

Compact writing: a logico-semantic analysis in academic abstracts

Escrita compacta: uma análise lógico-semântica em resumos acadêmicos

Escritura compacta: un análisis lógico-semántico en resúmenes académicos

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ABSTRACT

This study investigates the logico-semantic relations and the taxis system of Halliday's Systemic Functional Grammar in eight abstracts from the Paleontological Research Support Center of the Federal University of Santa Maria, known for its international publications. The analysis revealed a high frequency of embedded clauses, paratactically extended clauses, and hypotactically elaborated clauses, which appear

to be features of academic writing. These patterns may be related to the short length and complexity of the texts. The findings help Us understand how academic writing operates in specific fields and may inform the development of teaching materials for English for Specific Purposes.

KEYWORDS: Internationalization; Academic writing in English; Systemic Functional Grammar; Logico-semantic relations.

RESUMO

O presente estudo investiga as relações lógico-semânticas e o sistema de taxis da Gramática Sistemico-Funcional de Halliday em oito resumos acadêmicos do Centro de Apoio à Pesquisa Paleontológica da Universidade Federal de Santa Maria, reconhecido por suas publicações internacionais. A análise revelou alta recorrência de orações encaixadas, orações parataticamente estendidas e orações hipotaticamente elaboradas, características frequentes da escrita acadêmica. Esses padrões parecem estar ligados à brevidade e à complexidade dos textos. Os resultados contribuem para a compreensão da escrita acadêmica em áreas específicas do conhecimento e podem subsidiar o desenvolvimento de materiais didáticos voltados ao ensino da escrita em inglês para propósitos específicos.

PALAVRAS-CHAVE: Internacionalização; Escrita acadêmica em inglês; Gramática Sistemico-funcional; Relações lógico-semânticas.

RESUMEN

El presente estudio investiga las relaciones lógico-semánticas y el sistema de taxis de la Gramática Sistemico-Funcional de Halliday en ocho resúmenes académicos del Centro de Apoyo a la Investigación Paleontológica de la Universidad Federal de Santa María, reconocido por sus publicaciones internacionales. El análisis reveló una alta recurrencia de cláusulas incrustadas, cláusulas extendidas paratáticamente y cláusulas elaboradas hipotáticamente, características comunes de la escritura académica. Estos patrones parecen estar relacionados con la brevedad y la complejidad de los textos. Los hallazgos contribuyen a comprender cómo se organiza la escritura en campos específicos del conocimiento y pueden apoyar el desarrollo de materiales didáticos para la enseñanza de la escritura en inglés con fines específicos.

PALABRAS-CLAVE: Internacionalización; Escritura académica en inglés; Gramática sistemico-funcional; Relaciones lógico-semánticas.

1 Introduction¹

The current context of internationalization of Higher Education Institutions, and the need to have a democratic university aligned with the best in the scientific world, lead to several actions necessary to foster this process. At the Federal University of Santa Maria (UFSM), current demands and the internationalization process led to the creation of two documents: the Institutional Development Plan (IDP), approved in 2016 (UFSM, 2016), and the Institutional Internationalization Plan (IIP), approved in 2017 (UFSM, 2017).

One of the challenges pointed out in the documents IDP and IIP is the necessity to expand the dissemination of knowledge produced at UFSM, and thereby increase the institution's national and international visibility. Similarly, graduate programs may also have better evaluations by the Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* – CAPES). One way to increase the visibility of the university's scientific publications is by using writing in English, the *lingua franca* of science scientific publications in which the *lingua franca* is English (Hendges, 2021).

Considering the context of internationalization in UFSM, the Nucleus of Studies on Academic Literacies (*Núcleo de Estudos sobre Letramentos Acadêmicos* – NELA) focuses its studies on studying the academic literacies needed for successful participation in international academic environments (HENDGES, 2021). One example of this kind of environment is the group of researchers from the Paleontological Research Support Center of the Fourth Colony (*Centro de Apoio à Pesquisa Paleontológica da Quarta Colônia* – hereafter referred to as CAPP) stands out for its numerous international scientific publications.

CAPP is a paleontology center in the municipality of São João do Polêsine, created in 2003 to support paleontological research in the Fourth Colony region in the south of Brazil. This region has scientific relevance for its abundance of Triassic period fossils. As of 2010, CAPP became part of UFSM and a subsidiary of the Center of Natural and Exact Sciences (*Centro de Ciências Naturais e Exatas* – CCNE). CAPP has been constantly publishing academic articles, and according to their official website, since 2014, at least 86 publications have been produced by researchers associated with this center.

¹ The present study concentrates on a common concern of three ongoing doctoral research in Applied Linguistics that investigate the context of higher education and the teaching of academic writing in English for internationalization.

Moreover, between the years of 2 and 2021, 24 out of the 26 publications reported on their website were written in English and published internationally. This is representative of the potential and interest the center has in internationalization. Multiple studies carried out at CAPPa are published in influential international journals from the field of Paleontology.

In general, these publications follow a traditional organization convention of academic texts, so all articles are preceded by an abstract. Abstracts are an independent genre that functions source of accurate and complete information and, among other things, play an important role in helping researchers to have quick and efficient access to the growing volume of scientific publications (Swales, 1990; Swales; Feak, 1994). In addition, they incline readers to continue reading the following article, as it might show that the research is interesting and its results are relevant (Motta-Roth; Hedges, 2010).

In the field of Applied Linguistics, the rhetorical organization of abstracts is sedimented in Introduction–Methods–Results–Discussion (IMRD), similar to scientific articles, as defined by Bittencourt (1995). The abstract genre has been studied quite extensively (Samraj, 2005), especially in the 1990s, and mainly in terms of rhetoric organization and linguistic features (Swales, 1990; 1994; Bittencourt, 1995; Dos Santos, 1996; Motta-Roth; Hedges, 1998).

In addition to these aspects, another possible perspective for analyzing scientific discourse is using clause complexes, that is, how clauses are linked to one another (Halliday; Matthiessen, 2014). According to Halliday and Matthiessen (2014),

[s]emantically, the effect of combining clauses into a clause complex is one of tighter integration in meaning: the sequences that are realized grammatically in a complex clause are construed as being subsequences within the total sequence of events that make up a whole episode in a narrative (Halliday; Matthiessen, 2014, p. 430).

Narratives, which are a series of events into a subsequence, include not only fictional stories but also other kinds of text where experience is construed in terms of a timeline (Halliday; Matthiessen, 2014, p. 430). One of the reasons for analyzing scientific discourse is taking into consideration the typical sequence of moves, and the flow of information. In addition, the lack of studies about logic-semantic relations justifies the present study. Some examples of studies based on the notion of clause complex are presented as

follows.

Antonio (2012) investigates the expression of the rhetorical relations of cause, evidence, justification, and motivation using causal hypotactic clauses in formal oral discourse (university lectures and interviews with academic researchers) in Brazilian Portuguese; Melo and Spindola (2014) investigate the semantic system of projection in professional reflective writing of supervised pre-service training reports; Adjei and Opoku (2017) focus on the expansion relations of clause complexes in editorials of a Ghanaian daily newspaper; Schmidt, Chagas, and Cabral (2018) identify the meanings that the writers of an open letter emphasize through a given semogenic mechanism denominated embeddedness; Petry Radünz and Cabral (2022) investigate the linguistic organization of the introduction sections of academic papers from the Veterinary Medicine field in terms of taxis and logico-semantic relation.

Another motivation for an investigation into scientific discourse is to understand academic knowledge production in situated contexts (Marcuzzo, 2021), and to contribute to academic writing. Language is seen as central to members of scientific communities in the sense that a successful claim depends on “linguistic choices which appropriately convey the writer’s intention, facilitate the smooth exchange of information and create conditions for persuading readers of a point of view” (Hyland, 1998, p. 22). Specifically, the choice for analyzing abstracts is related to its primary feature in projecting the research, “functioning as a window for the research community” (Bittencourt, 1995, p. 4).

In this way, the purpose of this study is to investigate how logico-semantic relations are organized in a sample of abstracts of the Paleontology field produced in the context of CAPP. The analysis was carried out from the perspective of Systemic-Functional Linguistics (Halliday; Matthiessen, 2014). We sought to identify how the logico-semantic relationships and the taxis system are linguistically structured in these abstracts “to form clause complexes representing moves that are presented as textually related messages” (Halliday; Matthiessen, 2014, p. 428).

2 Review of literature

In this section, firstly, the academic genre abstract and its main features are presented, based on the current literature. Secondly, the perspective that underlies this study is presented, that is the logico-semantic relationships and the taxis system.

2.1 The genre abstract

The abstract genre is an important part of academic texts such as articles, dissertations, and theses, with a defined rhetorical pattern and purpose. The definition, purpose, and rhetorical organization of the genre abstract are discussed by many authors.

Bittencourt (1995), in his genre analysis, defined the genre abstract as the concise presentation of the main information in a text with a similar organization to the experimental article, that is, introduction, method, results, and discussion. According to Bittencourt (1995), abstracts may have five moves in their organization, so the purpose of writing an abstract is defined depending on its moves. The moves and their purposes defined by Bittencourt (1995) are in Table 1, and here they are related to the main article structure.

TABLE 1. The moves prototypical on the genre abstract and their relation with the article structure

Move 1	Situating the research	Introduction and Literature Review
Move 2	Presenting the research	Objective
Move 3	Describing the research	Methodology
Move 4	Summarizing the results	Results
Move 5	Discussing the results	Conclusion

Source: The authors based on Bittencourt (1995).

Similarly, Gil and Aranha (2017) used a model of five moves for analyzing abstracts of research articles in their rhetorical and linguistic characteristics in the discipline of Anthropology from two journals. The model comprises Contextualization (M1), Objectives (M2), Methodology (M3), Results (M4), and Conclusions (M5) (Gil, 2011 Apud Gil; Aranha, 2017, p. 854-855). Although the two journals analyzed are from the same discipline, the data indicate that the standard way in which the abstract materializes in both journals is very different: while one presents a standard structure of the genre, as expected by the literature, the other uses a structure unconventional,

without detailing the methodology and results (Gil; Aranha, 2017, p. 855). In this sense, the authors understand that the abstract is “shaped by the constitutive heterogeneity of the areas and disciplines, polished by the expectations of the discursive communities, sculpted by the demands of the journals and their editorial rules” and “manipulated by author or to also comply with their purposes” (Gil; Aranha, 2017, p. 869, own translation).

According to Motta-Roth and Hedges (1996), the academic abstract is an important genre that summarizes a longer text and allows readers to have faster access to the context of the full text. For the authors, the purpose of the abstract is to persuade the readers to continue reading the full text, convincing them that the article that follows is interesting and has relevant results. Motta-Roth and Hedges (1996) state that the abstract is a short text which encapsulates the essence of the article that will come next.

By Bittencourt (1995), Motta-Roth and Hedges (1996) also point out the importance of rhetorical organization in academic writing, which refers to how ideas are presented and developed throughout a text. Motta-Roth and Hedges (1996) build on this idea and focus specifically on the rhetorical organization of abstracts. They argue that abstracts serve as a condensed version of the full article, and as such, they should follow a similar organizational structure. The authors highlight the importance of carefully crafting the rhetorical organization, coherence, and cohesion of abstracts to effectively communicate the essence of the research in a concise and accessible manner. By doing so, authors can help readers quickly grasp the main ideas in the abstract and decide whether to read the full article.

Another research, from the 2000s, indicates the importance of abstracts in the academic field, which includes five reasons: abstracts save reading time; help overcome the language barrier; can provide some language preparation for the text; can serve as a key to understanding fully the arguments on the longer text; and, can serve as a current awareness tool (Cross; Oppenheim, 2006, p. 429).

Some of the reasons pointed out by Cross and Oppenheim (2006) are related to linguistic characteristics. Motta-Roth and Hedges (1996) also discuss the most common characteristics related to language in abstracts, which include the use of verbs in the past tense and present tense, third-person forms, passive voice, declarative sentences, no abbreviations and symbols, an economic language with simple sentences, avoiding redundancies, examples, superlatives, illustrations, and excess details.

Recently, Jiang and Hyland (2023) explored the extent to which the four features – the use of a past tense, third person, passive, and the non-use of negatives – are used in abstracts of four disciplines, the functions they perform and how their frequency has changed over the past 30 years. The authors found high but decreasing frequencies of past tense and passives, an increasing number of third-person forms, and more than one negation in every two texts. They also noted a remarkable decrease in past tense and passive use in the hard sciences and an increase in applied linguistics, with sociologists making greater use of negation. According to the results, abstracts have developed a distinctive argumentative style, rhetorically linked both to their communicative function and to the changing social contexts in which academic writing is produced and consumed.

According to Halliday (2004, p. 47), “Scientific discourse becomes a discourse of prestige and power, something to be exploited by a technocratic elite that prefers to exclude everyone else from taking part in political processes”. In our view, the academic community must be aware of the theoretical terms, scientific principles, technical knowledge, and standard language that constitute a powerful resource for scientific discourse. If universities want to be social spaces, diverse and inclusive, the academic community, including students and staff, needs to be encouraged the development of reading and writing in English as a vehicle for accessing knowledge.

2.2 Types of Relationship between Clauses

Considering that a small number of studies have positioned abstracts within the context of textual, discourse, and genre analysis (in opposition to the readability of abstracts) (Cross; Oppenheim, 2006, p. 430), analyzing language from “above the clause” perspective seems essential to the study of discourse using the analysis of grammar² (Halliday; Matthiessen, 2014, p. 10). Grammar constructs the world, as it has constructed (and continues to construct) other worlds; and it does so by complex of systemic strategies, such as “packaging’ into extended nominal groups, nominalizing processes and properties, lexicalizing logico-semantic relations first as verbs and then as nouns, and constructing the whole into the sort of clause we meet with

² By grammar we mean “the grammatical systems and structures – the clause complexes, clauses, phrases, groups and words, as well as the lexical items themselves, the vocabulary” (Halliday, 2004, p. 183).

everywhere” (Halliday; Martin, 1996, p. 102), such as academic writing, newspapers, bureaucracy, school textbooks, etc.

This study involved the analysis of the types and the roles of logico-semantic relationships and the taxis system (the degree of interdependency between clauses), proposed by M. Halliday in his remarkable book *Halliday's Introduction to Functional Grammar* (2014). According to Halliday, such analysis can be conducted from “above the clause”, in his words, “from the point of view of how the flow of events is construed in the development of text at the level of semantics” (Halliday; Matthiessen, 2014, p. 428).

The logico-semantic relations in a text are established to form and link clause complexes, which represent “sequences of figures (or moves) that are presented as textually related messages” (Halliday; Matthiessen, 2014, p. 428). The clause complexes realize the moves of a text, and sequences of moves, in its turn, structure genres. The nature of the logico-semantic relations can be of two types: a) expansion, in which the secondary clause expands the primary clause, by either elaborating, extending, or enhancing it; and projection, where the secondary clause is projected through the primary clause, which instates it as a locution or an idea (Halliday; Matthiessen, 2014, p. 443). Table 2 presents the logico-semantic relations and their specific subdivisions.

TABLE 2. The logico-semantic relations, their categories, symbols, and meanings

Logico-semantic relations	Categories and Symbols	Meanings
Expansion	Elaborating = (equals)	one clause restates the other in other words, specifies it in greater detail, comments on it, or exemplifies it
	Extending + (is added to)	one clause adds some new element to the other, gives an exception to it, or offers an alternative
	Enhancing x (is multiplied by)	one clause qualifies the other with some circumstantial feature of time, place, cause, or condition
Projection	Locution “ (double quotes)	one clause presents the other as a locution, a construction of the wording
	Idea ‘ (single quotes)	one clause presents the other as an idea, a construction of meaning

Source: The authors are based on Halliday and Matthiessen (2014, p. 444).

Furthermore, there are two different degrees of interdependency between clauses, called parataxis (equal semantic status between elements) and hypotaxis (unequal semantic status between elements). Hypotaxis is the relation between a dependent element and its dominant element, which is represented by letters of the Greek alphabet (α , β , γ , etc.). Whereas parataxis is the relation between two elements of equal semantic status, one initiating and the other continuing the clause complex, represented by Arabic numerals (1, 2, 3, etc.) (Halliday; Matthiessen, 2014).

In addition to these categories, the elements of a clause may relate through the embedding system, which is represented by a set of two square brackets at the beginning of the embedded clause or element and a set of closing square brackets at the end of the embedded clause or element. Embedded clauses can be defined as clauses “that function inside the structure of a nominal group, as defining relative clauses” (Halliday; Matthiessen, 2014, p. 127).

In the next section, the *corpus*, procedures, and categories are presented.

3 Methods

The *corpus* of this investigation is composed of eight abstracts from the paleontology field. In addition to the rationales exposed in the Introduction section, the genre abstract was chosen due to its importance when reading an academic paper, as it serves to summarize, indicate and predict in a short paragraph, the content and structure of the full text that follows. Besides persuading the reader to continue reading the full text, to convince them that the article that follows is interesting and that the results are relevant.

The abstracts were produced in the context of CAPPa and were made available on the official website of the institution³. Although eight abstracts might be considered a relatively small *corpus*, they allow us to meet the goals of this investigation. The selected abstracts represent the most recent ones available at the time they were collected⁴, and all eight preceding papers written in English that were published in international journals as of 2021.

³ Available at: <https://www.ufsm.br/unidades-universitarias/ccne/cappa/publicacoes-cientificas-produzidas-no-cappa-ufsm/>. Access in: August 8, 2022.

⁴ The *corpus* was collected on July 29, 2022.

For purposes of organization, the *corpus* was coded. Each analyzed abstract was numbered according to the organization on the website from which they were collected. Details on the analyzed abstracts are shown in Table 3.

TABLE 3. The *corpus*

Code	Title	Date of Publication	DOI hyperlink	Journal
Abstract#1	Endocranial Morphology of a Middle Miocene South American Dugongid and the Neurosensory Evolution of Sirenians	June 3, 2021	https://doi.org/10.1007/s10914-021-09555-8	Journal of Mammalian Evolution
Abstract#2	The nasal cavity of two traversodontid cynodonts (Eucynodontia, Gomphodontia) from the Upper Triassic of Brazil	March 19, 2021	https://doi.org/10.1017/jpa.2021.6	Journal of Paleontology
Abstract#3	3D dataset 3D model related to the publication: A new fossil of Taxassuidae (Mammalia: Cetartiodactyla) from the Pleistocene of northern Brazil	January 29, 2021	https://doi.org/10.18563/journal.m3.105	MorphoMuseu M
Abstract#4	Olfactory acuity in early sauropodomorph dinosaurs	April 14, 2021	https://doi.org/10.1080/08912963.2021.1914600	Historical Biology
Abstract#5	Taxonomic and phylogenetic reassessment of a large-bodied dinosaur from the earliest dinosaur-bearing beds (Carrián , Upper Triassic) from southern Brazil	March 9, 2021	https://doi.org/10.1080/14772019.2021.1873433	Journal of Systematic Paleontology
Abstract#6	Review of the fossil record of early dinosaurs from South America, and its phylogenetic implications	April 29, 2021	https://doi.org/10.1016/j.jsames.2021.103341	Journal of South American Earth Sciences
Abstract#7	A new record of Taxassuidae (Mammalia: Cetartiodactyla) from the Pleistocene of northern Brazil	January 29, 2021	https://doi.org/10.1590/0001-3765202120191080	Annals of the Brazilian Academy of Sciences
Abstract#8	A Pliocene-Pleistocene continental biota from Venezuela	April 23, 2021	https://doi.org/10.1186/s13358-020-00216-6	Swiss Journal of Paleontology

Source: the authors.

As for the procedures that carried out this investigation, the *corpus* was analyzed following Halliday and Matthiessen's (2014) notions of clause complex and taxis system. Firstly, the abstracts were carefully read by all authors to identify the clause types (simple clauses, embedded clauses, and clause complexes). Secondly, the complex clauses were classified deductively, from theory to data, based on the following systems: taxis (parataxis and hypotaxis) and logico-semantic relation (expansion and projection). At the

same time, the embedded clauses were also classified in terms of expansion (elaborating, extending, or enhancing) and projection (locution or idea). Finally, the clauses were counted and the recurrences were interpreted in light of the specificities of the *corpus* and its context.

To better organize and display our analysis for readers, we have organized them into several tables, in which each category is represented by the symbols proposed by Halliday and Matthiessen (2014). Other than the ones mentioned in Section 2.2, we have also included the following:

[[]] embedded;
= elaboration;
+ extension;
x intensification;
“ ” locution;
‘ ’ idea;
1 2 parataxis;
 $\alpha \beta$ hipotaxis;
||| clause complex;
|| clause;
^ order.

Also, for organizational purposes, all examples presented in the Results and Discussion section were labeled alphabetically. Some elements in the examples were highlighted to better elucidate the analysis carried out.

4 Results and discussion

The *corpus* selected consists of eight abstracts, which comprise a total of 1.195 words. Two abstracts largely differ in a number of words from the others: Abstract#3 accompanies a two-page article, one of which contains a 3D model figure; and Abstract#7 also accompanies an article of fewer pages (excluding pre and post-textual elements, the article is four pages long), which has two figures. These abstracts are possibly written in a reduced number of words because the presence of figures might be a particularity of the area, this, however is an assumption that requires further analysis. In this sense, the figures may contain the essence of the information, the most important topic. This configuration is reflected in the organizational structure of clauses. Table

4 presents the number of words in each abstract and the number of clause relations in each one.

TABLE 4. Number of words and clause relations in the *corpus*

Code	Total words	Clause complexes	Simple clauses	Embedded clauses
Abstract#1	257	06	01	13
Abstract#2	259	05	02	08
Abstract#3	38	01	0	01
Abstract#4	190	05	04	02
Abstract#5	198	03	03	02
Abstract#6	240	03	02	09
Abstract#7	85	01	02	02
Abstract#8	228	01	03	06
Total	1.495	25	17	43

Source: the authors.

It is worth noting that, while Abstract#1, Abstract#2, and Abstract#6 are the longest (in terms of the number of words), they are also the ones with the lowest occurrences of simple clauses (except for Abstract#3, which is the shortest in length). These factors might be indicative of the complex nature of the subjects of these texts. This interpretation is supported by the results later presented in Table 4 and Table 5.

The analysis also showed that the number of embedded clauses is greater than simple clauses and clause complexes. A possible reason for this difference is the purpose of the genre itself, which is to “summarize, indicate and predict, in a short paragraph, the content and structure of the full text that follows” (MOTTA-ROTH; HENDGES, 2010, p. 152). According to Petry Radünz and Cabral (2022), the embedding system is highly explored in the academic language, which presents several definitions of technical terms that often need to be made as clear as possible.

TABLE 5. Examples of embedded clauses

Embedding: Elaborating	Embedding: Enhancing	Embedding: extending
20 occurrences in the <i>corpus</i>	15 occurrences in the <i>corpus</i>	08 occurrences in the <i>corpus</i>
Example A	Example B	Example C
Sirenians are placental mammals [[<u>that</u> comprise the extant manatees (<i>Trichechus manatus</i> , <i>T. inunguis</i> , and <i>T. senegalensis</i>) and dugongs (<i>Dugong dugon</i>).]] Abstract#1	The present study provides a comparative analysis of the morphology of the nasal cavity, nasal recesses, nasolacrimal duct, and maxillary canals of both species [[<u>using</u> computed tomography,]] [...] Abstract#2	The specimen is a left dentary with molars [[assigned to cf. <i>Pecari tajacu</i> [...] Abstract#7

Source: the authors.

In Example A, the embedded clause is used to specify the meaning of the nominal group “placental mammals”. In Example B, the embedded clause builds a circumstantial feature. And in Example C, the embedded clause adds a new element to the previous nominal group.

Both Examples B and C have non-finite clauses. According to Halliday and Matthiessen (2014), in a non-finite dependent clause, the Subject can be ellipsed and presupposed from the primary clause. It is common when the domain is a nominal group or some larger segment of the primary clause. Thus, in a clause complex, it suggests a continuity of thematic Subjects. Moreover, non-finite clauses, typically of extension and enhancement, can occur without conjunction or preposition. In these cases, there is no doubt about its hypotactic relation in a clause complex. However, there may be no indication of its logic-semantic function. These aspects of the non-finite clauses function as a means of compacting information. It is useful for writing abstracts due to the reduced number of words typical of the genre.

In addition, most of the embedded clauses found in the *corpus* function as Postmodifiers in nominal groups, as the following example demonstrates.

TABLE 6. Example of Postmodifiers in a nominal group

Example D

||| In southern Brazil, a rich fossil [| **record** of late Middle/mid-Late Triassic cynodonts]| **has been documented**, with *Exaeretodon riograndensis* Abdala, Barberena, and Dornelles, 2002 and *Siriusgnathus niemeyerorum* Pavanatto et al., 2018 [| **representing** two abundant and well-documented traversodontids.]| |||
Abstract#2

Source: the authors.

In Example D from Abstract#2, there are two embedded clauses functioning as Postmodifiers of nominal groups. First, “record of late Middle/mid-Late Triassic cynodonts” refers exclusively to “a rich fossil”, whereas “representing two abundant and well-documented traversodontids” refers to “*Exaeretodon riograndensis* Abdala, Barberena, and Dornelles, 2002 and *Siriusgnathus niemeyerorum* Pavanatto et al., 2018”. Both clauses are detailing terms of the Paleontology field, within a specific period and context. In addition, the clause complex also has a non-finite clause, as explained in Examples B and C.

In summary, as pointed out by Petry Radünz and Cabral (2022), “this high recurrence of embedded clauses demonstrates the density and technicity of academic language, that is, the necessity of mentioning technical terms that must be further detailed” (p. 162).

Table 7 details the total number of occurrences of taxis and logico-semantic relationship in the *corpus*.

TABLE 7. Occurrences of taxis and logico-semantic relationship systems

	Parataxis	Hypotaxis	
	Expansion	Expansion	
	Extending ($1 \wedge +2$)	Elaborating ($\alpha \wedge =\beta$)	Enhancing ($\alpha \wedge \times\beta$)
Abstract#1	4	4	4
Abstract#2	4	1	3 ⁵
Abstract#3	-	-	1
Abstract#4	3	2	-
Abstract#5	2	4	-
Abstract#6	2	2	-
Abstract#7	1	-	-
Abstract#8	-	1	-
Total occurrences in the corpus	16 (42%)	14 (37%)	8 (21%)

Source: the authors.

Our analysis showed the recurrence of paratactically extended clauses ($1 \wedge +2$) and hypotactically elaborated clauses ($\alpha \wedge =\beta$), where there were, respectively, 16 and 14 occurrences of each. Examples of these occurrences are presented in Table 8 and 9. We speculate that such “balance” is likely to happen in academic writing in general, and might be related to the reduced size of the texts that have to report concisely on subjects that are considerably complex. This can also be suggestive of the attention that researchers put on the writing of these texts, especially considering that, during the process of publication, these texts are usually reviewed more than once by several highly educated and experienced professionals. It might also be worth noticing that most authors of the analyzed abstracts are non-native English speakers, meaning that they might have either made an extra effort for writing in a second language or hired professionals for doing it. This might be the reason for the multiple occurrences of gerunds and embedded clauses, as it could be a reflection of the Brazilian Portuguese syntax in English writing.

TABLE 8. Examples of paratactically extended clauses

Example E

||| Here, the olfactory ratio (ratio between the size of the olfactory bulbs and cerebral hemispheres) of some sauropodomorphs **is calculated** || and **plotted** as a function of body mass in a sample of dinosaurs. ||| Abstract#4

Example F

||| In the present paper we **offer** an updated review [| **focused** on the available evidence of Carnian dinosaurs from this continent,]| || but we also **discuss** the record of Triassic dinosaur precursors and the evolution of Triassic dinosaurs in other continents. ||| Abstract#6

Source: the authors.

These clause complexes are represented, respectively, as $1 \wedge +2$ and $1 [] \wedge +2$. In Example E, a new element is added to another by an additive: positive relation expressed by “and” (HALLIDAY; MATTHIESSEN, 2014, p. 472). In Example F, the extended relation in the clause is presented as an adverse idea to another introduced by the word “but”. In this additive: adversative relation, “the linker *but* contains the semantic feature ‘and’” (HALLIDAY; MATTHIESSEN, 2014, p. 473). The occurrence of a non-finite clause reinforces the feature of compacting information in academic abstracts.

TABLE 9. Examples of hypotactically elaborated clauses

Example G

||| Herein we **reassess** a dinosaur specimen from Brazil, || informally **known** as the ‘Big *Saturnalia*’, || a **supposed** large-sized sauropodomorph [| **unearthed** at the ‘Cerro da Alemoa’ locality in Santa Maria municipality, Rio Grande do Sul State.]||| Abstract#5

Source: the authors.

Example G from Abstract#5 presents two hypotactically elaborated clauses, represented as $\alpha \wedge =\beta []$. Traditionally, this is the category of apposition and it may restate or particularize a group or phrase complexes (HALLIDAY; MATTHIESSEN, 2014, p. 560). The information “informally known as the ‘Big Saturnalia’” is a restatement that specifies the subject “a dinosaur specimen from Brazil”, whereas “unearthed at the ‘Cerro da Alemoa’ locality in Santa Maria municipality, Rio Grande do Sul State” is a particularization, that is a comment on “a supposed large-sized

sauropodomorph”.

Another interesting result refers to the role of the logico-semantic relations and the taxis system within each move identified in the abstracts.

TABLE 10. The logico-semantic relations and the taxis system in each move of the abstracts

	Introduction	Objective	Methodology	Results	Discussion
Abstract#1	[[]]; $\alpha \wedge x\beta$	$\alpha \wedge x\beta$	$1 << \alpha \wedge \beta$ $>> +2$	[[$1 \wedge +2$ [[]]]]; $1 << \alpha \wedge x\beta >> +2$; $\alpha \wedge \beta$ ([[$\alpha \wedge \beta$ ([[$\alpha \wedge x\beta$ (1 $\wedge +2)$]]]]]; Simple Clause (SC)	[[[[]]]]; [[[[[[$\alpha \wedge \beta$]]]]]
Abstract#2	[[]]; [[] [[]]]	α [[]] \wedge $x\beta$ [[]]		[[[[$1 \wedge +2$ ([[]]]]]]]; $1 \wedge +2$; $\alpha \wedge \beta$ ($\alpha \wedge x\beta$ (1 $\wedge +2$)); SC	$x\beta \wedge \alpha$ (1 $\wedge +2$); SC
Abstract#3	[[]]	Not identified in the analyzed <i>corpus</i> (NI)	$\alpha \wedge x\beta$	NI	NI
Abstract#4	SC ; $\alpha \wedge \beta$; SC ; SC ; [[]]; $1 \wedge +2$	NI	$1 \wedge +2$	1 [[]] $\wedge +2$; $\alpha \wedge \beta$	SC
Abstract#5	SC ; [[]]	$\alpha \wedge \beta$ ($\alpha \wedge$ $=\beta$ [[]])	NI	SC ; SC ; $\alpha \wedge \beta$	$1(\alpha \wedge \beta) \wedge$ $+2(1 \wedge +2)$
Abstract#6	SC ; [[]]; 1 [[]] $\wedge +2$; 1 [[]] $\wedge +2$; [[]]; [[[[]]]]	SC	NI	$\alpha \wedge \beta$ ($\alpha \wedge \beta$ [[]])	[[[[]]]]
Abstract#7	NI	SC	NI	[[[[]]]]; SC	$1 \wedge +2$
Abstract#8	[[]]; [[]]; SC	NI	NI	[[]]; SC ; [[]]; SC ; $\alpha \wedge \beta$	[[[[]]]]

Source: the authors.

As can be seen, in Table 10, the Introduction move is frequently structured by embedded clauses (represented by [[]]). In the objectives and methodology moves, however, elaboration (=) and intensification (x) are more often used. It is also worth noticing that elaboration and extension (+) are recurrent in the results and discussion moves, indicating that the results may

have been re-textualized and possibly extended for the abstracts. Overall, the significant number of embedding occurrences, mostly defining relative clauses, can be seen as evidence of the need to explicitly define the reported results.

Nevertheless, most of the abstracts under analysis do not correspond to the “move” that are often assumed to structure the abstract genre. Unconventional structures have been previously identified in studies such as Gil and Aranha (2017), in which the abstracts from one journal were reported to use “an unconventional structure, without detailing methodology and results” (p. 855). In the *corpus* of our study, one piece of evidence of this unconventional structure is the *Introduction* move, which is considerably longer in the *corpus*, as the information that would be presented in the *Objective* move might be either included in the *Introduction* or simply omitted from the abstracts (even though they are very likely to be present in the articles that follow these abstracts). The same is likely to be true for the *Results* and *Discussion* moves, which are present in almost all analyzed abstracts⁵, and might include information that would be typically present in the *Methodology* move. In this way, the abstracts from the paleontology field seem to provide a careful contextualization (introduction) and highlight the findings in the *Results* and the *Discussion* moves in a very concise manner, as pointed out by Bittencourt (1995) and as it is often demanded in journal’s guidelines for publications for example.

5 Final remarks

This study sought to analyze the linguistic organization of eight abstracts from the Paleontology field, as to understand how logico-semantic relations are organized in publications of this specific context. The results indicate that the logico-semantic relations identified in the abstracts are related to sedimented prototypical organization of the genre abstract, its purpose, the academic writing context, and the process of publication. Therefore, the logico-semantic relationships and the taxis systems identified are closely related to the purpose of the genre.

Despite the modest size of the *corpus*, the findings of this investigation can be used to help us understand how writing happens in specific contexts, such as CAPP. Further research might seek to contribute to the development

⁵ These moves are not present in Abstract#3, which, however, is an abstract that precedes a two-page article presenting a 3D model and its scanning process.

of teaching materials for English writing for specific purposes such as the ones from the paleontology field.

To deepen the analysis, future research can investigate other texts and the context in which they are produced. For example, further investigations of these texts based on the transitivity system (Halliday; Matthiessen, 2014) would likely result in significant findings, as well as contextual investigations following the principles of Critical Genre Analysis (Motta-Roth, 2008; Motta-Roth; Heberle, 2015) and Critical Discourse Analysis (Fairclough, 1989; 2003).

Our brief investigation seeks to add to the studies on academic writing in specific contexts. We believe that language teachers and text reviewers, for example, can benefit from understanding the structure of the texts of their interest, not only for teaching or reviewing texts from paleontology writers but for understanding and teaching the writing of academic genres overall.

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