

A Structured Approach to Form-Focused Instruction for Reading Comprehension in EAP: The Case of Complex Noun Phrases

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Complex noun phrases (CNP) are a major vehicle of academic written discourse. However, despite the view that they pose significant challenges to English language learners, they are rarely taught in college-based English for Academic Purposes (EAP) programs, especially for the purposes of improving reading comprehension. This article presents a teaching intervention that integrates explanations on and practice with the structure and use of these types of CNP in an EAP program at a large Canadian college. This specially designed teaching intervention was integrated within a standard curriculum in a non-credit preparatory EAP reading course. Drawing on the research that has identified elements of syntactic parsing ability instrumental in the successful processing and interpretation of CNP, this article describes the reading strategies taught in this intervention and reports on student feedback. It concludes with a discussion of potential improvements to the learning tasks.

Les groupes nominaux complexes (GNC) sont une composante importante du discours académique écrit. Cependant, malgré le fait qu'ils constituent un défi de taille pour les apprenants de l'anglais, ils sont rarement abordés dans les programmes postsecondaires d'anglais sur objectifs académiques (AOA), particulièrement en vue d'améliorer la compréhension de l'écrit. Cet article illustre une intervention pédagogique qui intègre les explications et la pratique de cette structure, ainsi que l'utilisation de ces types de GNC dans un programme d'AOA d'une large institution postsecondaire canadienne. Cette intervention pédagogique spécialement conçue a été intégrée dans le programme d'un cours préparatoire et non crédité de lecture en AOA. En nous basant sur les études qui ont identifié les éléments de la capacité d'analyse syntaxique qui sont essentiels au traitement et à l'interprétation des GNC avec succès, cet article décrit les stratégies de lecture enseignées dans cette intervention et rapporte les rétroactions des apprenants. L'article conclut avec une discussion des améliorations possibles sur les tâches d'apprentissage.

Keywords: complex noun phrases, English for Academic Purposes, form-focused instruction, reading comprehension, syntax

One of the challenges that English language learners (ELLs) experience with academic reading is the acquisition of complex lexicogrammar (Schleppegrell, 2004; Zwiers, 2006). This paper addresses one such feature of academic language: complex noun phrases (henceforth CNP), defined as phrases where a noun is the head modified by preceding or following lexical or phrasal items. CNP are considered a major vehicle of academic written discourse (Fang et al., 2006; Halliday, 2004; Massoud & Kuipers, 2008; Schleppegrell, 2004; Zwiers, 2008) and seem to present a unique set of structural challenges in ELLs' reading comprehension. For example, syntactic interference from an L1 may be a factor in the processing of CNP, specifically for Mandarin-speaking (Chan, 2004) and Spanish-speaking learners (Carrio Pastor, 2008; Herczeg & Himelfarb, 2007). In my own college- and university-based EAP classes, I have observed the students' struggle with parsing and interpreting CNP in academic texts. For example, they are often unable to identify the head noun, which is the noun that carries the main lexical load of the phrase. Also, they may not be able to connect a head noun with the appropriate verb, or correctly interpret the predicative relationship between the head noun and its modifiers (e.g., there may be semantic ambiguity in seemingly simple phrases like *iron tools*—are these tools made out of iron, or tools meant to work on iron?). This often leads to misunderstanding factual information, especially when complex syntax is coupled with complex academic vocabulary in CNP. According to Wisniewski (1997) and Gagné and Shoben (1997), these are critical skills in interpreting complex nominals. The teaching approach described in this article focuses on building students' strategic awareness of these CNP parsing and interpreting skills in the context of an EAP reading course.

While a number of studies have advocated the teaching of CNP as genre features for EAP writing purposes (Hu & Perez, 2022; Lee, 2018; Liardét, 2016; Pan et al., 2016; Parkinson, 2015; Ward, 2007), only two have focused on the effect of instruction on CNP for reading purposes: Lee (2018) and Priven (2020). The latter found a mildly positive effect of explicit instruction of one type of CNP in an EAP class. The present article reports on action research I conducted in my EAP class to address the challenges that EAP students face with parsing and interpreting CNP. The research question was to investigate the effects of explicit instruction of several strategies encompassing a wider variety of CNP for reading comprehension purposes. This article also presents the teaching approach in detail and briefly reports on ways to improve it based on classroom observations and exit interviews with the students.

Background: Syntactic Types of CNP

According to Berlage (2014), the complexity of the noun phrase in English lies in its length and internal structure: the multitude of syntactic relationships between the head noun and its modifiers, and the resulting semantics. Biber and Gray (2016) add that the complexity also stems from lexical density: the number of content words per phrase and their semantic relationships. Table 1 presents the types of CNP used in this study and the respective abbreviations that will be used in this article. These abbreviations are used only for the purposes of identifying various types of CNP, not for pedagogical purposes. Of note is the fact that CNP in English can be both pre-modified, in which case the head of the noun phrase is the rightmost noun in the phrase, and post-modified, in which case the head is the leftmost noun. As Table 1

demonstrates, while the NMod CNP are not particularly syntactically complex, they present a significant processing challenge based on the predicative relations between the head and its modifiers. Note that the grammatical terminology used in the table is consistent with standard pedagogical grammar employed in English language teaching.

Table 1

Types of CNP Used in This Study, with Examples (adapted from Biber & Gray, 2016)

Pre-modified	Post-modified														
Noun – NMod <i>English noun phrase complexity</i> <i>Examples of predicative relationships between head and modifier in NMod</i>	Prepositional phrase – PPMo <i>complexity of the noun phrase in English</i>														
<table border="1"> <thead> <tr> <th>NN sequence</th> <th>Meaning paraphrase*</th> </tr> </thead> <tbody> <tr> <td><i>iron tools, milk diet</i></td> <td>an N2 that is composed of N1</td> </tr> <tr> <td><i>cannon ball, farm house</i></td> <td>an N2 used for/with an N1</td> </tr> <tr> <td><i>sea captain, rescue dog</i></td> <td>an N2 specializing in N1</td> </tr> <tr> <td><i>government official, union member</i></td> <td>a person (N2) belonging to the institution identified by N1</td> </tr> <tr> <td><i>family history, psychology lecture</i></td> <td>a text (N2) about the topic identified in N1</td> </tr> <tr> <td><i>investigation department, safety officials</i></td> <td>a person or institution (N2) that regulates or administers N1</td> </tr> </tbody> </table>	NN sequence	Meaning paraphrase*	<i>iron tools, milk diet</i>	an N2 that is composed of N1	<i>cannon ball, farm house</i>	an N2 used for/with an N1	<i>sea captain, rescue dog</i>	an N2 specializing in N1	<i>government official, union member</i>	a person (N2) belonging to the institution identified by N1	<i>family history, psychology lecture</i>	a text (N2) about the topic identified in N1	<i>investigation department, safety officials</i>	a person or institution (N2) that regulates or administers N1	Adjective clause and reduced adjective clause/participial phrase - CLMod <i>levels that have not been seen for millions of years;</i> <i>changes preserved in sedimentary rocks</i> Infinitive phrase – InfMod <i>suggestions to address the obesity epidemic [included]...</i>
NN sequence	Meaning paraphrase*														
<i>iron tools, milk diet</i>	an N2 that is composed of N1														
<i>cannon ball, farm house</i>	an N2 used for/with an N1														
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*N1 and N2 refer to noun order in a pre-modified sequence

The choice of CNP selected for this intervention is supported by Biber et al. (2011), who suggest that in the developmental sequence of CNP acquisition, CLMod (for example, reduced adjective clauses) occur fifth-last, NMod fourth-last, and PPMo either third-last or last.

Method

Participants

The teaching intervention was implemented as part of the regular course curriculum in a bridging-level EAP reading course at an Ontario community college. This is the terminal level in the non-credit EAP program before admission to a program of study. The participants were international students and permanent residents of Canada, with the average range of English language proficiency in the four skills equivalent to IELTS Academic 5.5–6.0 (CEFR B2). This level of language proficiency was ascertained based on the placement test that all incoming EAP students had to write, which is referenced to the IELTS levels, and the fact that IELTS 6.0 to 6.5 is the common admission threshold to postsecondary programs in Ontario colleges. There were 24 students in the course, with the demographics shown in Table 2.

The participants in this study thus represent student demographics frequently found in Canadian postsecondary EAP programs, which makes this pedagogical approach applicable to a wider context of EAP programs in Canada.

Table 2

Participants' Demographic Information

First language	Arabic – 12
	Mandarin Chinese – 4
	Turkish – 2
	Russian – 2
	French – 2
	Spanish – 1
	Nepali – 1
Age range	18 – 55
Highest level of education completed in home country	High school – 3
	College diploma – 2
	Bachelor's degree – 14
	Master's degree – 4
	PhD – 1
Range of professional background	Law, medicine, accounting, management, business, finance, office administration, computer engineering, entrepreneurship
Residency in current EAP program	4 months – 6
	8 months – 14
	12 months – 4

Data Collection

The data were collected through a teaching intervention I delivered in the class described above. Qualitative data were collected first throughout the intervention based on my observations of students' reactions to the instruction and the questions asked in breakout rooms, and their performance on the CNP parsing and interpreting tasks. The second phase of data collection consisted of semi-structured interviews with four of the students and a think-aloud protocol based on CNP parsing tasks. The purpose of the think-aloud protocol was to gauge the uptake of the CNP interpretation strategies. The interviews took place after the final grades were submitted.

Teaching Intervention

The teaching intervention consisted of four two-hour modules devoted to parsing and interpreting various types of CNP. Each module contained the following:

- 1) Academic texts from *Critical Reading: English for Academic Purposes* (Pattison, 2015)—articles from peer-reviewed journals, slightly abridged and preserving most of the original language.
- 2) PowerPoint slides with explanations of how to parse and interpret various CNP types.
- 3) Practice exercises and self-paced end-of-module quizzes on the learning management system.

Most of the examples presented in the modules came from the academic readings in *Critical Reading*, the required textbook for this particular reading course.

I delivered the modules as part of the regular seven-week course on Zoom. The modules were also recorded and made available to the students for the duration of the course, as were the slides. Each module was devoted to specific types of CNP, as shown in Table 3.

Table 3

Schedule of Teaching Modules

Module 1	Week 3	prepositional phrase–modified CNP (PPMod) and infinitive phrase–modified CNP (InfMod)
Module 2	Week 4	adjective clause– and reduced adjective clause–modified CNP (CLMod)
Module 3	Week 5	noun-modified CNP (NMod)
Module 4	Week 6	review of all CNP types

CNP are typically not covered in EAP textbooks. In my over 20 years’ experience as a postsecondary EAP practitioner, the only pedagogical treatment of CNP I have come across was in Marshall (2017), where the NMod type of CNP was explained for writing purposes. In my experience, CNP are also not part of grammar topics in EAP curricula, where the focus in higher levels tends to be on complex sentences and discursive features.

In explaining my teaching approach to the students, I used the “X-ray machine” metaphor: the idea was to help them uncover the underlying structure of CNP (“skeleton”) underneath layers of complex vocabulary (“soft tissue”). The X-ray machine approach thus references one of the fundamental and often neglected (Chen et al., 2018) reading subskills: syntactic parsing. Grabe and Stoller (2002) posit syntactic parsing as one of the lower-level reading processes that goes hand-in-hand with lexical access. These allow readers to decode written text in real time, process information as it appears in words and sentences, and make initial sense of it. In explaining my approach to the students, I pointed out that being able to parse a CNP can help with potential vocabulary challenges: even if the relationship between the head and the modifiers may not be clear, they can tell what the phrase is about by singling out the head noun.

My X-ray machine approach was in part informed by Pritchard and Nasr’s (2004) unchaining nominal compounds approach, which was first presented in a form-focused intervention in an EAP for Engineering course at an Egyptian university. The teaching techniques I selected were identifying headwords and paraphrasing CNP using prepositional phrases and adjective clauses. Another strategy that informed my X-ray machine approach was the “Who does what / What does what” sentence-simplification strategy described by Paul Nation (2009). These strategies will be elaborated on further in this section. Table 4 summarizes the X-ray machine approach.

The CNP modules with explanation and practice were presented as pre-reading exercises. This approach aimed to promote the students’ noticing the target structure during reading because they were primed for it at the pre-reading stage. According to Schmidt (1990) and Sharwood Smith (1993), such priming causes more noticing during reading, while the reading material in turn supports acquisition of the syntactic structure.

Table 4

Summary of the X-Ray Machine Approach

Teaching approach	Strategies	Types of CNP
Unchaining nominal compounds	Identifying head nouns and their placement vis-à-vis modifiers	NMod, PPMoD, InfMod, CLMod
	Paraphrasing pre-modified CNP through backformation as PP	NMod
	Paraphrasing pre-modified CNP as finite clauses	NMod
Who does what/what does what	Reducing sentences with CNP to subject-verb dyads; connecting a head noun with its verb outside the CNP	CLMod

Practice exercises integrated within each module had students practice the strategies taught using further examples from *Critical Reading*. They were all multiple-choice questions and featured six to ten questions asking the students to find head nouns, choose the best paraphrase of a CNP, or answer a comprehension question based on a paraphrase of a CNP, as explained below.

Teaching Approach

The instructional approach used in the CNP intervention was a combination of deductive and inductive approaches to teaching grammar (Thornbury, 2000). For example, when introducing the rule on head noun placement for the first time in relation to the PPMoD type (Figure 2 below), the rule was explained directly and then some examples provided. When the same rule was introduced with the NMod type in Module 3, the students were first given a few NMod noun phrases and asked to identify the head nouns and their location, and then presented with the actual rule (Figure 1). Because they were already familiar with the terminology through Module 1, Modules 2 and 3 generally featured a more inductive presentation.

Since the intervention was done synchronously through Zoom, emphasis was put on collaborative practice. When the students had to work on practice exercises, they were always placed in breakout rooms, where they were going through the questions in the exercises one by one, verifying their solutions and often helping each other apply the rules in identifying the head nouns or choosing an appropriate paraphrase. I moved between breakout rooms and provided guidance when the students were in doubt. Visiting breakout rooms provided important insight into whether the students understood the rules, as well as what needed correction or adjustment in following debriefing sessions.

Head Noun Identification

Head noun identification was one of the fundamental strategies I presented in interpreting all types of CNP. Figure 1 is a screenshot of a slide devoted to the NMod type of CNP.

Figure 1

Screenshot from the Slides on NMod Type of CNP

Structure of NMod Noun Phrase

modifier *fossil* *fuel* head

NMod phrase	MODIFIER	HEAD
ground current	ground	current
government authorities	government	authorities
heart palpitations	heart	palpitations

! Remember: Head noun is on the right in NMod

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Figure 2

Screenshot from the Slides on PPMoD Type of CNP

PPMod phrase

the efficacy *of prevention and treatment efforts*

head noun prepositional phrase (PP)*

- PP = preposition *[of]* + noun phrase *[prevention and treatment efforts]*
- PPMoD

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Special emphasis was given to the placement of the head noun in a CNP: in the case of the NMod type, it is always the rightmost noun, while in the case of the PPMoD type, it is the leftmost one, as indicated in Figure 2. Placement of the head noun and the awareness that it is the head noun that determines the overall meaning of the CNP were the fundamental parsing skills taught and evaluated in practice exercises and module quizzes.

Paraphrasing through Backformation

Backforming pre-modified phrases into prepositional phrases proved another useful teaching technique, as was paraphrasing pre-modified CNP through converting nominalizations (nouns formed out of verbs) back into finite clauses containing the same verbs, as shown in Figure 3.

For example, as can be seen in Figure 3, the pre-modified CNP *sleep disturbance* is paraphrased not only as a genitive prepositional phrase, *disturbance of sleep*, but also as a clause, *when sleep is disturbed*. Other-than-genitive prepositional constructions were also used as potential paraphrases, illustrated in Figure 4. Ultimately, I posed a semantic problem that may arise during a CNP backforming exercise: what preposition should be used in interpreting a NMod CNP? In other words, would the best paraphrase of *health effects* be *effects OF health*, *effects FOR health*, or *effects FROM health*? Similarly, would the best paraphrase for *noise exposure* be *exposure OF noise*, *exposure TO noise*, or *exposure FROM noise*? Choosing a particular preposition would imply a distinctive way of disambiguating a pre-modified CNP by attributing a specific meaning to the phrase. How would one choose the best one given the overall reading context? The solution I proposed is based on several models describing how native speakers of English process CNP. These models often employ the metaphor of *competing interpretations*. Wisniewski (1997) and Gagné and Shoben (1997) propose a multi-stage processing mechanism that is engaged by native speakers of English when processing a CNP, which involves assessing frequency of associations between the head and the modifier, calculating coherence of potential interpretations of the relationships between them, and finally assessing the fit of the resulting interpretation within the overall propositional context. In the case of interpreting *noise exposure*, for example, I encouraged the students to visualize the relationship between *exposure* or *being exposed* and *noise* to determine which of the three potential prepositional interpretations in the context of an article on the effects of industrial wind turbines on our health would be most cogent.

Reduction to Subject + Verb Dyad

Another explanatory technique I presented as part of my X-ray machine approach was a version of Nation's (2009) "Who does what / What does what" reading strategy. According to Nation, a learner should always keep that question in mind when trying to process longer, multi-phrase clauses. This effectively reduces sentences to their subject-verb skeleton and helps readers to somewhat lighten the processing load that may be exacerbated by keeping multiple nouns in their short-term memory before deciding which of them is attached to the verb/predicate (Warren & Gibson, 2005). In my teaching intervention, this approach proved particularly fruitful in deconstructing the CLMod type of CNP. Thus, the pedagogical thrust in relation to this type of CNP was to demonstrate (1) how to find the head noun, and (2) what verb the CLMod CNP attaches to, no matter how far it may be from the head noun.

While I demonstrated this approach using CNP with finite adjective clauses, I put special emphasis on identifying the subject + verb dyad in reduced adjective clauses, as shown in Figure 5. As I have seen in my own teaching in EAP programs, learners tend to parse the first verb that they see after the subject as the verb that corresponds to that subject in the main clause, that is, S [students] + V [accessing] in the screenshot above. This observation is supported by Juffs (1998): ELLs can resolve the semantic

Figure 3

Screenshot from the Slides on Interpreting NMod Type of CNP

NOUNS FROM VERBS = NOMINALIZATION

- disturbance (n.) ← disturb (v.)
- palpitation (n.) ← palpitate (v.)
- spacing (n.) ← space (v.)

NOUN PHRASE AND ITS LOCATION (line #)	HEAD NOUN	RELATIONS BETWEEN HEAD AND MODIFIER	PARAPHRASE
sleep disturbance (8, 106)	disturbance	N2 of N1	disturbance of sleep, or when sleep is disturbed
heart palpitation (109)	palpitation	N2 of N1	palpitation of heart, or when heart palpitates
wind turbine spacing (32-33)	spacing	N2 of N1	spacing of wind turbines; how far turbines are spaced from one another

Figure 4

Screenshot from the Slides on Interpreting Predicative Relationships in the NMod Type

Understanding the meaning of the NMod noun phrase – other prepositions

NOUN PHRASE AND ITS LOCATION (line #)	HEAD NOUN	RELATIONS BETWEEN HEAD AND MODIFIER	PARAPHRASE
health effects (of IWTs) (146)	effect	N2 on N1	effects of IWT on/for health
ground current (13-14)	current	N2 in N1	current in the ground
relocation assistance (97)	assistance	N2 for N1	assistance for relocation
health outcomes (182)	outcomes	N2 for N1	outcomes for health
noise exposure (184)	exposure	N2 to N1	exposure to noise

Figure 5

Screenshot from the Slides on the CLMod Type of CNP

Spotting a reduced adjective clause

- Line 6-14

Mazer, Murphy and Simonds (2009) have found that **students accessing the Facebook website of a teacher with self-disclosure reported** higher levels of teacher credibility, but the research findings on the educational potential of Facebook are limited and are mainly concerned with the conditions of use and users' characteristics.

- Noun followed by -ing verb (**students accessing**)
- This -ing verb is not the head noun's verb!
- N + V = **students reported**

facebook FOR TEACHERS

ambiguity caused by participial forms in reduced adjective clauses less often than their native speaker counterparts. To prevent them from this garden path analysis, I raised awareness about CNP containing reduced adjective clauses, where the verb may be in the *-ing* or the *-ed* form but where the finite verb governed by the subject may be far removed from it. The suggestion to the students was thus to analyze a participle as modifying the head noun they identified as part of the CNP, and to look for the main finite verb beyond the target CNP.

Findings

The findings presented in this section are based on my own classroom observations, the students' perceptions of the interventions solicited in the interviews, and the think-aloud protocol.

Classroom Observations

Throughout the intervention, I observed the students' reactions and interactions in working on the CNP parsing and paraphrasing tasks in breakout rooms. Overall, the strategy of parsing CNP into head nouns and modifiers was fairly straightforward. Once the students were presented with the different types of CNP and the location of head noun in each type, there were hardly any questions or concerns. The identification of subject + verb dyads in the CLMod type of CNP also turned out to be quite straightforward, almost a checklist item, as one student pointed out. However, paraphrasing the NMod type of CNP was more challenging. Most of the questions in breakout rooms concerned paraphrasing strategies: how to

choose the best paraphrase and how to verify it against what it might mean in the real world. In this respect, my initial hypothesis that more mature students, especially those with some experience in science, engineering, and technology, may do better than younger students with only high-school education, was disproved: everyone was struggling with this task. In fact, my observation was that students with higher metalinguistic ability struggled less with the paraphrasing tasks. This finding is in line with research that posits syntactic ability as a more reliable predictor of reading comprehension than advanced vocabulary knowledge (Jeon & Yamashita, 2014).

Interviews

Overall Usefulness of the Intervention

In general, all four interview participants reported a positive experience with the subject matter of the intervention. When asked to comment on what they found useful in the CNP modules, all of the participants mentioned locating the head noun within a CNP. One participant said that finding a head noun is a good start in figuring out the meaning of the sentences, “because it forces you to find the noun that the sentence is about.” She further mentioned that she was able to apply this newly acquired knowledge on identifying the head noun to interpret unclear CNP in a different course: “when the teacher in Listening and Speaking course was trying to explain the meaning of the term ‘thought group.’ Before the [intervention], I thought that this expression was about ‘thought.’ Now I understand that it is about a ‘group’—a group of thoughts.” Another student suggested that identifying the head noun was useful when the meaning of the head noun was not clear, and she applies this technique now to every sentence in her academic readings. In addition, two participants reported that finding the subject + verb dyad was a useful task, particularly in relation to processing the CLMod type of CNP. They felt that stripping longer sentence down to their subject + verb skeleton helped simplify longer sentences and thus get to their core meaning.

Criticism of the Intervention and Teaching Materials

All of the respondents noted that the intervention was quite intensive. They felt that seven weeks was too short to deliver the intervention. Three of the participants mentioned that they wished the instruction on CNP were spread over all levels of the EAP program, not just the highest level. They felt they would have been able to handle simpler CNP at lower levels. In this way, there would have been more time to grasp all the details and the types of CNP and to have sufficient practice.

Another point of criticism concerned the design of some of the quiz items. The quizzes consisted mostly of multiple-choice items, including selecting a correct paraphrase for a CNP (see Figure 6). The original sentence ended in the stem *financial relocation assistance*. Two of the participants mentioned that it was too difficult to keep multiple paraphrases in their short-term memory as they assessed their applicability. They suggested that they could show their CNP paraphrasing skills by creating correct paraphrases themselves.

Think-Aloud Protocol

This part involved verbalizing the participants’ thought process in several CNP parsing tasks. Overall, the participants did quite well on these three tasks.

Figure 6

Screenshot from Quiz 3

Question Text *

In Lines 95-101, a health resolution organization in Wisconsin asked for

Answers *

- assistance to move the affected residents' finances to a different bank. ×
- money to help residents affected by ITW noise move to a different area. ×
- financial assistance to treat the health effects of IWT. ×
- financial relocation for the affected residents. ×

The first task (see Figure 7) was to identify how many noun phrases were part of the highlighted CNP. Next, the participants had to name them and identify the head noun in each. Three out of four participants were able to identify all three NP within the target CNP correctly. Overall, when asked how they found the NP and their head nouns within the higher CNP, the participants were able to deploy most of the techniques taught during the intervention to locate the head nouns, and specifically in application to the CLMod type.

The second task was to find a head noun in this combined CLMod + NMod + PPMOD type CNP, “panic episodes associated with sensations of internal pulsation or quivering.” Three out of four participants found the correct head noun within the NMod part—*episodes*—which was also the head noun of the overall combined CNP. They correctly invoked the rule that the head noun is the rightmost noun in the NMod type.

The third item (see Figure 8) included the head noun identification and paraphrasing tasks. The participants had to first identify the two head nouns in this stacked NMod phrase—*sound pressure level*—and then choose between two potential paraphrases reflecting the correct order of modification/embedding. This task was the most complex of the three because it involved choosing between two competing interpretations of the CNP (Gagné & Shoben, 1997), where the identification capacity is contingent upon the interpreter’s good conceptual knowledge. For example, if they were familiar with the concept of sound pressure, they would probably see it as the head noun *pressure* codified by *sound*, and *sound pressure* then modifying the head noun *level*. Three of the four participants were successful in this dual task.

Figure 7

Screenshot from the Think-Aloud Protocol, Task 1

• Pierport (2010) documented **symptoms reported by individuals exposed to wind turbines**, which include sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep.

- How many noun phrases can you detect in the phrase in red above?
- What are they? What head nouns can you identify in them?

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Figure 8

Screenshot from the Think-Aloud Protocol, Task 3

According to the WHO guidelines for community noise, the capacity of a noise to induce annoyance depends upon many of its physical characteristics, including its **sound pressure level** and spectral characteristics, as well as the variation of these properties over time.

- What is the head noun in the phrase in red above?
- Would you interpret it as:
level of sound pressure [sound pressure LEVEL] or
pressure level of sound [sound PRESSURE LEVEL]

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Discussion and Conclusion

Overall, it seems that the CNP intervention was well received by the students. In our interactions in breakout rooms and during my explanations of the rules, the attitude was quite positive. They found the reading strategies that were taught helpful and were able to apply the syntactic rules to disambiguate and interpret CNP in other courses. They were mostly also able to analyze and interpret a few novel CNP using the strategies taught. The results of the intervention are in line with a recent classroom study by Lee (2018), who integrated a grammar module involving explicit instruction on reading strategies in relation to CNP (for example, how to paraphrase them) in a high-school ESL science class. While there was no significant effect of the intervention on overall reading comprehension scores, the experimental group scored high on the ability to process and paraphrase CNP in sentences.

With regard to the comments on the short timeframe of the intervention, I concur with the participants that integrating the CNP modules within a longer semester and thus distributing the modules related to individual types of CNP more evenly across the curriculum would allow for better retention. The CNP modules in this intervention were spaced one week apart due to curricular constraints. Bird (2010), in his study on the acquisition of English verb tense and aspect, found that distributed learning resulted in more durable retention than a more condensed approach. A takeaway from this classroom study could be redesigning the intervention so that the modules are more spaced out, with a view to delivering them over two or more seven-week semesters, and perhaps over two levels of the EAP program. A modification on the existing modules could also include more emphasis and practice with the paraphrasing tasks: both the students and I saw them as the most challenging and requiring further practice.

Lastly, with regard to the students' comment about the difficulty of multiple-choice quiz items containing several potential paraphrases of the target CNP, allowing students to create their own paraphrases of CNP may enhance the validity of the assessment procedures. Since the lower-level reading processes of lexical access and syntactic parsing take up significant short-term memory resources (Grabe & Stoller, 2002), assessing the feasibility of several paraphrases while keeping a hypothesis of the semantic proposition in one's short-term memory may add to the processing burden for EAP students.

Overall, these findings on the effects of teaching the structure of CNP directly as a reading strategy are encouraging. Several of my colleagues have made the CNP modules a permanent part of their EAP reading courses, and I invite other EAP practitioners to learn more about the lexicogrammatical complexity inherent in CNP and the potential use of direct teaching of the structure of various types of CNP as a reading strategy. Since one of the learning outcomes of EAP courses is effective reading strategies for academic or professional literature that contains CNP, the reading strategies based on CNP parsing and paraphrasing may be useful in a wide range of academic and professional pursuits in the English language.

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