NOMINALISATION IN ENGLISH SCIENTIFIC DISCOURSE: A SYSTEMIC FUNCTIONAL DESCRIPTION

DANH HÓA TRONG NGÔN BẢN KHOA HỌC TIẾNG ANH: MÔ TẢ CHỨC NĂNG HỆ THỐNG

Vu Thi Mau[1,*], Nguyen Thi Quy[1], Nguyen Thi Thanh Tung[1], Hoang Tra My[2]

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ABSTRACT

This study examines the frequency and function of nominalisation in English scientific discourse (ESD) through an analysis of 33 texts in engineering, biology, medicine, pharmacy, chemistry, geography, history, physics, environmental science, business, and information technology. Nominalisation, that is, the transformation of verbs or adjectives, or other parts of speech into nouns or nominal groups, is a central feature of scientific writing and a key concept within Systemic Functional Linguistics (SFL). Employing a corpus-based approach, this research investigates the role of nominalisation in condensing information, enhancing precision, and foregrounding key concepts across disciplinary boundaries. The findings reveal that nominalisation is pervasive in all texts, with significant variation in its density across disciplines. The highest concentrations are observed in fields such as medicine, pharmacy, chemistry, and business, reflecting the distinct communicative objectives and stylistic norms of these domains. Additionally, the study underscores the challenges nominalisation poses for second-language (L2) learners and English as a Foreign Language (EFL) speakers, highlighting its implications for English for Specific Purposes (ESP) and English for Academic Purposes (EAP) pedagogy. The results suggest a need for targeted instructional strategies to enhance academic writing proficiency, particularly in teaching nominalisation as a critical feature of scientific discourse.

***Keywords**: Nominalisation, English scientific discourse, systemic functional linguistics, abstraction, objectivity.*

TÓM TẮT

Bài báo này nghiên cứu tần suất và chức năng của hiện tượng danh hóa trong ngôn bản khoa học tiếng Anh thông qua phân tích 33 văn bản kỹ thuật, sinh học, y học, dược học, hóa học, địa lý, lịch sử, vật lý, khoa học môi trường, thương mại và công nghệ thông tin. Danh hóa, tức là việc chuyển đổi động từ hoặc tính từ, hay từ loại khác thành danh từ hoặc cụm danh từ, là một đặc trưng nổi bật trong văn bản khoa học và là một khái niệm quan trọng trong ngôn ngữ học chức năng hệ thống. Sử dụng phương pháp phân tích dựa trên ngữ liệu, nghiên cứu này khám phá vai trò của danh hóa trong việc cô đọng thông tin, nâng cao độ chính xác, và làm nổi bật các khái niệm chính trong các văn bản khoa học khác nhau. Kết quả cho thấy danh hóa xuất hiện phổ biến trong tất cả các ngôn bản này, với sự khác biệt đáng kể về mật độ sử dụng giữa các ngành. Các lĩnh vực như y học, dược học, hóa học và kinh tế học có tần suất danh hóa cao nhất, phản ánh các mục tiêu giao tiếp và chuẩn mực phong cách đặc thù của từng ngành. Ngoài ra, nghiên cứu còn nhấn mạnh những thách thức mà danh hóa đặt ra đối với người học ngôn ngữ thứ hai và người nói tiếng Anh như một ngoại ngữ, đồng thời nêu bật những tác động của hiện tượng này đối với việc giảng dạy tiếng Anh chuyên ngành và tiếng Anh học thuật. Dựa trên kết quả nghiên cứu, nhóm tác giả đề xuất cần có các chiến lược giảng dạy phù hợp nhằm nâng cao kỹ năng viết học thuật, đặc biệt là trong việc dạy danh hóa như một đặc điểm quan trọng của ngôn bản khoa học.

***Từ khóa:** Danh hóa, ngôn bản khoa học tiếng Anh, ngôn ngữ học chức năng hệ thống, trừu tượng, khách quan.*

[1]School of Languages and Tourism, Hanoi University of Industry, Vietnam

[2]University of Languages and International Studies, Vietnam National University, Hanoi, Vietnam

[*]Email: mauvt@haui.edu.vn

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1. INTRODUCTION

Scientific discourse is characterised by its formal structure, objectivity, and precision, which distinguish it from other types of communication. According to Halliday and Martin, among the linguistic strategies that contribute to this distinctive style is nominalisation, that is, the process of turning verbs and adjectives into nouns [7]. Biber and Gray note that in English scientific writing, nominalisation plays a crucial role by condensing complex actions and qualities into abstract concepts, thereby facilitating the dense, impersonal, and information-rich style typical of the genre [2]. This linguistic feature is pervasive in a range of disciplines, including engineering, biology, medicine, pharmacy, chemistry, geography, history, physics, business, and information technology, reflecting both the shared communicative goals of scientific writing and the specific conventions of each field.

Hyland emphasises that nominalisation has been widely studied in relation to its function in enhancing textual abstraction, allowing writers to present actions and processes as static entities, thereby focusing on the outcomes rather than the actors involved [10]. Thompson states that this shift from dynamic to static language promotes an impersonal tone, which is highly valued in scientific discourse for its contribution to objectivity [20]. In Schleppegrell's view, nominalisation allows authors to package information more densely, reducing the need for explicit agents and actions [17].

In disciplines such as medicine and pharmacy, nominalisation is particularly prominent due to the need to convey complex processes and results concisely. Studies by Gotti have shown that in medical research articles, nominalisation serves not only to reduce verbosity but also to emphasise findings, treatments, and phenomena without needing to continually refer to human agency [6]. Similarly, Becher and Trowler show that in engineering and information technology, where processes and methodologies are central to the discourse, nominalisations are frequently used to encapsulate intricate procedures in a single term, thus facilitating clearer communication [1].

While nominalisation is common across all scientific disciplines, its usage and frequency vary significantly depending on the field. Hyland argues that chemistry and physics often require precise descriptions of experimental results, where nominalisation allows the succinct reporting of complex phenomena [12]. In contrast, disciplines like history or geography, which may involve more narrative forms of writing, tend to employ nominalisation in less frequent but equally significant ways. Here, Fairclough finds that it serves to structure arguments, abstract events, and synthesise broader historical or geographical trends [4].

Swales indicates that in disciplines such as business, nominalisation is used to present theories and models as established facts, creating an authoritative tone that supports the presentation of data and predictions [18]. For instance, terms like inflation, market regulation, and policy formation are employed to discuss broad concepts without the need to explain the underlying processes repeatedly.

Martin notes that despite its importance, nominalisation can pose significant challenges, particularly for L2 and EFL speakers, who may struggle with understanding and producing nominalised structures [14]. Flowerdew specifies that in the context of ESP education, helping learners to navigate and effectively use nominalisation is critical to improving their scientific writing proficiency [5]. Research by Hinkel has shown that explicit instruction in nominalisation can help students grasp its role in achieving the clarity, formality, and precision required in scientific discourse [9]. Also, Swales and Feak's study shows that nominalisation allows students to move from describing experiments in step-by-step terms to summarising results in abstract, generalised forms [19]. In Hyland's research, such instruction is especially crucial for learners in interdisciplinary fields, where the conventions of scientific writing may differ, requiring a more nuanced understanding of how nominalisation functions across various genres [11].

While nominalisation in scientific discourse has been widely examined [7, 12], there is a need for more research that explores how this feature varies across a wide range of scientific disciplines. Most existing studies tend to focus on one or two fields, neglecting a comparative analysis that includes areas such as pharmacy, geography, and environmental sciences. This study seeks to fill that gap by investigating nominalisation across 33 texts from diverse disciplines, including engineering, biology, medicine, chemistry, physics, business, and information technology. By conducting a corpus-based analysis, this research aims to explore not only the frequency of nominalisation but also how it functions to convey meaning in each discipline.

2. THEORETICAL FRAMEWORK

2.1. The framework of nominalisation

The study of nominalisation in ESD requires a robust theoretical framework that integrates insights from SFL, critical discourse analysis (CDA), and genre theory. Halliday and Martin emphasise that nominalisation, as a linguistic phenomenon, plays a crucial role in shaping scientific discourse by enhancing abstraction, objectivity, and informational density [7]. The theoretical foundation of this study draws on key linguistic theories to explain how nominalisation operates within different scientific disciplines, influencing how knowledge is constructed, presented, and communicated.

SFL, developed by Halliday and other systemists [8], provides a comprehensive approach to understanding language as a social semiotic system. In SFL, language is viewed as a resource for making meaning, and linguistic choices are determined by the context in which language is used. One of the key concepts in SFL is the idea that language serves three metafunctions: ideational, interpersonal, and textual functions. These metafunctions are particularly relevant when examining nominalisation in scientific writing. The ideational metafunction refers to the way language represents the world, including actions, processes, and entities. Halliday and Matthiessen confirm that nominalisation is a tool that transforms verbs (actions) and adjectives (qualities) into nouns (entities), allowing complex processes to be represented as abstract, static phenomena [8]. In Schleppegrell's view, the nominalisation of the verb allows for a more formal and detached presentation of the action, contributing to the impersonal and objective tone of scientific discourse [17]. The interpersonal metafunction concerns how language establishes relationships between speakers and listeners or writers and readers. Nominalisation plays a role in depersonalising the discourse, which helps maintain the formal, neutral tone expected in academic writing. Hyland asserts that by removing the agent from the action**,** nominalisation aligns with the objective stance often required in scientific research [12]. The textual metafunction deals with how information is organised in discourse. Nominalisation contributes to the informational density of scientific texts by compressing processes into nouns, which can then be embedded into more complex sentence structures. According to Biber and Gray, this feature of nominalisation allows scientific writing to convey large amounts of information efficiently, a key requirement in disciplines like engineering, medicine, and chemistry [2]. SFL provides a powerful theoretical lens through which to analyse the role of nominalisation in ESD. By framing nominalisation as a resource for meaning-making within specific disciplinary contexts, SFL enables researchers to understand how different scientific fields use language to construct knowledge and present findings.

Genre theory, particularly as developed by Swales, is another key component of the theoretical framework for this study [18]. In this theory, language use is shaped by the communicative purposes and social practices of particular communities. Scientific discourse, like other academic discourses, operates within specific genres, each with its own conventions and expectations regarding structure, style, and language use. Scientific writing encompasses a variety of genres, including research articles, reports, reviews, and textbooks, each with its own norms for how nominalisation is used. Hyland finds that in research articles within fields like biology, medicine, and pharmacy, nominalisation is often employed to report experimental findings in a concise and objective manner [11]. Gotti says that the use of nominalisation in these genres allows authors to focus on the processes and results of their research rather than the researchers' actions, which aligns with the conventions of impersonal scientific reporting [6]. Genre theory also helps explain why the use of nominalisation varies across disciplines. Each scientific discipline has its own genre conventions, which reflect the specific communicative needs and epistemological priorities of that field. Becher and Trowler indicate that physics and chemistry often prioritise the precise description of experimental processes and results, which encourages the frequent use of nominalisation [1]. In contrast, fields like history or geography may use nominalisation to discuss broader trends or theoretical concepts, but the narrative structure of these fields means that nominalisation is used less frequently than in more empirically-driven fields like engineering or medicine [4].

CDA provides another theoretical lens for examining the role of nominalisation in ESD. Fairclough sees that CDA focuses on how language reflects and reproduces power relations and ideologies within society [4]. In scientific writing, nominalisation is often used to obscure agency and depersonalise actions, which can have ideological implications. In Thompson's research, by transforming actions into abstract entities, nominalisation can obscure

the role of human agents in scientific processes, making the text appear more objective and authoritative [20]. One of the key critiques of nominalisation is that it can obscure who is responsible for certain actions or decisions. Fairclough also realises that in business and environmental science, nominalisation may be used to present large-scale social or environmental changes as natural or inevitable processes, thereby downplaying the role of human agency [4]. Salager-Meyer argues that by critically analysing how nominalisation functions in scientific texts, discourse analysis can reveal the underlying power dynamics and ideologies that shape scientific knowledge [16].

Finally, cognitive linguistics offers insight into how nominalisation reflects cognitive processes involved in the production and reception of scientific discourse. From a cognitive perspective, nominalisation allows for conceptual reification, that is, the transformation of complex actions and processes into concrete, manageable concepts. Lakoff and Johnson note that this abstraction enables scientists to categorise and discuss complex phenomena more easily, facilitating communication within and across disciplines [13].

2.2. Research design

This study adopts a corpus-based approach to examine the frequency and function of nominalisation across various scientific disciplines, including engineering, biology, medicine, pharmacy, chemistry, geography, history, physics, environmental sciences, business, and information technology. The methodology is designed to capture frequency of nominalisation and how nominalisation varies across these fields, focusing on its role in shaping the formal, objective, and information-dense nature of scientific writing.

A specialised corpus of 33 scientific texts from the aforementioned disciplines (11 discourses each) was compiled for analysis. The corpus includes research articles, textbook chapters, and reports published in the last 10 years, ensuring a diverse and updated representation of scientific discourse. These texts were selected from reputable journals and academic publishers like Oxford, Cambridge, etc. to reflect both current and widely accepted practices in each field. Each text was chosen based on its relevance to scientific inquiry, following established guidelines for text selection in corpus linguistics. The corpus consists of 18,162 words, with roughly equal word counts allocated across the disciplines to facilitate comparative analysis. To ensure discipline-specific accuracy, texts were classified according to their subject matter. This approach allowed for the identification of field-specific trends in nominalisation usage and ensured that the corpus was representative of the variety of linguistic conventions across scientific domains.

The analysis of nominalisation in the corpus was conducted using both quantitative and qualitative methods, following established frameworks for corpus-based linguistic research. The quantitative analysis involved calculating the frequency of nominalisations in each text. Specific wordlists were generated to identify common nominal forms, focusing on nouns derived from verbs or adjectives. The frequency data were normalised to facilitate cross-disciplinary comparisons, accounting for differences in text length and subject matter. The qualitative analysis examined the functions of nominalisations within the context of each discipline. This analysis aimed to explore how nominalisations contribute to key aspects of scientific writing, such as abstraction, objectivity, and conciseness. A close reading of sample texts from each discipline was conducted to identify the role of nominalisation in structuring arguments, summarising processes, and presenting findings. This analysis also considered how nominalisations interact with other linguistic features, such as passive constructions and complex noun phrases, to enhance the formal and impersonal tone of scientific discourse.

Each occurrence of nominalisation was coded according to its source and its function within the sentence. Categories included process nominalisation, result nominalisation, and abstract concept nominalisation. Additionally, discipline-specific patterns were noted, such as the tendency for medicine and biology to use nominalisation to describe processes and outcomes, whereas business and geography frequently employed nominalisation to frame broader theoretical concepts. The findings from this study were compared with existing research on nominalisation in scientific writing to confirm their alignment with broader trends identified in previous studies. This comparison helps to generalise the results and contributes to the ongoing discussion of nominalisation across various academic fields.

3. RESULTS AND DISCUSSION

3.1. Results

Frequency of nominalisation across disciplines

Although nominalisations appeared in all texts frequently, the quantitative analysis of nominalisation in

ESD revealed significant variation across the disciplines examined. Fields such as medicine, pharmacy, biology, and chemistry exhibited the highest frequency of nominalization (See Table 1).

Table 1. Nominalisations in the English scientific discourses

No.	Disciplines	Number of words	Number of nominalisations	Frequency of nominalisations
1	Engineering	1,673	159	9.5%
2	Biology	1,696	215	12.7%
3	Medicine	1,805	244	13.5%
4	Pharmacy	1,852	241	13.2%
5	Chemistry	1,590	206	13%
6	Geography	1,731	178	10.3%
7	History	1,478	156	10.6%
8	Physics	1,494	154	10.3%
9	Environmental sciences	1,599	157	9.8%
10	Business	1,683	228	13.5%
11	Information technology	1,561	169	10.8%
	Total	18,162	2,107	11.6%

This is consistent with earlier studies that emphasise the role of nominalisation in consolidating complex processes into abstract nouns, which enables researchers to present results concisely and objectively [6, 15].

In contrast, disciplines such as history and geography, while still employing nominalisation, showed lower frequencies (See Table 1). This reflects the more narrative and event-driven nature of these fields, where there is a greater reliance on verb-based structures to convey actions and agents explicitly. However, abstract concepts were frequently nominalised, reflecting the need for these disciplines to summarise broader historical or spatial trends.

In engineering and information technology, nominalisations from verbs were prevalent, reflecting the technical and process-oriented nature of these fields. The nominalisation here serves to encapsulate intricate procedures and outcomes, facilitating a precise and formal style that is crucial for communicating technical information [1]. An example of nominalisation in engineering is below.

Example 1: The implementation of the algorithm significantly improved system efficiency. (In this sentence the nominalization "implementation" comes from the verb "implement", encapsulating the process in a concise noun form, and this enables the sentence to focus on the outcome ("improved system efficiency") while maintaining a formal and precise tone suitable for technical or engineering discourse).

Function of nominalisation in scientific writing

The analysis confirmed that nominalisation plays a critical role in enhancing abstraction, objectivity, and impersonality in scientific writing. Across all disciplines, nominalisations were used to remove the agent from the sentence, focusing instead on the process or result. For instance, in biology and chemistry, nominalisation allows authors to foreground the phenomena under investigation, rather than the researchers conducting the experiments. This aligns with Halliday and Martin's observations on the importance of nominalisation in constructing an objective and depersonalised discourse [7].

In business and geography, nominalisation served a similar function but often encapsulated broader theoretical concepts, such as inflation or urban development. This abstraction allows scholars to discuss complex processes as entities that can be analysed independently from individual actions or events [11]. The findings reinforce the argument that nominalisation is a critical tool for presenting knowledge as generalizable and universally applicable, particularly in fields that seek to describe large-scale social or economic phenomena. An example of nominalisation in business is below.

Example 2: The analysis of urban development trends reveals significant disparities in infrastructure investment across regions. (In this sentence the nominalization "analysis" derives from the verb "analyse", "urban development" and "infrastructure investment" abstract complex, large-scale processes into single theoretical concepts, and this enables the discussion of these processes as discrete, generalizable entities, facilitating a focus on broader patterns and implications rather than specific events).

Furthermore, nominalisation contributed to the condensation of information, allowing for more concise and dense academic writing. This was particularly evident in medicine and pharmacy, where the need for brevity in reporting clinical trials or treatment outcomes often led to the use of nominalised forms such as treatment and diagnosis. This compression of information through

nominalisation aligns with Schleppegrell's claim that nominalisation is key to achieving the information density that characterises scientific texts [17]. An example of nominalisation in medicine is below.

Example 3: The treatment of patients with the new drug resulted in a significant reduction in symptom severity. (In this sentence the nominalization "treatment" comes from the verb "treat", and "reduction" is derived from the verb "reduce", and these nominalised forms condense the processes into compact nouns, allowing for a concise and dense presentation of clinical trial results while maintaining the precision and formal tone required in scientific texts).

Disciplinary variation in nominalisation patterns

While nominalisation was a common feature across all the disciplines studied, its form and function varied depending on the communicative goals of the field. In medicine and pharmacy, for example, nominalisation was heavily process-oriented, focusing on procedures, treatments, and outcomes. The high frequency of terms reflects the nature of these fields, where reporting the results of interventions or trials requires a focus on the process and outcome rather than the agent [16]. An example of nominalisation in pharmacy is below.

Example 4: The administration of the vaccine led to a rapid decline in infection rates among the studied population. (In this sentence the nominalization "administration" is derived from the verb "administer", and "decline" comes from "decline" (verb form), and this use of nominalization emphasises the procedure ("administration") and its outcome ("decline in infection rates"), aligning with the process-oriented nature of pharmaceutical reporting, where the focus is on the procedure and result rather than the agent performing the action).

In contrast, in history and geography, nominalisation often served to generalise specific actions or events into abstract entities, allowing scholars to discuss large-scale phenomena. Colonisation, urbanisation, and globalisation abstract historical or geographic events into broader trends that can be analysed as objective phenomena [4]. This use of nominalisation supports the construction of historical and geographic knowledge, which often relies on identifying patterns and trends rather than focusing on individual actions or events. An example of nominalization in geography is followed.

Example 5: The colonisation of the Americas had profound and lasting impacts on indigenous populations and global trade networks. (In this sentence the nominalization "colonisation" comes from the verb "colonise", transforming a series of specific actions into an abstract entity, and this allows the discussion to shift from individual events to a broader trend, facilitating an analysis of large-scale patterns and their long-term implications, which is central to constructing knowledge in geography).

Engineering and information technology also demonstrated unique nominalisation patterns, with a focus on technical and procedural nominalisations such as implementation, design, and optimisation. These nominalisations reflect the technical, process-oriented nature of these fields, where the emphasis is on describing procedures and outcomes rather than the individuals involved. This finding echoes the results of earlier research, which highlighted the importance of nominalisation in technical and engineering writing for achieving precision and formality [2]. An example of nominalization in information technology is followed.

Example 6: The implementation of the new encryption protocol enhanced data security and reduced system vulnerabilities. (In this sentence the nominalization "implementation" comes from the verb "implement", "encryption" from "encrypt", and "optimization" encapsulates procedural aspects of the field, and these nominalizations emphasise the processes and outcomes central to the discourse in information technology, rather than focusing on the individuals or agents involved, achieving the precision and formality characteristic of technical writing).

In a nutshell, the results of this study confirm that nominalisation plays a crucial role in shaping the structure and style of scientific discourse across a range of disciplines. While its frequency and function vary depending on the field, nominalisation consistently serves to enhance abstraction, objectivity, and conciseness in scientific writing. However, the overuse of nominalisation can pose challenges for readability and accessibility, particularly for L2 and EFL learners and non-specialist or novice readers and laymen. These findings underscore the importance of understanding both the benefits and limitations of nominalisation in ESD and suggest that further research is needed to explore how nominalisation can be used most effectively across different scientific fields.

3.2. Discussion

Chafe and Danielewicz states that nominalisations occur most frequently in academic papers, 92

occurrences per 1,000 words, as compared to 27 per 1,000 in conversations, 56 per 1,000 in lectures, and 55 per 1,000 in letters [3]. Interestingly, in these 33 discourses there are 2,107 instances of nominalisations. That means 116 occurrences per 1,000 words and in texts of biology, chemistry, pharmacy, medicine and business nominalisation happens more than 127 times every 1,000 words and in the rest of texts it exists from 95 to 108 times. This high incidence may be explained as the result of conceptual complexity of the discourses. The tone of the English scientific writing sounds more abstract and formal. Also, one powerful means of producing a lexically dense style is by using nominalisation to build long nominal groups. Since the discourse is a highly nominalised register, it is difficult to understand, especially for those who do not have the required knowledge of the subject matter.

There are several functional reasons why the language of ESD demands a very high degree of nominalisation. Firstly, it increases the objectivity for the discourse since it produces a greater concentration of the experiential meaning and a smaller incidence of interpersonal elements. Secondly, it creates thematic progression without tedious repetitions, that is, the rheme of a clause functions as the theme of the following because the grammar 'packages' the previous information by turning processes into nominal entities. As a result, chains of reasoning are structured. Thirdly, it synthesises the message in ESD. Many nominalised items have been turning into norms naturally as a process of development in English. As an effect, taxonomies and terminologies are created. This is considered the technicalising role of the nominalising process.

4. IMPLICATIONS AND CONCLUSION

4.1. Implications

The findings from this research hold important implications for both academic writing and language pedagogy, especially for disciplines such as engineering, medicine, chemistry, biology, history, business, information technology, and others. This study demonstrates that nominalisation is a pervasive feature of scientific discourse, contributing to the clarity, abstraction, and formality that characterise the texts. However, its usage varies significantly across disciplines, influencing how knowledge is constructed and communicated.

One of the key implications of this study is the need for greater disciplinary awareness in academic writing instruction. Nominalisation patterns differ across scientific fields, and an understanding of these differences can enhance both the production and comprehension of academic texts. For example, in engineering and information technology, nominalisation tends to focus on processes and technical outcomes, whereas in chemistry, business, biology, pharmacy and medicine, it centres more on procedures and results [2]. Lecturers, particularly those involved in ESP and EAP, should incorporate explicit instruction on the role of nominalisation in academic discourse. Teaching students not only how to recognise nominalisations but also when and how to employ them effectively in different disciplinary contexts will equip them with the necessary skills to produce clearer and more accurate scientific writing [11]. L2 learners often struggle with nominalisation, as it abstracts actions and agents, making texts more difficult to decode [17]. Providing targeted exercises to practice these structures, and clarifying their communicative purposes, could improve learners' writing proficiency.

A second implication concerns scientific communication. Nominalisation plays a vital role in compressing information and presenting findings in a concise, formal, and objective manner [7]. This is essential for scientific writing, where brevity and clarity are critical, particularly in fields like medicine, pharmacy, and chemistry, where results need to be communicated precisely. However, excessive use of nominalisation can lead to texts that are overly dense and challenging for readers, especially those outside the field [4].

Thus, while nominalisation can improve the professionalism and academic tone of scientific writing, it must be balanced with accessibility. Over-reliance on nominalised structures risks alienating non-expert audiences and impeding interdisciplinary collaboration. Writers should aim to use nominalisations judiciously, combining them with other grammatical structures like verb-based clauses to ensure clarity without sacrificing formality as stated in Swales and Feak [19]. This recommendation applies particularly to scientific communication targeted at broader audiences, including policymakers and the general public, who may not have the same level of linguistic proficiency as domain experts.

Another significant implication is the cross-disciplinary transferability of nominalisation. While the function of nominalisation varies by discipline, its presence across diverse fields suggests that it serves a

common linguistic purpose in creating specialised discourse [12]. Understanding these functions can foster better interdisciplinary collaboration, as researchers become more attuned to how nominalisation structures and simplifies complex ideas in their writing. Recognising these patterns can enable scientists to communicate more effectively with colleagues in different fields, enhancing both the readability and impact of their work [6]. Moreover, interdisciplinary collaborations often require researchers to explain technical concepts to those outside their immediate field, necessitating a clear understanding of how nominalisation can obscure or clarify information.

The results also have important implications for ESP teaching, particularly for L2 and EFL learners in scientific fields. The complexity and abstraction associated with nominalisation can pose significant challenges for L2 and EFL learners, who may struggle to comprehend texts with high nominalisation densities or to produce academic writing that conforms to the conventions of their discipline [5, 9]. This is particularly relevant in fields such as biology, environmental science, and business, where the ability to understand and use nominalised forms is critical for both reading comprehension and academic writing. Explicit instruction in nominalisation, particularly in how to recognise and use these forms effectively, could help L2 and EFL learners overcome these challenges [19]. By teaching students how nominalisation functions to enhance objectivity, abstraction, and conciseness, lecturers can help them develop the skills necessary to engage with academic texts in their field. Additionally, awareness of the disciplinary differences in nominalisation usage could inform more targeted ESP and EAP instruction, helping students understand how nominalisation is used in their specific discipline and guiding them in developing the appropriate writing style for their academic field [12].

While nominalisation is a powerful tool in scientific writing, the study also highlights potential challenges associated with its overuse. Excessive nominalisation, particularly in fields like economics or pharmacy, can lead to overly dense and abstract texts that are difficult to understand, especially for non-specialist readers. Thompson warns that over-nominalisation can obscure meaning and reduce clarity, making it harder for readers to follow the argument or identify the underlying processes or actions being described. This concern is particularly relevant in interdisciplinary communication, where scientists from different fields may struggle to interpret heavily nominalised texts [20].

Balancing nominalisation with other grammatical structures, such as verb-based clauses, can enhance the readability and accessibility of scientific texts. As such, Swales and Feak suggest that writers need to be aware of when and how to use nominalisation effectively, ensuring that it contributes to the clarity and precision of their writing rather than hindering it [19].

4.2. Conclusion

The research presented in this article underscores the importance of nominalisation in ESD across multiple disciplines, highlighting both its widespread use and its variable function. Nominalisation is a crucial linguistic tool for creating abstract, formal, and information-dense texts, and it contributes significantly to the objectivity and professionalism that characterise academic writing. However, its usage is far from uniform across scientific disciplines, and these differences have important implications for how knowledge is constructed and communicated.

Nominalisation is a defining feature of ESD, serving as a marker of formality and abstraction. Its ability to condense processes into abstract nouns allows for a high level of information density, which is essential in fields like chemistry, biology, and medicine. The study shows that nominalisation helps scientists achieve an objective tone by focusing on processes, results, or theoretical concepts rather than on the researchers themselves. This impersonal tone is one of the hallmarks of scientific discourse, and it is facilitated largely by the frequent use of nominalised forms.

The findings also demonstrate that the function and frequency of nominalisation vary across disciplines. While medicine and pharmacy use nominalisation to report clinical results, business and geography employ it to describe broader theoretical frameworks. Understanding these disciplinary differences is crucial for lecturers and researchers alike, as it informs both the production and interpretation of academic texts. By identifying these patterns, future studies can further investigate how nominalisation evolves within specific fields over time.

Despite its advantages, nominalisation poses challenges, particularly for L2 and EFL speakers. Its abstraction can obscure meaning, making texts difficult to read for those unfamiliar with the conventions of scientific discourse. Furthermore, overuse of

nominalisation can render texts overly dense and complex, reducing accessibility. As scientific research becomes more interdisciplinary and global, striking a balance between formality and readability will become increasingly important. Lecturers must ensure that students, particularly those in ESP and EAP contexts, are well-equipped to use nominalisation effectively while maintaining clarity in their writing.

In conclusion, nominalisation is a powerful and versatile tool in scientific writing, yet it must be used with care. Understanding its role across different disciplines can lead to more effective scientific communication, ensuring that ideas are conveyed both precisely and accessibly. Future research could explore how nominalisation patterns change in response to shifts in scientific practice and communication, particularly in the digital age.

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THÔNG TIN TÁC GIẢ

Vũ Thị Mẫu[1], Nguyễn Thị Quý[1], Nguyễn Thị Thanh Tùng[1], Hoàng Trà My[2]

[1]Trường Ngoại ngữ - Du lịch, Trường Đại học Công nghiệp Hà Nội

[2]Trường Đại học Ngoại ngữ, Đại học Quốc gia Hà Nội