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Exploring Introduction Sections in Pharmacology: A Corpus-Based Comparison of Research Articles and Textbooks

Maedeh Ghorban Taleshian[1], Heydar Zahmatkesh[2], Atefeh Nasrollahi Mouziraji[3], and Alieh Nasrollahi_Mouziraji[4]

1 Department of English, Faculty of Letters and Humanities, Azarbaijan Shahid Madani University, Tabriz, Iran; mahsaa.ghorban@gmail.com

2 Department of English Language, Faculty of Foreign Languages, South Tehran Branch, Islamic Azad University, Tehran, Iran; zahmatkesh.heydar@gmail.com

3 Corresponding author, Department of English Language Teaching, Faculty of Humanities, Ayatollah Amoli Branch, Islamic Azad University, Amol, Iran; nasrollahi.atefeh59@gmail.com

4 Department of English Language Teaching, Faculty of Humanties, Babol, Branch, Islamic Azad University, Babol, Iran; nasrollahi.alieh@iau.ac.ir

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Abstract

Genre analysis is a systematic approach to studying the structure and language of specific text types. This study investigates the genre characteristics of introduction sections in research articles (RAs) and textbooks in the field of pharmacology. A corpus of RAs and textbooks written by native and non-native authors were compiled and analyzed using corpus linguistic methods. The analysis focused on collocation, technical vocabulary, lexical density, and rhetorical features. The analysis revealed significant differences between RAs and textbooks in terms of technical vocabulary, lexical density, and rhetorical structure. Textbooks contained a higher proportion of technical words (50/3%) and jargon (54.9) than RAs, while RAs exhibited a higher degree of lexical density and a more structured rhetorical organization. The findings suggest that ESP teachers and researchers should pay attention to the genre-specific language features of introduction sections in pharmacology. This knowledge can be used to develop pedagogical materials and strategies that help students to produce effective academic writing in this discipline.

Keywords: corpus linguistics, genre analysis, collocation technical vocabulary, lexical density, rhetorical structure

1. Introduction

Since the 1960s, English for Specific Purposes (ESP) has emerged as a significant component of English Language Teaching (Anthony, 2018). ESP instruction emphasizes tailoring language learning processes to the specific needs of learners who require English proficiency for purposes beyond mere linguistic knowledge. Its proven efficacy stems from its focus on the linguistic needs of students within specific discursive communities, encompassing grammar, vocabulary, register, study skills, discourse, and gender training.

The term 'genre' originates from the Latin word 'genus' and was first used by Aristotle over two thousand years ago to describe three literary genres: poetry, novel, and drama. Over time, the concept of genre has been adopted in various domains such as literature, film, music, media, fashion, art, video games, and linguistics, each with its own unique definition (Zhou Lijie, 2023). Genres represent distinct forms of discourse that emerge in response to specific rhetorical, procedural, and content-related requirements (Devitt, 2004). They embody social expectations regarding language use, subject matter, and the interplay of these dimensions within a genre. Genre operates as a reciprocal dynamic, wherein individuals' actions shape recurring contexts of situation, culture, and genres, and vice versa.

Among the various genres in academic discourse, textbooks and research articles hold particular significance for teachers and students in all academic fields. Academic textbooks serve as essential components of academic and professional settings. They introduce novel topics and provide not only academic knowledge but also guidance for verbal behavior. According to Riazi (2003, p. 52), "textbooks play a very crucial role in the realm of language teaching and learning and are considered the next important factor in the second/foreign language classroom after the teacher."

As Risager (2020) notes, contemporary language textbooks not only provide opportunities for students to develop their communicative skills and linguistic awareness, but also contribute to their intercultural learning and citizenship education by exposing them to a diverse range of cultural and societal contexts. In many parts of the world, the English language textbook is the primary, or even sole, source of language learning for students Therefore, the quality of the textbook is crucial for students' acquisition of the language (Nordlund, 2016). Heavy reliance on the textbook is that many teachers, particularly inexperienced ones, view the textbook as an authoritative and infallible guide. Hyland (2000, p. 14) notes that "university textbooks are something of a neglected genre; little is known about their rhetorical structure and their relationship to other genres." Despite their prevalence as the most common teaching genre in academic settings, textbooks require analysis to meet the needs of teachers and learners, enabling them to effectively access and evaluate the information they contain.

Introductions hold particular significance in textbooks and research articles because they establish the rationale for the study, articulate its aims and significance, and attract the reader's attention (Swales & Feak, 2000). As the initial section encountered by readers, introductions must be engaging and informative, enticing readers to continue reading (Swales and Najjar, 1987). The rhetorical complexity of introductions makes them a challenging section to write, subject to rigorous review by editors and reviewers (Martin et al., 2014).

The study of English is often driven by practical considerations rather than a deep appreciation for the language or its associated culture (Robinson, 1991). This is particularly true for students who require English proficiency for academic or professional purposes.

Within academic texts, the introduction section holds paramount importance. The effectiveness of the introduction section is crucial in determining the publication of textbooks or research articles. It provides the foundation for understanding the subsequent content and serves as a roadmap for the reader. Consequently, it is imperative for students to grasp the multifaceted functions of introductions in both textbooks and research articles within their respective fields of study. Similarly, educators of English for Specific Purposes (ESP) can enhance their pedagogical practices by familiarizing themselves with these functions.

In the field of pharmacology, the majority of textbooks are authored in English. This has presented challenges for Iranian ESP instructors due to their limited understanding of the fundamental principles governing textbooks. Notably, while numerous studies have examined the introduction sections of research articles in various disciplines, including medical science, a comparative analysis of introductions in textbooks and research articles in the field of pharmacology remains lacking.

ESP research has extensively explored unique grammatical categories such as hedges, negation, and passivation (Anthony, 2018). However, the frequency of collocations, technical vocabulary, and jargon within the context of pharmacology has received scant attention.

In light of the aforementioned challenges, this study aims to address the challenges faced by ESP teachers and students in pharmacology due to the prevalence of English textbooks and the lack of understanding of textbook functions. This study aims to conduct a comparative analysis of textbooks and research articles in the field of pharmacology. The investigation focused on specific linguistic features, including collocation, technical vocabulary, jargon, lexical density, and rhetorical devices. The findings will enhance the teaching of pharmacology and provide a deeper understanding of the discourse conventions in this field.

2. Literature Review

2.1. English for Specific Purposes (ESP)

Over the past three decades, English for Specific Purposes (ESP) has gained widespread acceptance as a novel approach to language instruction. The genesis of ESP can be traced to the need for specialized language proficiency among learners seeking to pursue specific occupations or fields (Hutchinson & Waters, 1987). In this context, "Language is not learned for its own sake or for general education, but to facilitate entry into or enhance language proficiency within an academic, professional, or occupational setting" (Basturkmen, 2006, p. 18).

As Syahid et al. (2024) note, in the present globalized world, having a strong command of English for Specific Purposes (ESP) is increasingly essential for success in various professions. ESP encompasses sub-fields such as English for Business Purposes (EBP), English for Academic Purposes (EAP), English for Occupational Purposes (EOP), and English for Medical Purposes (EMP), each tailored to meet the communicative demands of specific contexts and job roles. As such, ESP focuses on equipping learners with the linguistic skills necessary for their specific field of study, profession, or workplace. Robinson (1991) underscores the importance of needs analysis in defining ESP, emphasizing two key criteria: (1) ESP courses are "normally goal-directed," and (2) they are developed based on a comprehensive analysis of the linguistic demands of the students' intended English-mediated activities (p. 3).

2.2. Genre

Language evolves in tandem with social, economic, and political shifts, which impact the context of discourse, the participants involved, and the role of the text itself (Salager-Meyer, 1999). Bazerman (1988) posits that advancements in science have been paralleled by corresponding developments in the language and rhetorical conventions through which scientific knowledge is primarily conveyed. The generic structure of texts produced by a given society reflects the evolving knowledge structures of that society (Halliday, 1978).

According to Pham and Bui (2021), incorporating a genre-based approach in the classroom provides a multitude of benefits for teachers and students alike. By examining the rhetorical structures and functions of various text genres, students can develop critical reading and writing skills that are transferable to other contexts, ultimately enhancing their overall communication abilities. Furthermore, teachers can leverage the genre-based approach to design lessons that are more engaging, authentic, and aligned with students' academic and professional goals, thus promoting a deeper level of language learning and proficiency.

In recent years, the concept of genre has gained significant attention in the field of language teaching and learning. Genre studies have identified multiple sources of variation within genres. Hyland (2002) investigates the relationship between socioeconomic status and variation within genres, focusing on academic writing. He found that students from higher socioeconomic status tend to have larger vocabularies and use more sophisticated and technical language in their writing while, students from lower socioeconomic status backgrounds may use more non-standard informal grammatical constructions. The purpose of a text also affects its form and content. A persuasive essay, for instance, will employ different strategies and structures than an informative report (Swales, 1990). Furthermore, the individual style of the author can also contribute to variation within genres. Authors may have their own unique preferences for language, structure, and organization, which can influence the overall tone and presentation of their texts (Hyland, 2000).

2.3. Basic Ideas for the Aviation Vocabulary Teaching Method

In Contrastive Rhetoric (CR), cultural differences in discourse structure are a significant area of study. Taylor and Chen (1991) argue that "the cultural background of the author might lead to variation of the rhetorical structures of texts, and that such variation should be considered in ESL teaching programs" (p. 319). Swales' work has been particularly influential in developing a genre-based approach to teaching academic writing to non-native postgraduate students and early-career academics (Swales, 1990). This approach draws inspiration from sociological perspectives in writing scholarship (Bazerman, 1988) while remaining rooted in ESP and discourse research traditions.

2.4. Genre-Based Analysis of Textbooks

Textbooks, as a genre of academic writing, serve the primary purpose of educating students on a particular subject matter (Bazerman, 2014). They are characterized by their comprehensive coverage of a topic, logical organization, and use of pedagogical features such as headings, subheadings, and summaries. Furthermore, textbooks employ a range of rhetorical strategies to engage students and facilitate learning. They often include real-world examples, case studies, and exercises to illustrate concepts and encourage critical thinking (Hyland, 2007). They also utilize various modes of discourse, such as exposition, argumentation, and description, to present information in a clear and accessible manner. In terms of language, textbooks typically use formal and objective language, avoiding colloquialisms and slang. However, the level of formality may vary depending on the intended audience and the subject matter covered (Dudley-Evans, 1998).

While numerous genre studies have examined rhetorical moves and their linguistic characteristics, relatively few studies have applied genre analysis specifically to textbooks, let alone move analysis that considers textbook activities, targeted abilities, and learner proficiency. This gap in

research may be attributed to the variability of textbook content based on target students' levels and goals.

Moore (2002) conducted a study comparing textbooks from sociology, physics, and economics. The study examined the frequency and types of agentive elements (participants and processes) in the textbooks to determine the extent to which expertise in these fields is attributed to specific scholars, schools of thought, or traditional wisdoms, rather than being presented in a non-attributed canonical form. The findings indicated that, in terms of metaphenomenon, economics textbook discourse exhibited greater similarities to physics than to its social science counterpart, sociology.

2.5. Collocation

Collocation is the habitual co-occurrence of two or more words in a specific language (Sinclair, 1991). Collocations are not simply random combinations of words; they are fixed expressions that have a particular meaning and are used in specific contexts. Collocations are defined as specific types of formulaic sequences and prefabricated patterns (Wray, 2000) and are considered an essential component of second language (L2) lexical competence. They can be memorized as whole units or as chunks (Sinclair, 1991).

A collocation-based analysis of textbooks reveals the frequent and patterned combinations of words that are characteristic of this genre. Collocations are groups of words that co-occur more often than would be expected by chance (Stubbs, 2002). In textbooks, certain collocations are used to express key concepts and ideas in the field. For example, in a science textbook, we might find collocations such as "scientific method," "hypothesis testing," and "experimental design."

Collocations play a vital role in the process of English language learning. EFL students require exposure to collocations because they represent a fixed combination of words that cannot be readily interchanged without losing meaning or affecting native-like usage. Therefore, developing an awareness of appropriate collocational patterns is crucial for EFL learners to achieve fluency and idiomatic expression in English. (Alfiandita, & Ardi, 2020).

2.6. Jargon

Jargon is specialized language or terminology used within a particular field, profession, industry, or group (Meyer, 2019). It comprises technical terms, acronyms, abbreviations, and idioms that are not easily understood by individuals outside that particular domain. Jargon serves as a form of shorthand communication, allowing insiders to convey complex ideas and concepts efficiently.

Jargon is employed by diverse professional and social groups in a broad and ambiguous manner to enhance communication, foster group cohesion, and exclude outsiders (Fromkin, 2003). It serves as a distinct vocabulary used by specific groups to facilitate communication and establish group identity, often preventing outsiders from fully understanding the group's discussions. Jargon is a means for communities to express emotions while maintaining their unique linguistic identity (Brown et al., 2014).

2.7. Lexical Density

Lexical density serves as a vital tool for analyzing the richness of informational density and semantic complexity of a text (Fadhil et al., 2023). Texts with high lexical density are typically more challenging to read and understand, as they contain a greater proportion of unfamiliar and specialized

vocabulary. Conversely, texts with low lexical density are easier to read and understand, as they contain a greater proportion of common and familiar words.

According to Halliday (1985), lexical density is a measure that quantifies the information and ideational richness of a text by calculating the proportion of content words (lexical items) to grammatical words (function words and grammatical markers) within a given sample. In other words, lexical density assesses how much information or meaning is conveyed through the use of lexical items, excluding those words or markers that serve primarily to convey grammatical or syntactic relationships. Laufer and Nation (1995) present a formula for calculating lexical density. It is calculated by dividing the number of content words by the total number of words in the text and multiplying by 100. To accurately measure lexical density, it is crucial to differentiate between grammatical items and lexical items. Grammatical items, also known as function words, constitute a closed system that includes determiners (e.g., articles, pronouns), prepositions, conjunctions, certain classes of adverbs, and finite verbs (Lexical items, also known as content words, belong to an open system rather than closed sets (Halliday, 1985)

Lexical density can vary greatly depending on the genre of the text. For example, academic texts typically have higher lexical density than popular fiction, as they contain more specialized and technical vocabulary. Similarly, spoken language typically has lower lexical density than written language, as it contains more function words (Laufer & Nation, 1995).

3. Research Questions

This study aimed to exploring the introduction sections in pharmacology through a corpus-based comparison of research articles and textbooks. Specifically, the following research questions were raised by the researchers:

1. Do research articles and pharmacology textbooks differ significantly in the frequency of technical terms employed in their introduction sections?

2. Is there a notable disparity between research articles and pharmacology textbooks in the utilization of collocations within their introduction sections?

3. Does the occurrence of jargon differ markedly between the introduction sections of research articles and textbooks in pharmacology?

4. Are the proportions of different word types (i.e., technical words, collocations, and jargon) utilized in research articles and pharmacology textbooks comparable?

5. Is there a significant difference in the lexical density between the introduction sections of research articles and pharmacology textbooks?

6. Do research articles and pharmacology textbooks exhibit distinct rhetorical features in their introduction sections?

4. Method

4.1. Research Design

The study employed a genre analysis approach to investigate the language and structural characteristics of introduction sections in pharmacology research articles and textbooks. A corpus of

texts written by native and non-native authors was compiled and analyzed using corpus linguistic methods, focusing on collocation, technical vocabulary, lexical density, and rhetorical features.

4.2. Corpus

The corpus analyzed in this study consisted of a collection of 20 research articles and 26 textbook chapters authored by native and non-native speakers. The articles were randomly selected from the following journals:

- The British Medical Journal (BMJ)
- The Journal of the American Medical Association (JAMA)
- Journal of Medicine and Medical Sciences (JMMS)
- Tropical Journal of Pharmaceutical Research (TJPR)
- African Journal of Biotechnology (AJB)
- East and Central African Journal of Pharmaceutical Sciences (ECAJPS)
- Journal of American Association for Cancer Research (JAACR)
- The New England Journal of Medicine (NEJM)

The textbooks were selected from websites such as Research Gate and Library Genesis. All articles and textbooks were published in the field of pharmacology between the years 2000 and 2021. Equal proportions of articles and textbooks were included in the corpus to ensure the reliability of the findings. The total word count of the corpus was 11,057. To avoid any potential bias due to word count discrepancies, an approximately equal number of words were selected from both articles and textbooks.

4.3. Analytic Tools and Components

4.3.1. Collocation

The number of collocations in the introduction sections of research articles and pharmacology textbooks was manually identified and counted. The frequency of collocations was examined per article and textbook. The following steps were followed:

1. Each data set was copied into Microsoft Word software.
2. The data was read, and collocations were highlighted in orange.
3. The number of collocations was counted and tallied.

4.3.2. Technical Words

The number of technical words used in the introduction sections of research articles and textbooks was manually investigated. Each data set was copied into Microsoft Word software, and technical words were highlighted in red. The number of technical words was then counted and tallied. As mentioned earlier, the total number of words in both research articles and textbooks was approximately equal, so the analysis was performed on an equal number of words.

4.3.3. Jargon

To examine the number of jargon terms in the introduction sections of research articles and textbooks, each data set was copied into Microsoft Word software. The data was read, and jargon terms were highlighted in blue. The number of jargon terms was then counted and tallied. As with the other variables, the analysis was performed on an equal number of words.

4.3.4. Lexical Density

This study employs the method proposed by Halliday (1985) as a foundational measure for investigating lexical density in texts. According to Halliday (1985), the average lexical density for written text typically falls between 3 and 6, with a higher index indicating a more challenging text.

4. Lexical density = (Number of lexical words / Total number of words) x 100, Where:
5. Lexical words include nouns, verbs, adjectives, and adverbs.
6. Total number of words includes all words in the text, including function words (e.g., prepositions, articles, conjunctions).

4.3.5. Theoretical Model for Rhetorical Analysis

This study adopts Swales' (1990) CARS model as a framework to analyze the rhetorical moves in the introduction sections of Research Articles (RAs) and textbooks in the field of pharmacology. Swales' (1990) CARS model is presented below:

- Move 1, establishing a territory:
  Step 1: Claiming centrality (and/or),
  Step 2: Making topic generalizations (and/or),
  Step 3: Reviewing items of previous research.
- Move 2, establishing a niche:
  Step 1A: Counter-claiming (or),
  Step 1B: Indicating a gap (or),
  Step 1C: Question-raising (or),
  Step 1D: Continuing a tradition.
- Move 3, occupying the niche:
  Step 1A: Outlining purposes (or),
  Step 1B: Announcing present research,
  Step 2: Announcing principal findings,
  Step 3: Indicating RA (Research Article) structure.

To examine the rhetorical features, all of the introductions were read, and the Moves and sub-steps related to the Moves were assigned and tabulated. The manual procedure used here is supported by Hyland (2000), who noted that computer-based "concordance procedures are useless when dealing with move structure analyses... because the schematic structure that authors deploy to shape their purposes for a particular readership are not always clearly marked linguistically but more often draw on pragmatic understandings" (p. 140).

4.4. Procedure

To fulfill the predetermined objectives of this study, both native and non-native articles and textbooks were analyzed separately regarding collocation, technical words, jargon, lexical density, and rhetorical structures.

Initially, a pilot study was conducted to ascertain whether any discrepancies existed between the introduction sections of Research Articles (RAs) and textbooks of pharmacology. Various elements were considered, including verb tense (simple present, simple past), passive voice, collocation, technical words, jargon, and lexical density. The pilot study indicated potential differences in the introduction

sections of RAs and textbooks in terms of collocation, technical words, jargon, and lexical density. Subsequently, the data underwent manual analysis.

The total word count was standardized for both research articles and textbooks. Each introduction was copied into Microsoft Word software. A color-coding system was employed to distinguish collocations, technical words, and jargons (collocations were highlighted in orange, technical words in red, and jargons in blue).

Each data set was read, and the number of collocations, technical words, and jargon were tallied. The SPSS Software was utilized to analyze the frequency of collocations, technical words, and jargon in the introduction sections of research articles and textbooks of pharmacology. Descriptive statistics (frequency and percentage) and a bar graph were employed for examination.

Furthermore, to investigate the fourth research question ("Are different word types (i.e., technical word, collocation, and jargon) used with the same proportion in research articles and textbooks of pharmacology?"), a cross-tabulation analysis (two-way Chi-square or Chi-square test for independence) was conducted. According to Pallant (2013), the chi-square test for independence is appropriate when examining the relationship between two categorical variables (word type [i.e., technical word, collocation, and jargon] and academic text type of pharmacology [i.e., research article and textbook] in the current study). Each of these variables can comprise two or more categories. The chi-square test compares the observed frequencies or proportions of cases in each category with the expected values if no association existed between the two variables being analyzed.

To obtain lexical density values, the number of lexical words and clauses were identified for each data set and then analyzed using Halliday's formula (1985) (mentioned previously). The data were transferred to the SPSS Software, tabulated, and a corresponding bar graph was generated.

For the investigation of rhetorical moves, each introduction was read, and the occurrence of moves and sub-steps was examined through Swales' CARS model (1990). These were counted and tabulated.

4.5. Statistical Analysis

This research involved the analysis of both quantitative and qualitative data. In the quantitative phase, raw data was processed using SPSS (version 25) to generate tables presenting the information in terms of frequencies and percentages. This phase examined the frequency of collocations, technical words, and jargon in research articles (RAs) and pharmacology textbooks to identify differences between them. Additionally, it investigated distinctions in lexical density between articles and textbooks, as well as variations in the occurrence of moves. In the qualitative phase, the author sought to identify the underlying reasons for each result, offering a comprehensive understanding of the data.

5. Results

To determine if any differences existed between research articles and pharmacology textbooks in terms of technical words, the frequency and percentage of technical words employed in both text types were counted (Table 1). As illustrated in Table 1, a total of 898 technical words were observed in the two text types of pharmacology (i.e., research articles and textbooks). As illustrated in Table 1, of the 898 technical words identified, a greater number (f = 452, 50.3%) were employed in pharmacology

textbooks compared to research articles (*f* = 446, 49.7%). It can therefore be asserted that the introduction sections of research articles and pharmacology textbooks differ in terms of technical words.

To investigate potential differences in collocation usage between research articles and pharmacology textbooks, the frequency and percentage of collocations employed in both text types were analyzed (Table 2). Table 2 reveals that a total of 1247 collocations were identified in the two text types of pharmacology (i.e., research articles and textbooks).

Table 1

Frequency and Percentage of Technical Words in Pharmacologic Research Articles and Textbooks

Pharmacologic text type	Frequency	Percentage
Research articles	446	49.7%
Textbooks	452	50.3%
TOTAL	898	100.0%

As depicted in Table 2, of the 1247 collocations observed, research articles utilized a greater number (*f* = 655, 52.5%) than textbooks (*f* = 592, 47.5%) in pharmacology. Therefore, it can be concluded that the introduction sections of research articles and pharmacology textbooks differ in terms of collocation.

Table 2

Frequency and Percentage of Technical Words in Pharmacologic Research Articles and Textbooks

Pharmacologic text type	Frequency	Percentage
Research articles	655	52.5%
Textbooks	592	47.5%
TOTAL	1247	100.0%

An investigation was conducted to determine whether a disparity exists between research articles and textbooks in pharmacology with respect to the use of specialized terminology (jargons). The frequency and percentage of jargons employed in pharmacologic research articles and textbooks were calculated and presented in Table 3.

The results revealed that 689 jargons were identified across both textbook and research article types in pharmacology. As depicted in Table 3, the number of jargons encountered in textbooks (*f* = 378, 54.9%) surpassed that found in research articles (*f* = 311, 45.1%). Consequently, it is evident that research articles and textbooks in pharmacology differ significantly with regard to the frequency of jargons employed.

Table 3

Frequency and Percentage of Jargons Applied in Pharmacologic Research Articles and Textbooks

Pharmacologic text type	Frequency	Percentage
Research articles	311	45.1%
Textbooks	378	54.9%
TOTAL	689	100.0%

To ascertain whether various word categories (i.e., technical terms, collocations, and jargons) are employed in equivalent proportions across research articles and textbooks in pharmacology, a chi-square analysis was conducted. An examination of the adjusted residuals (Table 4) indicated that two of the aforementioned statistics deviated substantially from expectations, exceeding the threshold of +/- 1.96. This discrepancy highlights a significant difference between the two text types. Notably, the application of 'collocations' in research articles (2.6, Adj. Residual = 2.6 > 1.96) exceeded expectations, while in textbooks, it fell short of expectations (-2.6, Adj. Residual = -2.6 < -1.96). Conversely, the use

of 'jargons' in research articles (-2.8, Adj. Residual = -2.8 < -1.96) was significantly below expectations, whereas in textbooks, it surpassed expectations (2.8, Adj. Residual = 2.8 > 1.96).

Table 4

Frequencies, Percentages and Adjusted Residuals of Word Types in Pharmacological Research Articles and Textbooks

			Word type			Total
			Technical words	Collocation	Jargon	
Text Type	Article	Count	446	655	311	1412
		% Within Paper	31.6%	46.4%	22.0%	100.0%
		Adjusted Residual	-.1	2.6	-2.8	
	Textbook	Count	452	592	378	1422
		% Within Paper	31.8%	41.6%	26.6%	100.0%
		Adjusted Residual	.1	-2.6	2.8	
Total		Count	898	898	1247	689
		% Within Paper	31.7%	31.7%	44.0%	24.3%

A chi-square analysis was conducted to determine whether the differences observed in Table 4 were statistically significant. The results (Table 5) revealed a significant difference (χ^2 (2) = 9.70, n = 2834, p = .008, p < .05). Notably, the p-value (.008) was lower than the predetermined significance level (.05). Consequently. Therefore, it can be concluded that different word types have been employed in research articles and textbooks of pharmacology with varying proportions.

Table 5

Chi-Square Test for Word Types Occurrences in Pharmacological Research Articles and Textbooks

	Value	Df	Sig. (2-sided)
Pearson Chi-Square	9.703a	2	.008
Likelihood Ratio	9.715	2	.008
Linear-by-Linear Association	2.424	1	.119
N of Valid Cases	2834		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 343.28.

To ascertain whether a distinction exists between research articles and textbooks in pharmacology with regard to lexical density, the number of lexical words, clauses, and the resultant lexical density values were calculated for both text types (Table 6). Table 6 indicates that a total of 6633 lexical words and 730 clauses were identified across research articles and textbooks in pharmacology. The overall lexical density, calculated as the ratio of lexical words to clauses, amounted to 9.12 for the combined text types.

As depicted in Table 6, the lexical density of research articles (9.79) exceeded that of textbooks (8.45) in pharmacology. Thus, this finding suggests that the introduction sections of research articles and textbooks in pharmacology differ significantly in terms of lexical density.

Table 6

Value of Lexical Density in Pharmacologic Research Articles and Textbooks

Pharmacologic text type	No. lexical words	No. of clauses	Lexical density value
Research articles	3369	344	9.79
Textbooks	3264	386	8.45
TOTAL	6633	730	9.12

To investigate the presence of distinctions between research articles and textbooks in pharmacology with respect to rhetorical features, the frequency and percentage of such features were calculated for both text types (Tables 7 & 8).

Table 7

Frequency and Percentage of Rhetorical Features in Pharmacological Research Articles

Article	Frequency	Percentage
M1S1	20	100
M1S2	19	95
M1S3	12	60
M2S1a	14	70
M2S1b	13	65
M2S1c	0	0
M2S1d	2	10
M3S1a	4	20
M3S1b	17	85
M3S2	0	0
M3S3	0	0

Table 8.

Frequency and Percentage of Rhetorical Features in Pharmacological Textbooks

Article	Frequency	Percentage
M1S1	26	100
M1S2	25	96.1
M1S3	3	11.5
M2S1a	1	3.8
M2S1b	2	7.6
M2S1c	0	0
M2S1d	0	0
M3S1a	3	11.5
M3S1b	9	34.6
M3S2	0	0
M3S3	0	0

6. Discussion

Concerning the first research question, the results indicated that the number of collocations (52.5%) used in research articles was significantly larger than the number of collocations used in textbooks (47.5%). Furthermore, the frequency of technical words utilized in textbooks (50.3%) outnumbered the number of technical words used in research articles (49.7%).

Additionally, the number of jargons applied in textbooks was considerably larger than the number of jargons used in research articles. The Chi-Square Test for Independence revealed that the differences between collocations, technical words, and jargons are statistically significant.

The reason behind these results may be due to the inherent nature of textbooks or research articles, which require more collocations, technical words, or jargons in order to elaborate on the topic. Each genre has particular communicative purposes and specific audiences.

These audiences may include researchers, doctors, lecturers, and students in the field of pharmacology. Consequently, the way authors edit or write textbooks or research articles may be influenced by the need to meet the specific needs of their audiences.

In order to investigate the value of lexical density, Halliday's formula (1985) was deployed. The findings revealed that the lexical density of research articles (9.79) is greater than that of textbooks (8.45). This indicates that research articles are lexically denser.

This higher lexical density can be beneficial for the particular audiences of research articles, such as researchers, students, and lecturers. In contrast, textbooks must be easy for students to understand and must be in accordance with students' level, which might explain the lower lexical density of textbooks in pharmacology.

The comprehensive analysis of the "introduction genre move" has shed light on the intricate processes through which writers establish their knowledge and forge connections within their respective academic disciplines (Swales & Feak, 2000). The rationale underpinning this study is presented in the introduction section, underscoring the significance of crafting an introduction that effectively resonates with the target scholarly community.

A primary objective of "move analysis" is to ascertain the dominant communicative purpose (function) of each sentence within a given text (Swales & Feak, 2000). As demonstrated in the preceding section, the frequency of move occurrences in research articles (RAs) significantly exceeds that observed in textbooks. Furthermore, both RAs and textbooks exhibit deletions of certain steps, a phenomenon possibly attributable to the distinct nature of pharmacological articles and textbooks. In the process of editing and/or composing their works, RA and textbook authors may have consciously or unconsciously employed the rhetorical style familiar to them within the academic discourse. As noted by Hyland (2017) the observed differences can be partially attributed to variations in the traditions and cultural norms within different academic contexts.

Move 1: Establishing a Territory

The high frequency of occurrence of Step 1 (claiming centrality) and Step 2 (making topic generalization) within this move (Move 1) suggests that these steps constitute defining characteristics of this move. As noted by Swales (1990, p. 144), claims of centrality represent appeals to the discourse

community, inviting members to acknowledge that the research being reported is situated within a vibrant and well-established area of inquiry. This may explain why this move is prevalent in both research articles (RAs) and textbooks.

The extensive use of topic generalization indicates that authors employ this strategy to delineate their research domain. They may perceive this phase as an effective means of providing background information, familiarizing readers with the topic, and highlighting the significance of their research. Step 3 (reviewing items of previous research) of this move is an obligatory inclusion that was not observed in a substantial number of RAs and textbooks. This omission may be attributed to the author's perception that this step is superfluous, particularly in textbooks.

Move 2: Establishing a Niche

Both research articles (RAs) and textbooks exhibit deletions in certain steps of this move, particularly Step 1c (question-raising) and Step 1d (continuing a tradition). The occurrence of this move (establishing a niche) is notably more prevalent in RAs.

Numerous experts contend that counter-claiming (Step 1a) and indicating a gap (Step 1b) constitute two of the most significant steps expected to be included in RAs. When existing research fails to provide satisfactory answers to the authors' inquiries or when they seek to propose a novel approach or methodology, they may invoke a gap. The omission of Steps 1a and 1b in certain articles and textbooks may be attributed to the distinct traditions and cultural norms within each author's academic context. This suggests that these authors did not perceive these steps as essential for inclusion. Within the textbook genre, the deletion of Steps 1a and 1b may be related to the inherent nature of textbooks, which typically do not necessitate extensive referencing to previous studies or the identification of gaps to meet the needs of the target audience. The present study's findings diverged from those reported by Alinasab et al. (2021), which revealed that expansion, reformulation, and addition were the most commonly employed genre-based revision strategies by Iranian graduate students. The results of this study suggest that the revision patterns and strategies utilized by graduate students may not be universal, but rather contingent upon the specific context, genre, and level of expertise.

As noted by Feak and Swales (2011), research questions (RQs) have been recognized as a crucial rhetorical element in RAs, guiding the construction of research reports or dissertations. However, in the context of pharmacology, which primarily deals with chemical substances and diseases, the inclusion of explicit RQs may not be deemed necessary. Instead, authors may opt to descriptively state the purposes and procedures of their study within the introduction section.

Move 3: Occupying the Niche

The occurrence of this move is significantly higher in research articles (RAs) than in textbooks. A notable observation is the frequent deletion of this move in textbooks, suggesting that it is not a mandatory feature of the textbook genre. Many textbook authors conclude their introductions by announcing the present study rather than explicitly defining its aim. They articulate the objective of their study in terms of what the research will investigate or accomplish. This practice may be attributed to the inherent nature of research, which often requires authors to move beyond simply stating the purpose and to provide specific details about their research article. This study's findings align with those of Geng et al. (2023), which suggested that writers, when seeking publication, possess a general awareness of the

steps required in constructing the introduction of a research article (RA), often covering these steps in their initial drafts.

Numerous studies have focused on the analysis of the introduction section of master's theses. Employing quantitative methods, some studies of this kind have demonstrated that most rhetorical structures (moves) were adhered to with a high degree of consistency. Comparative analysis of the results of this study with prior studies reveals that while most research articles conform to Swales' model, textbooks do not consistently follow this framework. This discrepancy may be attributed to the inherent nature of textbooks, which constitute a distinct genre with its own unique framework. Consequently, textbooks may require a different analytical model tailored specifically to their genre. In light of the rhetorical features of the introduction sections of RAs, the findings of this study align with those of previous studies, such as Chahal's (2014).

7. Conclusions and Implications

This study conducted a corpus-based comparison of the language features in the introduction sections of pharmacology research articles (RAs) and textbooks (TBs). The analysis revealed significant differences in the use of technical words, collocations, and jargons between the two types of texts.

Technical words were more frequently employed in TBs, while collocations showed a higher occurrence in RAs. Jargons were more commonly found in TBs than in RAs. Moreover, the lexical density was significantly higher in RAs compared to TBs, indicating a greater concentration of content words in the research articles.

An examination of rhetorical moves also demonstrated variations between RAs and TBs. Some steps, such as reviewing previous research, were found to be omitted in both text types, possibly due to the perceived dispensability of these elements, especially in textbooks. Other steps, including counter-claiming and indicating a gap, were omitted in both RAs and TBs, potentially influenced by author traditions and genre conventions.

Notable differences were observed in the prevalence of question-raising between the two text types. This step appeared less frequently in both RAs and TBs due to the focus of pharmacology on materials, substances, and diseases. However, authors in both genres often explicitly stated their objectives and procedures in the introduction sections.

The findings of this study hold valuable implications for various stakeholders in the domains of language teaching, material development, and pharmacology. Firstly, the identification of obligatory moves and steps in academic writing can guide language instructors in providing targeted guidance and feedback on genre conventions and rhetorical structures. As suggested by Razali and Ki (2023), incorporating collaborative writing tasks into classroom practice exposes students to various obligatory moves and fosters a supportive learning environment.

In the realm of pharmacology, the findings highlight the importance of adhering to genre conventions and tailoring language use in research articles and textbooks. By incorporating the distinct language features and rhetorical moves observed in these texts, educators can enhance students' awareness of genre-specific conventions. This knowledge contributes to the development of effective communication skills and improves the overall quality of pharmacology research and education.

Moreover, the results of this study can inform the development of pharmacology-specific teaching materials and resources, such as specialized textbooks, glossaries, and writing guides. These

materials can cater to the unique language needs of researchers, students, and professionals in the field by addressing the specific language features and rhetorical moves identified in the research. Ultimately, this leads to a more comprehensive and effective learning experience for those engaged in the study and practice of pharmacology.

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Authors' Contributions

All authors have conducted the study, collected data, analyzed and interpreted the data, and written up the manuscript.

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The authors declare that there is no conflict of interest.

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