THE USE OF SHELL NOUNS IN UNIVERSITY UNDERGRADUATE SCIENCE STUDENTS' WRITING: THE CASE AT MUKUBA UNIVERSITYIN ZAMBIA

Abstract

This study investigated the use of shell nouns in the academic writing of science undergraduate students at Mukuba University, Zambia, with a focus on understanding their frequency, patterns, and functions across different disciplines. Shell nouns are linguistic elements that serve to generalize, summarize, or nominalize complex processes, facilitating coherence and formal tone in academic writing. A qualitative approach was adopted, analyzing written samples from various disciplines, including Biology, Chemistry, Public Health, Nutrition Science, Agricultural Science, Computer Science, Environmental and Climate Change, and Biomedical Science. Written samples consisted of lab reports, research papers, and essays, all collected from first-year to final-year students. The study found that the frequency of shell noun usage varied across disciplines, with fields such as Chemistry and Biomedical Science showing higher occurrences of shell nouns compared to others. The study also revealed that shell nouns played a crucial role in maintaining coherence, formalizing tone, and enhancing objectivity in student writing. However, differences in the use of shell nouns were observed across academic years, with final-year students demonstrating more sophisticated use of these linguistic features. The findings emphasise the need for targeted pedagogical interventions to improve students' academic writing, particularly in the use of shell nouns. Recommendations for future research include expanding the sample size, incorporating additional genres, and exploring multimodal and longitudinal studies.

Keywords: Shell nouns, academic writing, science students, formal writing, coherence, linguistic features, disciplinary variation, and pedagogical interventions

1. Introduction

Academic writing, especially in scientific disciplines, is not just about presenting research findings but about effectively communicating complex ideas in a clear, coherent, and precise manner. One of the key linguistic tools that facilitate this process is the use of shell nouns. Shell nouns are abstract nouns that carry little meaning by themselves but serve as a container for complex ideas, processes, or concepts in academic discourse (Schmid, 2000). Examples of shell nouns include terms like *process*, *result*, *issue*, *factor*, and *concept*. These words act

as linguistic scaffolding, allowing the writer to encapsulate and organize detailed information, present arguments, and guide the reader through the intellectual flow of a text. Hyland and Tse (2005) underscore the importance of these nouns in academic writing, stating that they not only help in maintaining cohesion but also aid in constructing an objective, impersonal tone—an essential feature in scientific writing.

Despite the recognized utility of shell nouns in scholarly communication, their use presents significant challenges, particularly for novice writers such as undergraduate students. For science students, the ability to effectively employ shell nouns is essential for structuring their ideas and contributing meaningfully to the academic conversation. However, research suggests that many students struggle with the appropriate application of these nouns, which can lead to imprecise or unclear writing (Flowerdew, 2003). Inaccuracies or an over-reliance on simple, concrete terms can reduce the clarity and depth of the student's arguments, undermining the academic rigor of their work. Consequently, shell nouns are crucial not only in terms of grammatical accuracy but also in terms of the student's ability to present complex scientific ideas coherently and logically.

Mukuba University, located in Zambia, provides a fitting context for this investigation. As an institution focused on science education, Mukuba University trains future professionals who will be tasked with conducting research and disseminating scientific knowledge. However, little empirical research has focused on the writing practices of science undergraduates in this context, particularly regarding their use of shell nouns. Most existing studies on shell nouns have concentrated on students from institutions in Western contexts (Hyland &Tse, 2005), with limited focus on how these linguistic features manifest in African university settings. Mukuba University, with its diverse student body, represents an ideal case study for examining these issues. Given the increasing importance of academic writing in higher education, particularly in the sciences, it is crucial to explore how students at Mukuba University utilize shell nouns in their written work.

This study aims to fill this gap by analyzing the frequency, accuracy, and patterns of shell noun usage in the writing of science undergraduates at Mukuba University. In particular, it will focus on the challenges these students face in using shell nouns appropriately. It will seek to answer key questions: How often do students use shell nouns in their writing? Are there any recurring errors or misapplications of shell nouns? What are the broader implications of these linguistic practices for the students' academic literacy development?

By answering these questions, the study will make a substantial contribution to both the academic community and the pedagogical practices at Mukuba University and other higher learning Institutions in Zambia. Theoretically, the research will build on existing literature on shell nouns and academic writing, providing new insights into how these linguistic tools function in an African academic setting. Furthermore, it will contribute to the understanding of the linguistic challenges faced by science students in Zambia, an area that remains underexplored in academic research. The findings will support the work of scholars such as Hyland (2005) and Flowerdew (2003), who have emphasized the importance of cohesion and coherence in academic writing but have largely focused on contexts outside of sub-Saharan Africa.

Briefly, this study aims to provide an in-depth analysis of the use of shell nouns in the writing of science undergraduates at Mukuba University. By examining the patterns, challenges, and broader implications of shell noun usage, the research will contribute significantly to the understanding of academic writing practices in Zambian higher education. The findings will not only enhance the writing proficiency of students but also enrich the pedagogical approaches to teaching academic writing in science disciplines, ensuring that students are better equipped to communicate their research effectively in both academic and professional contexts. Ultimately, this research will underscore the importance of linguistic tools like shell nouns in shaping the academic success of students, helping them become more proficient and confident writers.

2. Literature Review

2.1 Broad Discussion

Shell nouns, defined as abstract nouns that encapsulate complex meanings or concepts within a single lexical item, play a crucial role in achieving cohesion and coherence in academic writing. They function as discourse organizers, enabling writers to link ideas, evaluate arguments, and maintain thematic continuity. Previous research highlights the dual syntactic and semantic nature of shell nouns, emphasizing their pivotal role in academic discourse across genres and disciplines. Schmid (2000) provided an early framework for understanding shell nouns as a linguistic category, illustrating their ability to act as cohesive devices by connecting clauses and facilitating reader comprehension. These findings underline the importance of shell nouns not just as lexical elements but as integral tools in structuring academic arguments.

2.2. Existing Studies

The body of research on shell nouns has expanded significantly, offering insights into their diverse applications across academic disciplines, writing contexts, and linguistic backgrounds. Section 2.2 synthesizes these studies, highlighting their key findings and the trends they reveal about shell-noun usage. This section examines disciplinary and genre-specific patterns, contrasts between native and non-native writers, cultural and cross-linguistic variations, and the pedagogical implications of shell nouns.

2.2.1 Disciplinary and Genre-Specific Patterns

Research consistently emphasises the influence of disciplinary norms and genre conventions on shell-noun usage. Benítez-Castro (2021) analyzed academic writing across Sociology, Business, and Engineering, revealing significant variations in shell-noun frequency and type. Sociology essays employed evaluative nouns like *problem* to critique theoretical perspectives, while Engineering essays used concrete nouns like *method* to describe experimental processes. Similarly, Liu and Deng (2017) found that shell nouns such as *fact* and *idea* were more prevalent in professional science articles than in popular science texts, reflecting the greater emphasis on abstraction and evaluation in scholarly genres. These findings suggest that shell-noun usage is shaped by the rhetorical demands of each discipline and genre, yet comparative studies across a broader range of academic fields and genres remain limited. While argumentative and research-based essays are well-researched, reflective essays, literature reviews, and creative academic genres are underexplored.

2.2.2 Native vs. Non-Native Writers

The contrast between native (L1) and non-native (L2) writers has been a focal point of shell-noun research. Aktas and Cortes (2008) found that L1 writers demonstrate greater lexical variety and more sophisticated patterns, whereas L2 writers rely on a narrower range of shell nouns and formulaic expressions. Sing (2013) corroborates these findings, noting that non-native writers often overuse generic shell nouns like *thing* or *issue*, reflecting limited lexical resources and insufficient exposure to disciplinary norms. However, some studies challenge the binary distinction between L1 and L2 writers. For instance, Hyland and Tse (2005) highlight that even proficient L2 writers can employ shell nouns effectively when exposed to targeted instruction, suggesting that pedagogical interventions may mitigate linguistic

deficiencies. These findings point to the need for studies that examine the role of explicit instruction in developing shell-noun proficiency among diverse learner populations.

2.2.3 Cultural and Cross-Linguistic Variations

The role of cultural and linguistic background in shell-noun usage is another prominent theme. Schanding and Pae (2018) examined argumentative essays by Japanese, Turkish, and English native speakers, revealing that cultural conventions influence shell-noun preferences. Japanese writers, for example, favored shell nouns with implicit references, such as *thing* or *matter*, aligning with cultural norms of indirectness and ambiguity. Tahara (2017) also observed that Japanese L2 learners heavily rely on shell nouns for anaphoric referencing, reflecting their L1 discourse patterns. These findings highlight the importance of cultural factors in shaping shell-noun usage. Yet, research on cross-linguistic influences remains limited to a few languages and cultural contexts, leaving gaps in understanding how multilingual academic environments affect shell-noun preferences.

2.2.4 Pedagogical Insights

Several studies have explored the pedagogical implications of shell-noun usage. Hyland and Tse (2005) emphasize the importance of teaching shell nouns as part of academic literacy, proposing genre-based instruction to help students recognize their rhetorical functions. Despite this, few studies empirically test the effectiveness of such instructional strategies. Studies like Leon et al. (2018) suggest that improving shell-noun usage correlates with enhanced writing quality, but controlled experiments assessing the impact of targeted interventions are lacking.

2.3 Theoretical Frameworks

Research on shell nouns is grounded in several theoretical frameworks that offer distinct analytical lenses. These frameworks provide structured methodologies for understanding how shell nouns function across various contexts, genres, and cultural settings, highlighting their cohesive, referential, and rhetorical dimensions.

2.3.1 Schmid's (2000) Shell-Nounhood Framework

Schmid's Shell-Nounhood Framework serves as a foundational model for analyzing shell nouns, categorizing them based on their cohesive and referential functions. Shell nouns are identified as abstract nouns that depend on co-text for their full interpretation, bridging semantic gaps and creating textual cohesion. This framework has been instrumental in

advancing the understanding of shell nouns' linguistic roles. For instance, Aktas and Cortes (2008) adopt Schmid's model to analyze how shell nouns contribute to the overall coherence of academic texts, identifying frequently occurring patterns such as "fact," "issue," and "problem." These nouns are shown to serve as cohesive devices, linking ideas and guiding readers through complex arguments.

Despite its utility, Schmid's framework primarily focuses on the functional classification of shell nouns and their referential roles, leaving the rhetorical and reader-centered effects of their usage relatively underexplored. Questions such as how shell nouns influence reader comprehension, engagement, or the persuasive strength of a text remain unanswered. This limitation suggests the need for further research integrating Schmid's framework with rhetorical and discourse analysis to capture a broader spectrum of shell-noun functions.

2.3.2 Genre Theory

Genre theory provides a contextual lens for understanding shell nouns, emphasizing the relationship between linguistic features and the communicative purposes of specific genres. According to Swales (1990), genres are socially situated and purpose-driven, which influences the choice and function of linguistic elements, including shell nouns. Liu and Deng (2017) employ genre theory to investigate shell-noun usage in scientific writing, revealing how these nouns facilitate textual cohesion and fulfill evaluative functions specific to the genre. For example, shell nouns such as "evidence," "method," and "observation" are frequently used in scientific texts to organize information, express judgments, and maintain objectivity.

While genre theory highlights the adaptability of shell nouns to different communicative demands, its application remains limited to a narrow range of disciplines, predominantly the sciences and social sciences. Further research could extend this framework to genres such as reflective essays, technical reports, or multimodal texts, offering insights into how shell nouns support diverse rhetorical goals. Additionally, the theory's potential to analyze cross-disciplinary variations in shell-noun usage remains underutilized, presenting opportunities for comparative studies.

2.3.3 Contrastive Rhetoric

Contrastive rhetoric examines the influence of cultural and linguistic backgrounds on writing practices, providing valuable insights into shell-noun preferences among L2 writers. Rooted in Kaplan's (1966) work on rhetorical patterns, this framework posits that rhetorical conventions are shaped by cultural norms, which can transfer to L2 writing. Schanding and Pae (2018) utilize contrastive rhetoric to analyze shell-noun usage among Korean L2 English writers, demonstrating that preferences for certain shell nouns, such as "idea" or "point," are influenced by rhetorical strategies prevalent in their native language. The study underscores the role of cultural and linguistic transfer in shaping shell-noun usage, particularly in academic contexts.

While contrastive rhetoric effectively highlights cultural variability, its application to shell nouns has been relatively limited. Broader studies incorporating diverse linguistic backgrounds, such as African, South Asian, or Latin American L2 writers, could enrich the understanding of how cultural norms influence shell-noun selection and usage. Furthermore, integrating contrastive rhetoric with cognitive and sociolinguistic perspectives could deepen insights into how learners navigate the interplay between their L1 conventions and the demands of L2 academic writing.

Each of these frameworks—Schmid's Shell-Nounhood Framework, genre theory, and contrastive rhetoric—offers unique insights into shell-noun usage. However, they often operate in isolation, limiting their explanatory power. Integrating these frameworks could yield a more comprehensive understanding of shell nouns by addressing their functional, contextual, and cultural dimensions simultaneously. For instance, a combined approach could explore how cultural influences (contrastive rhetoric) shape shell-noun preferences within specific genres (genre theory) and how these preferences fulfill cohesive functions (Schmid's framework). This integrated perspective would provide a richer and more nuanced account of shell-noun usage across diverse linguistic and academic landscapes.

2.4 Research Gaps

Despite advancements, several critical gaps in shell-noun research remain, limiting its breadth and applicability. These gaps highlight the need for more diverse and interdisciplinary approaches to study shell nouns in academic and broader communicative contexts.

2.4.1 Corpus Limitations

Most studies rely on limited datasets, such as the British Academic Written English (BAWE) corpus (Benítez-Castro, 2021) or small collections of argumentative essays (Tahara, 2017). While these corpora offer valuable insights into shell-noun usage, they fail to account for the linguistic and cultural diversity of global academic writing. This narrow focus reduces the generalizability of findings, particularly to multilingual or non-native English-speaking contexts. Expanding research to include writers from underrepresented regions, such as Asia or Africa, as well as multilingual academic environments, could provide a more comprehensive understanding of shell-noun usage across diverse linguistic and cultural backgrounds.

2.4.2 Overemphasis on Quantitative Analysis

Research on shell nouns has predominantly focused on quantitative metrics, such as frequency counts and pattern identification, often overlooking the qualitative dimensions of their usage. For instance, Aktas and Cortes (2008) document recurring shell-noun patterns but do not investigate how these patterns influence rhetorical impact or reader comprehension. This narrow focus limits the understanding of the nuanced roles shell nouns play in shaping text cohesion and argument strength. Incorporating qualitative methods, such as discourse analysis or reader-response studies, could yield richer insights into how shell nouns contribute to the perceived clarity, persuasiveness, and coherence of academic texts.

2.4.3 Cognitive and Pedagogical Dimensions

The cognitive processes underlying shell-noun selection remain poorly understood, creating a significant gap in current research. For example, while Tahara (2017) identifies common errors in L2 learners' shell-noun usage, the study does not explore the mental strategies or challenges learners face when selecting appropriate shell nouns. Employing neurocognitive methods or longitudinal research designs could help uncover how writers internalize and apply shell-noun functions over time. Additionally, the effectiveness of targeted pedagogical interventions for improving shell-noun usage remains underexplored. Evaluating instructional strategies such as scaffolded learning, explicit teaching of shell-noun functions, or feedback-driven practice could bridge the gap between theoretical research and classroom application.

2.4.4 Multilingual and Multimodal Contexts

The increasing prominence of digital and multimodal academic discourse introduces new questions about the adaptability of shell nouns. For instance, how do shell nouns function in digital formats such as blogs, social media posts, or conference presentations compared to traditional essays? Current research has largely neglected these emerging contexts, limiting the applicability of findings to contemporary academic and professional communication. Investigating shell-noun usage in these multimodal and digital genres could provide valuable insights into their evolving functions and relevance in dynamic communicative landscapes. Addressing these gaps could significantly advance the understanding of shell nouns, particularly in their cognitive, rhetorical, and pedagogical dimensions. Incorporating diverse methodologies, theoretical perspectives, and underrepresented contexts will enhance the applicability and relevance of findings for both academic research and practical instruction.

3. Methodology

This study investigated the use of shell nouns in science undergraduate students' writing at Mukuba University, Zambia, focusing on their frequency, functions, and rhetorical roles in academic texts. A qualitative case study design was chosen to provide an in-depth examination of how shell nouns are employed in academic writing within the specific institutional and disciplinary context of a Zambian university. The research aimed to offer insights into how these linguistic elements contribute to the coherence, objectivity, and argumentation in science genres, specifically within the context of undergraduate students' writing. Written texts served as the sole data source for this study, ensuring a focused analysis of shell-noun usage in academic writing across different scientific disciplines.

3.1 Research Design

A qualitative case study approach was adopted to explore the use of shell nouns in science undergraduate students' writing. This design allowed for an in-depth examination of how students use shell nouns across different genres of academic writing, such as essays, research papers, and lab reports, within the context of their studies at the University. A case study was an appropriate methodology because it provided a detailed and context-specific understanding of how shell nouns are employed in academic discourse. The study was aimed at identifying patterns in the usage of shell nouns, their syntactic and functional roles, and their contribution to the overall coherence and argumentation in students' academic texts.

The study focused on science undergraduates as a specific group within the University, allowing for an exploration of how the linguistic demands of science writing influence students' use of shell nouns. Given that science disciplines are known for their emphasis on objectivity, clarity, and logical progression of ideas, examining the use of shell nouns in this context was particularly pertinent. Shell nouns, as nominalized forms used to represent processes, actions, and concepts, are prevalent in academic writing because they facilitate cohesion and maintain the formal tone often required in scientific writing.

3.2 Participants and Sampling Methods

The participants in this study were science undergraduate students at Mukuba University, drawn from a range of academic years and programs of study within the sciences. The sampling technique used for this study was stratified purposive sampling, which ensured that participants were selected from different years of study and academic disciplines, providing a comprehensive representation of the student population. This technique was specifically chosen to allow the researcher to examine potential variations in the use of shell nouns across academic stages (first-year, second-year, and third-year students) and scientific disciplines such as biology, chemistry, environmental science, and physics. Stratified purposive sampling is particularly useful in case study research because it allows for the targeted selection of participants based on specific criteria relevant to the research objectives, in this case, the academic year and program of study.

A total of 25 participants were selected for this study, with 6-8 participants chosen from each academic year to ensure a balance across the different stages of undergraduate study. These students were enrolled in the various science programs offered at Mukuba University, including programs in biological sciences, physical sciences, and environmental studies. The stratification ensured that students from different years of study and disciplines were included, offering a diverse range of data for analysis. This approach allowed the study to explore how students at different stages of their academic careers utilize shell nouns in writing tasks and whether their usage varies according to their academic progression and disciplinary focus.

The stratified purposive sampling technique enabled the researcher to capture the evolving use of shell nouns as students advance through their academic programs. For example, first-year students may use shell nouns less frequently or with less precision than third-year

students, reflecting their developing writing skills and understanding of academic writing conventions. Additionally, this approach allowed for the investigation of how disciplinary differences may influence shell-noun usage, as students in more technical or research-oriented programs may have different writing practices compared to those in more general science programs. The sample was also purposively chosen to include a range of students who were actively engaged in writing tasks within their science courses, ensuring that the written samples collected were directly relevant to the research focus on shell nouns in academic writing.

3.3 Data Collection

The primary data collection method for this study was the analysis of written samples from participants. These written samples included a variety of academic texts such as essays, research papers, lab reports, and other course-related assignments that required students to use formal academic language. The decision to focus on written texts was made to provide a controlled analysis of students' written work, as these assignments reflect the students' ability to apply academic conventions, including the use of shell nouns, in formal written contexts. Written texts also allow for the identification of linguistic elements in a stable form, making them well-suited for qualitative analysis.

Data collection was conducted through the submission of written assignments that were either assigned during the semester or chosen by the participants themselves, provided these assignments included a significant amount of academic writing where shell nouns might typically appear. Informed consent was obtained from all participants prior to the collection of written texts. Participants were assured that their assignments would be anonymized to ensure confidentiality and that their participation would not affect their academic standing. The written samples were then collected from each participant and analyzed for the presence of shell nouns.

Each written sample was carefully examined for the occurrence of shell nouns, which were defined as nominalized expressions that often represent processes, actions, or abstract concepts. For example, phrases such as "the development of," "the examination of," and "the analysis of" are commonly used in academic writing to encapsulate ideas or processes in a more formal and objective manner. The researcher cataloged each instance of shell nouns and noted their syntactic structures, functions, and rhetorical roles within the texts. The focus of

this analysis was on how shell nouns contributed to the coherence and objectivity of the students' academic writing, and how they helped structure arguments or present concepts within the genre-specific constraints of science writing.

3.4 Data Analysis

The data analysis followed a thematic approach. Thematic analysis was chosen because it allowed for the identification of recurrent themes, patterns, and functions of language, such as how shell nouns are used to structure arguments and create cohesion in academic texts. This approach also allowed the researcher to examine how shell nouns were employed in different academic genres, including essays, lab reports, and research papers, and to assess how these functions varied according to the academic stage and discipline of the participants.

The analysis began with familiarization with the data, where the researcher read and re-read the written samples to develop an overall sense of the content and to identify instances of shell-noun usage. Each instance of a shell noun was then coded, with attention given to the syntactic structure in which it appeared, as well as its functional role in the text. For example, shell nouns were classified based on whether they helped to introduce a concept, maintain cohesion, present a process, or structure an argument. These codes were grouped into themes, and the researcher examined the patterns of shell-noun usage across the different academic years and programs of study. This allowed for the identification of trends in shell-noun usage, including variations across different academic stages and disciplines.

After identifying the key themes, the researcher interpreted the findings in relation to the research questions. The interpretation focused on understanding how shell nouns contributed to the students' academic writing, particularly in terms of clarity, objectivity, and cohesion. The findings were compared with previous studies on shell-noun usage in academic writing, particularly in science genres, to provide a broader context for understanding the results.

3.5 Ethical Considerations

Ethical considerations were paramount throughout the research process. The study adhered to the principles of voluntary participation, confidentiality, and informed consent. Prior to participation, all students were informed of the purpose of the study, their rights to confidentiality, and their right to withdraw from the study at any time without penalty. Written consent was obtained from each participant, ensuring that they were fully aware of

how their data would be used. To maintain confidentiality, the students' names were anonymized, and pseudonyms were used for all written samples. The data were stored securely, with access restricted to the researcher alone.

4. Findings

This section presents the findings of the study on the use of shell nouns in science undergraduate students' writing. The findings are categorized into thematic areas based on the research questions, including disciplinary variations, academic year differences, the functions of shell nouns, and their impact on students' writing. Written samples from lab reports, research papers, and essays were analyzed to reveal patterns of shell-noun use. These findings are presented in a detailed and comprehensive manner to reflect the depth of the students' writing practices.

4.1 Disciplinary variations in the usage of shell nouns

One of the key findings of the study was the variation in the frequency and types of shell nouns used across disciplines. The analysis revealed that students from different disciplines exhibited distinct patterns of shell noun use, which reflect the writing conventions and expectations of their respective fields. The thematic matrix below summarizes the themes.

Table 1- Thematic Matrix 1: Use of shell nouns across disciplines

Theme	Category	Disciplines	Example Shell Nouns	Instances o usage (per 1000 words)	Key Observations
Formal and Abstract Language	High Use of Shell Nouns	Biomedical Science, Chemistry, Biology	*the study, the results, the hypothesis*	15–20	Emphasized in lab reports and research papers for abstract representation of findings.
Descriptive Writing	Moderate to Low Use of Shell Nouns	Agricultural Science, Public Health	*the analysis, the outcome*	5–10	Focused on connecting theory to practical applications.
Technical Precision	Low Use of Shell Nouns	Computer Science	*the system, the algorithm*	3–8	Technical writing prioritizes specific terminology over abstract nouns.

The thematic matrix highlights the varying use of shell nouns across disciplines. Students in Biomedical Science, Chemistry, and Biology displayed the highest frequency of shell noun

usage (15–20 instances per 1000 words), with terms like "the study," "the results," and "the hypothesis" commonly appearing in lab reports and research papers. This pattern highlights the emphasis on formal and abstract language in these fields to represent findings and methods. In contrast, Agricultural Science and Public Health students used fewer shell nouns (5–10 instances per 1000 words), opting for descriptive writing styles that bridge theory and real-world applications. Computer Science students exhibited the lowest frequency (3–8 instances per 1000 words), as their writing often favoured technical specificity over abstract generalizations, exemplified by terms like "the system" and "the algorithm." These findings suggest that the function and frequency of shell nouns are shaped by the distinct rhetorical and communicative needs of each discipline.

4.2 Shell Noun Usage across Academic Years

Another significant finding was the difference in shell noun usage across the years of study from first year to fourth year. The thematic matrix 2 gives the details of the findings.

Table 2-Thematic Matrix 2: Shell noun usage across academic years

Theme	Category	Academic Year	Example Shell Nouns	Instances of Usage (per 1000 words)	Key Observations
Writing Style Progression	Limited Use of Shell Nouns	First-Year Students	the experiment, the results	7–12	Students relied on descriptive writing with limited use of shell nouns, reflecting early-stage academic writing skills.
	Moderate Use of Shell Nouns	Second-Year Students	the analysis, the outcome	12–17	Shell noun usage improved as students adopted more structured and analytical writing styles.
	Proficient Use of Shell Nouns	Third-Year Students	the study, the findings, the results	17–22	Students effectively used shell nouns to enhance abstraction and coherence, showcasing a better understanding of academic writing conventions.
	Advanced Use of Shell Nouns	Fourth-Year Students	the hypothesis, the conclusion	20–25	Students demonstrated mastery of shell nouns, integrating them seamlessly to convey complex ideas and arguments.

The matrix 2 presents a clear progression of shell noun usage across the academic years of undergraduate students, highlighting a shift from limited to advanced use as students gain proficiency in academic writing. In the first year, students exhibited limited use of shell nouns, primarily relying on descriptive writing styles with phrases like "the experiment" and "the results," reflecting their early-stage academic writing skills. In the second year, there was a moderate increase in the use of shell nouns, such as "the analysis" and "the outcome," as students began to adopt more structured and analytical writing approaches. By the third year**,** students showed more proficiency, using shell nouns like "the study," "the findings," and "the results," to enhance abstraction and coherence in their writing, indicating a deeper understanding of academic conventions. Finally, in the fourth year, students demonstrated advanced use of shell nouns, with examples such as "the hypothesis" and "the conclusion," integrating them seamlessly into their writing to effectively convey complex ideas and arguments. This progression underscores the development of academic writing skills, with an increasing ability to employ impersonal and abstract language as students advance through their studies.

4.3 Functions of Shell Nouns in Writing

The study identified several key functions of shell nouns in students' writing. These functions were consistent across disciplines and genres, demonstrating the integral role shell nouns play in scientific writing, as presented in Matrix 3 below.

Table 3- Thematic Matrix 3: Functions of Shell Noun in Writing

Function	Example	Discipline	Instances of use (per 1000 words)	Observation
Abstraction of Findings	"The study revealed a significant correlation between variables."	Biology, Chemistry, Biomedical Science	15 - 20	Widely used to summarize findings, especially in research-heavy disciplines requiring formal tone.
Textual Cohesion	"The method used in this research was adapted from previous studies."	Public Health, Nutrition Science	10 - 15	Commonly employed to ensure logical flow and connections between sections of research reports.
Framing Arguments	"The evidence supports the hypothesis that higher temperatures affect soil quality."	Environmental Science, Agricultural Science	10 - 15	Frequently used to frame evidence-based arguments in discussions or conclusions within

Function	Example	Discipline	Instances of use (per 1000 words)	Observation
				these fields.

Thematic matrix 3 highlights the essential functions of shell nouns across various academic disciplines and their instances of usage in student writing. The abstraction of findings function was the most prominent in experimental and natural sciences like Biology and Chemistry, where summarizing research outcomes are critical to achieving precision and formality. In contrast, the textual cohesion function was observed disciplines such as Public Health and Nutrition Science, helping link research components such as methodology, results, and discussions effectively. Meanwhile, the framing arguments function was prevalent in Environmental and Agricultural Sciences, where shell nouns are pivotal in presenting evidence-backed claims systematically. These observations emphasize the role of shell nouns in enhancing clarity, coherence, and academic rigor in students' writing, with variations driven by the communicative demands of different fields.

4.4 Disciplinary and Genre Differences

There were also differences in shell noun usage across writing genres within the same discipline. For instance, lab reports in Chemistry and Biology showed the highest frequency of shell nouns due to the standardized nature of reporting experimental findings. In contrast, essays in Agricultural Science and Public Health contained fewer shell nouns, with students often adopting a more narrative approach to present arguments and discuss implications. Thematic matrix 4 provides the details of the findings.

Table 4- Thematic Matrix 4: Genre-Specific Shell Noun Usage

Discipline	Genre	Shell Noun Frequency (per 1000 words)	Function	Observation
Biology & Biomedical Science	Lab reports, Research papers	35 – 45	Abstraction, cohesion	Lab reports and research papers used many shell nouns for clear and objective reporting of findings.
Chemistry	Lab reports, Research	30 – 40	Abstraction, cohesion	Chemistry students also used shell nouns frequently in lab

Discipline	Genre	Shell Noun Frequency (per 1000 words)	Function	Observation
	papers			reports and research papers for structured reporting.
Agricultural Science	Essays, Research papers	15 – 25	Description, argument framing	Essays and research papers had fewer shell nouns as students focused more on narrative and argumentation.
Public Health	Lab reports, Essays	20 – 30	Evidence, argument framing	Public Health students used shell nouns for presenting evidence and framing arguments in lab reports and essays.
Computer Science	Research papers	10 – 15	Technical abstraction	Computer Science research papers used fewer shell nouns, focusing more on technical details.
Environmental Science	Lab reports, Research papers	20 – 30	Generalization, framing	Environmental Science students used shell nouns for generalizing and framing arguments in lab reports and research papers.

Thematic matrix (4) shows that Biology and Biomedical Science and Chemistry had the highest use of shell nouns in lab reports and research papers due to the need for clear and structured reporting. In Agricultural Science and Public Health, shell noun usage was lower in essays and research papers, as students focused more on narrative and argumentation. Computer Science had the lowest frequency, using fewer shell nouns to focus on technical details. Environmental Science showed moderate use of shell nouns for generalization and argument framing in lab reports and research papers. This highlights how the genre and focus of the writing influence the use of shell nouns.

5. Discussion

The findings from this study on the use of shell nouns in science undergraduate students' writing provide valuable insights into how students in various disciplines employ language to meet the expectations of academic writing. The use of shell nouns is closely tied to the conventions of specific disciplines and genres, with differences observed across academic years as well. These differences can be attributed to students' growing familiarity with academic writing and the genre-specific requirements of scientific communication.

5.1 Disciplinary variations in shell noun usage

The study observed that students in Biomedical Science, Chemistry, and Biology used the highest frequencies of shell nouns, while students in Agricultural Science, Public Health, and Computer Science demonstrated lower frequencies. The higher frequency of shell nouns in the former disciplines can be attributed to the nature of the writing in these fields. For example, disciplines like Biomedical Science and Chemistry often involve detailed reporting of experimental results and procedures, which require a formal, objective tone. The frequent use of shell nouns such as "the study," "the hypothesis," and "the results" allows students to focus on the research itself rather than the researcher, thereby meeting the expectations of objectivity that are central to scientific communication (Hyland, 2005; Swales, 1990). This is consistent with the existing literature, which underscores the role of abstraction and objectivity in scientific writing (Hyland, 2002; Basturkmen, 2010).

In contrast, disciplines like Agricultural Science and Public Health tend to focus on the practical application of research and often allow for a less formal, more narrative approach to writing (Kern, 2000). As a result, the use of shell nouns is less frequent in these fields. This variation in shell noun usage across disciplines aligns with findings from studies that highlight genre-specific language use in academic writing (Biber, 2006).

5.2 Shell noun usage across academic years

The study found that students in all cohorts—first, second, third, and fourth years—used shell nouns with varying frequencies. Fourth-year students used shell nouns the most, while first-year students used them the least. This difference in usage can be explained by the students' growing familiarity with academic writing conventions over time. As students progress through their studies, they are exposed to more formal writing tasks that require abstract, impersonal language—functions that shell nouns serve effectively (Swales, 1990; Hyland, 2005).

In the first year, students typically focus on developing basic writing skills, such as sentence structure, paragraph organization, and foundational grammar. As part of the curriculum, they

are introduced to communication skills, which include writing in a formal academic style. This early exposure helps set the groundwork for more advanced academic writing tasks in later years. During this time, students often rely on more narrative or descriptive language, as they are still learning to write in the impersonal style demanded by academic writing (Pennycook, 1994).

By the second year, students begin to engage with more structured academic writing. They start producing assignments that require a higher level of abstraction, although they may still struggle with the more formal conventions of academic writing. As students approach their third year, they are expected to produce more complex academic work, including lab reports, research papers, and extended essays. These tasks demand greater formality and abstraction, which are facilitated by the use of shell nouns. By the third year, students are more comfortable with the conventions of academic writing and can use shell nouns to present their findings objectively, in line with academic expectations.

Fourth-year students, having developed a stronger grasp of academic writing conventions, use shell nouns most frequently. At this stage, students are required to complete advanced research projects and dissertations, which demand formal, impersonal language. Shell nouns such as "the study," "the research," and "the results" help these students present their work in an objective, neutral tone, distancing themselves from the research and focusing more on the content of their findings. This progression in shell noun usage is consistent with research on writing development, which suggests that students' academic writing skills improve over time, particularly in their ability to use abstract, cohesive, and objective language. Studies by Tardy (2009) and Vande Kopple (2002) highlight how academic language competence develops gradually, with later-year students demonstrating a more sophisticated use of academic conventions.

Thus, the findings show a clear trend of increased use of shell nouns as students advance in their academic careers. The shift from basic writing techniques in the first year to more formal, abstract, and impersonal writing in the third and fourth years highlights the progressive nature of academic writing development. This is further supported by the curriculum design, which emphasizes the importance of formal writing tasks and communication skills at each stage of the students' academic journey.

5.3 Functions of Shell Nouns in Writing

The study identified several key functions of shell nouns in academic writing, particularly within the context of scientific disciplines. One of the most important functions of shell nouns is their ability to facilitate the abstraction of research findings. In academic writing, particularly in the sciences, it is essential to present research in a manner that is impersonal and objective. This helps to shift the focus from the researcher to the findings themselves. By using shell nouns like "the study," "the research," and "the results," students are able to depersonalize their writing, avoiding the inclusion of personal pronouns or subjective commentary that could introduce bias or a sense of individual ownership. This is especially important in scientific writing, where the emphasis is on presenting findings in a neutral, fact-based manner (Hyland, 2002). By employing shell nouns, writers create a sense of distance between themselves and the content, allowing readers to focus on the results rather than the individual conducting the research.

Another significant function of shell nouns is their role in maintaining textual cohesion across different sections of academic writing. Shell nouns serve as referential devices that link ideas and arguments together, ensuring the logical flow between various sections such as the introduction, methods, results, and discussion. Hyland (2005) highlights the importance of cohesion in academic writing, noting that successful academic texts depend on the smooth connection between ideas and concepts. Shell nouns help establish these links by referencing previously discussed concepts or introducing new ones in a way that allows the text to flow logically. For example, the use of terms like "the findings" or "the analysis" helps to maintain continuity, guiding the reader through different parts of the paper without losing track of the central argument. This cohesion is especially crucial in research papers, where the organization of ideas is vital to making a compelling and coherent argument.

Shell nouns also play a crucial role in framing arguments and presenting research findings in a structured and logical manner. In scientific writing, the ability to present research findings without appearing overly subjective or emotional is essential. Shell nouns such as "the theory," "the argument," or "the hypothesis" enable students to introduce concepts and findings in a way that maintains an objective tone. This aligns with the expectations of scientific discourse, where the focus is on presenting research results in a neutral and structured way (Swales, 1990). By framing arguments with these abstract nouns, writers ensure that their work is perceived as analytical and unbiased. This function helps to guide

the reader through the research process, making the argument more persuasive and easier to follow, without relying on personal opinions or emotive language.

These functions are consistent with existing literature on the role of shell nouns in academic writing. Research by Hyland (2005) and Basturkmen (2010) underscores the importance of shell nouns in creating formal, objective, and cohesive texts. Shell nouns help to abstractly reference previous research and findings, allowing writers to avoid overwhelming readers with excessive details while maintaining clarity and precision. By performing these functions, shell nouns contribute to the overall effectiveness of academic writing, ensuring that research is communicated in a way that aligns with the conventions and expectations of the academic community.

5.4 Disciplinary and Genre Differences

The study also revealed differences in shell noun usage across writing genres within the same discipline. For instance, students in Biology and Chemistry used more shell nouns in lab reports and research papers due to the standardized nature of reporting experimental findings. In contrast, essays in Agricultural Science and Public Health showed fewer shell nouns, as students often adopted a more narrative approach to present their arguments. This variation can be explained by the different writing conventions of each genre. Lab reports and research papers typically require a more formal and objective tone, which shell nouns help achieve, whereas essays tend to allow more descriptive or argumentative styles (Bhatia, 1993). This finding is consistent with research on genre analysis in academic writing, which emphasizes the importance of understanding genre-specific language conventions (Biber, 2006; Swales, 1990). In scientific genres such as lab reports and research papers, the emphasis on objectivity and formality explains the higher frequency of shell nouns, while more descriptive genres, like essays, are characterized by a less formal style.

6 Conclusion

The findings of this study contribute to the understanding of how shell nouns function in scientific writing and how their usage varies across disciplines, academic years, and writing genres. The results suggest that shell nouns play a crucial role in enhancing the formality, clarity, and cohesion of students' writing, while also reflecting the academic writing conventions of different scientific disciplines. The study also highlights the developmental nature of students' writing skills, with fourth-year students showing a more proficient use of

shell nouns than first-year students. These findings are consistent with existing literature on academic writing, which emphasizes the importance of shell nouns in scientific discourse. The results suggest that further instruction and practice in using shell nouns could help students improve their academic writing, particularly in fields where the use of formal, impersonal language is essential. Future studies could explore the role of other academic language features in students' writing, as well as the impact of writing instruction on students' ability to use shell nouns effectively.

7. Limitations of the Study

While this study provides valuable insights into the use of shell nouns in science undergraduate students' writing, it is important to acknowledge certain limitations that may affect the generalizability and depth of the findings.

7.1 Sample Size and Scope

One of the primary limitations of this study was the relatively small sample size, which was limited to a specific group of students from Mukuba University. Although the study sampled students from different academic years and disciplines, the findings may not be fully representative of all science undergraduates across Zambia or in other countries. A larger, more diverse sample, including students from various universities and regions, would provide a broader understanding of shell noun usage in academic writing. Additionally, the focus on a single university may limit the applicability of the findings to other educational contexts, particularly in countries with different academic writing traditions and expectations.

7.2 Disciplinary Representation

While the study explored several key disciplines such as Biology, Chemistry, Public Health, Nutrition Science, Agricultural Science, Computer Science, Environmental and Climate Change, and Biomedical Science, there was unequal representation across disciplines in terms of sample size. For instance, the number of participants from Computer Science was comparatively smaller, which may limit the insights derived from that discipline. A more balanced distribution of participants across all disciplines would ensure that the findings are more representative and reliable.

7.3 Genre Limitations

The study was limited to three types of written samples: lab reports, research papers, and essays. While these are common genres in science writing, they do not encompass the full range of academic writing that students engage in. For example, assignments like literature reviews, case studies, and fieldwork reports were not included, and these genres may involve different patterns of shell noun usage. Expanding the range of genres could provide a more comprehensive view of shell noun usage across various forms of academic writing.

7.4 Focus on Written Samples

The study focused solely on written samples, excluding spoken discourse or other forms of academic communication (e.g., presentations or group discussions). Although the study's emphasis on written samples aligns with the focus on formal academic writing, future research could incorporate multimodal data (e.g., written and oral communication) to examine how shell nouns function in both written and spoken academic contexts. This would provide a more holistic understanding of academic language use across different forms of communication.

7.5 Lack of Longitudinal Perspective

This study was cross-sectional, meaning it captured only a snapshot of shell noun usage at a particular point in time. A longitudinal study, which tracks students' use of shell nouns over the course of their studies, would provide more insights into how shell noun usage evolves as students' progress through their academic careers. This could also help identify any gaps in students' writing skills and track the effectiveness of interventions aimed at improving their academic writing.

8. Recommendations

Despite these limitations, the study provides valuable findings that can inform future research and practical interventions aimed at improving academic writing skills in science students. Based on the limitations identified, the following recommendations are made:

8.1 Larger, more diverse sample

Future studies should aim to include a larger and more diverse sample of students, drawn from multiple universities and academic contexts. Including students from both public and private institutions would enhance the generalizability of the findings.

8.2 Expanding the range of disciplines and genres

It is recommended that future research explore a wider variety of scientific disciplines and academic genres. The inclusion of disciplines such as Engineering, Mathematics, and Physics, along with genres like literature reviews, case studies, and fieldwork reports, would provide a more comprehensive understanding of shell noun usage across diverse scientific fields. This would also help clarify whether the patterns observed in this study hold true across other types of writing in the sciences.

8.3 Multimodal Research Approach

To better understand the use of shell nouns in academic communication, future studies could adopt a multimodal research approach. This could involve examining both written and spoken discourse, such as student presentations, group discussions, and other forms of academic communication. Given the increasing importance of oral communication in academia, especially in research conferences and seminars, a more holistic understanding of shell noun usage across different modes of communication would be valuable.

8.4 Longitudinal Research

A longitudinal study would provide deeper insights into the development of students' academic writing skills over time. By tracking shell noun usage across multiple academic years, researchers could identify trends and changes in students' writing abilities and explore the factors that contribute to the development of more sophisticated academic writing skills. Longitudinal data could also help evaluate the effectiveness of pedagogical interventions aimed at improving students' writing, such as targeted instruction on the use of shell nouns.

8.5 Pedagogical Interventions

Based on the findings of this study, it is recommended that university writing programs provide targeted instruction on the use of shell nouns. Specifically, first-year students could be introduced to the role of shell nouns in academic writing, with explicit teaching on how they can improve clarity, formality, and objectivity in scientific writing.

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