number of students for each of the three tasks in the BA3 group. This was not the case for MA2 students, however. Furthermore, we only tested the usefulness of the tool in one direction, from French to English, and for one specific difficulty, the identification of head nouns in complex noun phrases. Future studies should assess the usefulness of tools in helping students overcome other known difficulties when translating between these two languages, and in both directions.

Another limit to our study is that since the students completed the same task each week, the improvements could be partly due to experience and a better understanding of the task itself. Our experimental design therefore imperfectly distills the effects of MT outputs on students’ ability to perform linguistic analysis. Finally, for reasons of ecological validity (using the same tools as our students, who favor freely available online tools), the tools used in this study are the free version of DeepL and versions 3.5 and 4o of ChatGPT (freely available for the former, freely available with limited daily use for the latter), and are not the only tools available. Our experimentation should therefore be reproduced with other tools, such as Google Translate, ChatGPT-4, and Google Gemini. However, we believe that using the same tools as our students is important; a series of surveys in our department has shown that DeepL is preferred over Google Translate or other OTs, and that students generally use tools that are freely available.

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Appendix 1: Instructions given to students

Exercice 1

L'une des difficultés en traduction anglais-français est **les composés nominaux**, qui doivent être bien analysés pour être bien traduits. Par exemple dans le composé *student film festival*, il est important de comprendre que le nom principal, que l'on appelle le **nom tête** (*head noun* en anglais), est *festival*. C'est ce mot qui est le plus important et il doit donc être traduit en premier : il s'agit d'un festival du film étudiant.

Les composés peuvent s'allonger :

the Los Angeles student film festival

the Los Angeles student short film festival

the Los Angeles student short film festival in the summer of 2023

Los Angeles' international festival of student films in the summer of 2023

Dans tous ces cas, *festival* reste le nom tête. Ce n'est pas toujours le dernier mot.

Dans l'exercice ci-dessous, il vous est demandé d'identifier le nom tête du syntagme qui apparaît en gras dans la phrase.

Exemple 1 : STIFF is **an international festival dedicated to student and debutant films**.

=> Le nom tête du syntagme en gras est *festival*.

Exemple 2 : **The last day of the 9th Student International Film Festival** was marked by the award ceremony where the winners of the best documentary, fiction, and animated films were announced.

=> Le nom-tête du syntagme en gras est *day*.

Si tout est clair pour vous, vous pouvez cliquer sur le lien ci-dessous : 15 phrases vous attendent. À chaque fois un syntagme apparaît en gras. La question est simple : quel est le nom tête ? (vous verrez une liste de propositions, il n'y a qu'une seule bonne réponse). Durée approximative de l'exercice : entre 5 et 10 minutes.

Exercice 2

Le même exercice vous attend (relire les consignes du premier exercice ci-dessus peut vous rafraîchir la mémoire), mais cette fois, ce ne sont pas des phrases mais des titres d'articles de presse. Durée approximative de l'exercice : une dizaine de minutes.

Exercice 3

Le même exercice vous attend (relire les consignes du premier exercice ci-dessus peut vous rafraîchir la mémoire), mais cette fois, la traduction automatique obtenue via DeepL vous est fournie. Durée approximative de l'exercice : une dizaine de minutes.

Appendix 2 : List of items

Task 1

1. Why do **right-wing adherents** engage in more animal exploitation and meat consumption?
 - right-wing
 - adherents
2. Why do right-wing adherents engage in more **animal exploitation** and meat consumption?
 - animal
 - exploitation
3. Why do right-wing adherents engage in more animal exploitation and **meat consumption**?
 - meat
 - consumption
4. The cowboy, **the enduring symbol of virility, affluence and rugged Americana**, is himself a cattle farmer.
 - enduring
 - symbol
 - virility
 - affluence
 - rugged
 - Americana
5. “The Lion Diet” has been gaining traction on social media, where shirtless men proudly display their **meals of steak, grassfed-cow butter, and duck eggs**.
 - meals
 - steak
 - grassfed-cow
 - butter
 - duck
 - eggs
6. “The Lion Diet” has been gaining traction on social media, where shirtless men proudly display their meals of steak, **grassfed-cow butter**, and duck eggs.
 - grassfed-cow
 - cow
 - butter
7. “The Lion Diet” has been gaining traction on social media, where shirtless men proudly display their meals of steak, grassfed-cow butter, and **duck eggs**.
 - duck
 - eggs
8. The **popularity of beef consumption in the US** has been manufactured and created by cultural and market forces.
 - popularity
 - beef
 - consumption
 - US

9. The **meat industry's marketing campaigns** have long been funded by commodity checkoff programs that are paid into by farmers.
 - meat
 - industry
 - marketing
 - campaigns
10. The **meat industry's** marketing campaigns have long been funded by commodity checkoff programs that are paid into by farmers.
 - meat
 - industry
11. Recently **my three-year-old £1,300 Apple MacBook Pro's backlight** stopped working, rendering the screen completely black and unusable.
 - Apple
 - MacBook Pro
 - backlight
12. When I took my device into an Apple store, the technician kindly informed me that the problem I am having is **a repeated, known one with 13-in MacBook Pro laptops** and that Apple has a service programme that offers to fix these affected screens for free.
 - repeated
 - known
 - one
 - MacBook Pro
 - laptops
13. As well as the damage from the rubbish, Ghana's own clothing industry is badly hurt by **the undercutting of their prices by the secondhand market**.
 - undercutting
 - prices
 - secondhand
 - market
14. Our economies continue to suffer **slow rates of productivity growth**.
 - slow
 - rates
 - productivity
 - growth
15. Many of the perks that are now being cut were designed for **a pre-pandemic world of long weeks in full offices**.
 - pre-pandemic
 - world
 - weeks
 - offices

Tasks 2 and 3 (2 without MT output, 3 with MT output) – note that a screenshot was systematically provided (see Figures 1a/b)

1. **Nose-picking health workers** more likely to get Covid, study shows
Prétraduction par DeepL: Une étude montre que les travailleurs de la santé qui se piquent le nez sont plus susceptibles d’attraper le Covid
 - nose-picking
 - health
 - workers
2. **EU battle over gig economy worker rights** to intensify
Prétraduction par DeepL: La bataille de l’UE sur les droits des travailleurs de l’économie parallèle va s’intensifier
 - EU
 - battle
 - gig
 - economy
 - rights
3. **Mystery sea urchin deaths** threaten Red Sea coral reefs
Prétraduction par DeepL: La mort mystérieuse d’oursins menace les récifs coralliens de la mer Rouge
 - mystery
 - sea
 - urchin
 - deaths
4. **UK Brexit checks on fresh food from EU** delayed for fifth time, reports say
Prétraduction par DeepL: Les contrôles britanniques sur les aliments frais en provenance de l’UE dans le cadre du Brexit sont retardés pour la cinquième fois, selon certaines sources
 - UK
 - Brexit
 - checks
 - food
 - EU
5. US President Joe Biden says **his student debt forgiveness plan** “would have been good for the US economy”
Prétraduction par DeepL: Le président américain Joe Biden estime que son plan d’annulation de la dette étudiante “aurait été bénéfique pour l’économie américaine”
 - student
 - debt
 - forgiveness
 - plan
6. **Pregnancy test damages claims** thrown out by judge
Prétraduction par DeepL: Un juge rejette les demandes de dommages-intérêts relatives à un test de grossesse
 - pregnancy
 - test

- damages
 - claims
7. Michelle Pearson: **Mum of arson death children dies**
Prétraduction par DeepL: Michelle Pearson : La mère des enfants décédés dans un incendie criminel meurt
- mum
 - arson
 - death
 - children
8. Baby death prompts **heart infection cluster investigation**
Prétraduction par DeepL: Le décès d'un bébé donne lieu à une enquête sur un groupe d'infections cardiaques
- heart
 - infection
 - cluster
 - investigation
9. **Warning of summer water shortages** after dry winter
Prétraduction par DeepL: Avertissement de pénurie d'eau en été après un hiver sec
- warning
 - summer
 - water
 - shortages
10. **Dog show pulled over ear crops** moved to new venue
Prétraduction par DeepL: L'exposition canine est déplacée pour cause de cultures auriculaires
- dog
 - show
 - ear
 - crops
11. Funerals for victims of **Monaghan school dance crash**
Prétraduction par DeepL: Funérailles des victimes de l'accident de danse de l'école de Monaghan
- Monaghan
 - school
 - dance
 - crash
12. Thousands will die after **UK foreign aid cuts**, says report
Prétraduction par DeepL: Selon un rapport, des milliers de personnes mourront après la réduction de l'aide étrangère du Royaume-Uni
- UK
 - foreign
 - aid
 - cuts

13. **The Alabama senator's military promotions blockade** is already a crisis
Prétraduction par DeepL: Le blocus des promotions militaires du sénateur de l'Alabama est déjà une crise
 - Alabama
 - senator
 - military
 - promotions
 - blockade

14. **Donald Trump election probe court** files criminal charges
Prétraduction par DeepL: Le tribunal chargé de l'enquête sur l'élection de Donald Trump porte des accusations criminelles
 - Donald Trump
 - election
 - probe
 - court

15. **Scorching heat strains US air conditioning capacity**
Prétraduction par DeepL: La chaleur torride met à rude épreuve la capacité de climatisation des États-Unis
 - US
 - air
 - conditioning
 - capacity

16. **Rail ticket office mass closure consultation** extended
Prétraduction par DeepL: Prolongation de la consultation sur la fermeture massive des guichets ferroviaires
 - rail
 - ticket
 - office
 - mass
 - closure
 - consultation

17. **Avoiding a commercial real estate crash** requires some imagination
Prétraduction par DeepL: Il faut faire preuve d'imagination pour éviter un krach de l'immobilier commercial
 - commercial
 - real
 - estate
 - crash

18. **Norfolk committee rejects mental health bosses' account of report changes**
Prétraduction par DeepL: La commission du Norfolk rejette la version des patrons du secteur de la santé mentale concernant les changements apportés au rapport
 - health
 - bosses
 - account
 - report
 - changes

19. **Fast grocery firms doomed by French dark store ban**
Prétraduction par DeepL: Les entreprises d'alimentation rapide condamnées par l'interdiction des magasins noirs en France
French
 - dark
 - store
 - ban

20. **Railway station's £150m revamp plans revealed**
Prétraduction par DeepL: Les plans de rénovation de la gare ferroviaire, d'un coût de 150 millions de livres sterling, sont dévoilés
 - railway
 - station
 - £150m
 - revamp
 - plans

21. **GPs ignoring cancer warning signs in young people, says UK oncology expert**
Prétraduction par DeepL: Les médecins généralistes ignorent les signes d'alerte du cancer chez les jeunes, selon un expert britannique en oncologie
 - cancer
 - warning
 - signs
 - people

22. **Safety fears over drop in police road traffic officers**
Prétraduction par DeepL: La baisse du nombre d'agents de la police chargés de la circulation routière suscite des craintes en matière de sécurité
 - safety
 - fears
 - drop
 - police
 - road
 - traffic
 - officers

23. **Leicester maternity units review urged after baby deaths**
Prétraduction DeepL: Les maternités de Leicester doivent être révisées après la mort de bébés Leicester
 - maternity
 - units
 - review
 - baby
 - deaths