Journal of Language and Literature
Vol. 24 No. 2, October 2024, pp. 510 – 522
DOI: 10.24071/joll.v24i2.9097
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The Use of English Relative Clauses by Indonesian Authors: A Case Study in Business, Engineering, and Science Journal Articles

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Abstract

The ability to effectively use relative clauses is pivotal in English journal articles, as it allows authors the flexibility to modify various noun phrases within sentences to convey clearer and more precise writing. This research explores the strategies employed by Indonesian authors from three distinct disciplines - business, engineering, and science. To accomplish this, we analyzed thirty papers published in Electrical Engineering and Computer Science, Makara Journal of Science, and Gadjahmada International Journal of Business. In total, 1453 relative clauses were collected and analyzed. A cross-classification analysis was performed to examine the distribution of relative clauses. The findings of the study indicate a preference among Indonesian writers to use non-reduced relative clauses, specifically those that serve as restrictive modifiers for objects. We also observe that the past participle is employed with greater frequency than the present participle. The results reveal that Indonesian authors prefer non-reduced relative clauses over reduced ones, opt for restrictive clauses over non-restrictive ones, and consistently favor relativizing the subject (S-form) in their relative clauses over the object (O-form). Our results also show that the choice of relative clauses is subject-specific, influenced by the distinct communicative requirements and preferences within each field. Our examination of relative clauses has provided insights into the syntactic choices, including their reduction status, restrictiveness, the use of participles, connectors, and the syntactic category modified by the clause.

Article information

Received: 8 July 2024

Revised: 6 August 2024

Accepted: 13 August 2024

***Keywords**: reduced relative clause; non-reduced relative clause; restrictive; non-restrictive; relativizing*

Introduction

The widespread use of relative clauses in academic journal articles highlights their crucial role in scholarly writing (Master, 2002; Supriyanto, 2007; Tse & Hyland, 2010; Cho & Lee, 2016; Deveci & Nunn, 2018). However, navigating these clauses becomes challenging for non-native English speakers due to

grammatical distinctions between their native languages and English (Marefat & Rahmany, 2009; Wiechmann, 2015). To delve deeper into these challenges, consider Yip & Matthews's (1991) study, which found that students in Hong Kong with a Chinese language background tend to refrain from using relative clauses to avoid errors stemming from language transfer from their mother tongue. Interestingly, the challenges encountered by English learners in using relative clauses were also documented by Park (2000) for Korean, Phoocharoensil & Simargool (2010) for Thai, and Abdolmanafi & Rahmani (2012) for Persian. In brief, English learners tend to avoid employing relative clauses, resulting in a reduced frequency of usage in their English production.

Recent studies continue to explore the nuances of academic writing in non-native English contexts. For instance, Darus & Subramaniam (2009) investigated common grammatical errors among English learners, highlighting persistent difficulties with relative clauses. Kafes (2018) focused on Turkish' English learners and emphasized the importance of explicit grammar instruction in overcoming these challenges. Studies by Chen (2018) and Zhang (2020) also provide insight into how relative clause usage varies across different linguistic backgrounds, further justifying the need for focused research on Indonesian authors. In addition, Deveci & Nunn (2018) also conducted a study highlighting the frequent use of reduced relative clauses but not addressing the challenges non-native speakers face. Their methodology primarily focused on frequency analysis, which, while useful, did not delve into the underlying reasons for the avoidance or misuse of relative clauses. Similarly, Master (2002) and Tse & Hyland (2010) provided valuable insights into the prevalence of reduced relative clauses. Still, they lacked a detailed exploration of non-native speakers' comprehension and production difficulties.

Indonesian authors of journal articles with non-native English backgrounds encounter analogous difficulties. According to Celce-Muria and Larsen-Freeman (1983), Indonesian writers may need help due to the limited range of noun phrases that can be utilized in English relative clauses. Keenan and Comrie (1977) also observe that Indonesian, Malay, and Malagasy languages, akin to Tagalog, can only relativize subjects. In contrast, English permits the relativization of subject noun phrases, direct object noun phrases, indirect object noun phrases, oblique object noun phrases, and genitive noun phrases. Therefore, it could be predicted that Indonesian writers will face difficulty constructing the four types of relative clauses proposed by Sheldon (1974), except the one related to subject relativization.

A relative clause is a subordinate clause that modifies a preceding noun or pronoun, providing additional descriptive information when simple adjectives are insufficient (Master, 2002). Among the various types of clauses, the relative clause stands out as a dynamic clause that can coexist with any noun or pronoun, functioning as the subject, object, or complement. Relative clauses can take different forms, including reduced or non-reduced, restrictive or non-restrictive, and Subject form (S-form) or Object form (O-form). The choice between reduced or non-reduced forms is a matter of the author's preference, as it does not alter the meaning. However, previous studies have shown that the reduced relative clause is more frequently used (Deveci & Nunn, 2018; Master, 2002; Tse & Hyland, 2010). The choice between restrictive and non-restrictive clauses depends on the importance of the information the clause conveys. Similarly, the use of S-form or O-form depends on what is being modified or relativized (Master, 2002).

The modification of sentences with relative clauses is categorized into four types: SS, OS, SO, and OO (Celce-Murcia & Larsen-Freeman, 1983; Cho & Lee, 2016). SS and OS stand for the subject of the embedded sentence, which is the same as the subject of the main clause (SS; e.g., *The dog <u>that jumps over the pig</u> bumps into the lion*) and the object of the main clause (OS; e.g., *The pig bumps into the horse <u>that jumps over the giraffe</u>*). Similarly, SO and OO refer to the object of the embedded sentence, which is the same as the subject of the main clause (SO; e.g., *The lion <u>that the horse bumps into</u> jumps over the giraffe*) and the object of the main clause (OO; e.g., *The dog*

stands on the horse that the giraffe jumps over). Finding parallel function relative sentences like SS and OO types was easier to understand than non-parallel function relative sentences like SO and OS types. However, producing OO-type relative clauses for Indonesian writers will be challenging, as their mother language lacks the same pattern as English.

Reduced and non-reduced relative clauses provide descriptive information about a noun or pronoun. The non-reduced relative clause, also known as the full form, includes a relative pronoun followed by an active or passive verb. On the other hand, the reduced relative clause is a shorter form that maintains the same meaning but does not include a relative pronoun such as "who," "which," or "that," and omits the verb "be." English allows for transforming a relative clause into a reduced form due to the presence of non-finite verbs, typically indicated by the past participle. The following examples illustrate this transformation:

1. a. *The respondents who participated in this study are contract lecturers at various Muhammadiyah universities.*
   b. *The respondents participated in this study are contract lecturers at various Muhammadiyah universities.*
2. a. *The survey results have obtained 182 contract lecturers who are willing to be respondents.*
   b. *The survey results have obtained 182 contract lecturers willing to be respondents.*
3. *Employees who have affect-based trust in their supervisors could improve the quality of the relationship between themselves and their supervisors.*
4. *The quality of leadership-subordinate relationships, which is accompanied by a sense of affect-based trust, is expected to mediate the influence of interpersonal and informational justice on OCB.*

In sentence (1b), the reduced form of (1a), the relative pronoun "who" is omitted. Despite this reduction, the non-finite verb "participated" function remains the same, modifying the subject "the respondents." Similarly, in sentence (2b), a reduction occurs from (2a) by omitting the relative pronoun "who" and the verb "are." The function of the reduced clause remains unchanged, modifying the object "contract lecturers." As the reduced relative clause primarily functions to modify a noun, it can realize various functions, such as modifying the subject, object, complement, or any other noun category.

A restrictive clause, also known as a 'defining relative clause,' provides essential information about the antecedent in the main clause, which is necessary for the complete identification of the noun. In contrast, a non-restrictive relative clause, or 'non-defining relative clause,' provides supplementary information that is not essential for the precise identification of the noun and, therefore, can be omitted without affecting the sentence's meaning (Downing, 2015).

Sentence (3) illustrates a restrictive clause in the sentence. The omission of the defining clause would render the sentence incomplete and unclear. The sentence's subject is no longer simply “employees” but “employees who have affect-based trust in their supervisors”. Sentence (4) provides an example of a non-restrictive clause. In this case, the relative clause offers additional information about the antecedent, “The quality of leadership-subordinate relationships,” but does not define it.

This study explores how Indonesian authors use relative clauses across business, engineering, and science disciplines. Previous studies reported that clarity in conveying technical information is crucial in engineering (Bazerman & Prior, 2004). In science, precision contributes to objective information (Swales & Feak, 2012), while in business, effective communication impacts negotiations, reporting, and decision-making (Guffey, 2013). Researching the topic in Engineering, Science, and Business contexts is essential because each field has unique communication needs and technical requirements. In other words, this study would highlight how authors adapt their linguistic choices to precisely meet the demands of their research areas. It represents a pivotal step toward a deeper understanding of how language can be finely tuned to

communicate across diverse academic contexts effectively.

Our study aims to provide detailed insights into Indonesian authors' strategies in handling the intricacies of relative clauses in academic writing, contributing a fresh perspective to existing literature. A research question is formulated: how do Indonesian authors use different relative clauses across engineering, science, and business articles? We would supplement the descriptive findings with quantitative analysis. By doing so, we hope to unravel how Indonesian authors tackle relative clause challenges across diverse disciplines and to what extent they adopt clauses to meet communication demands. Moreover, this study aims to fill the gap in understanding the nuances of relative clause usage among Indonesian authors by incorporating quantitative and qualitative approaches. The quantitative aspect will involve a frequency analysis of relative clause usage across the selected disciplines, while the qualitative aspect will be useful to provide an explanation of the numerical phenomena and patterns identified in our research data.

Methodology

We selected three Scopus-indexed journals listed in SINTA to source data for this research. Sinta is an abbreviation of 'Science and Technology Index'. The online scientific platform, overseen by the Ministry of Education and Culture, Research and Technology, provides a curated list of nationally authorized journals that adhere to the established requirements of journal quality. Furthermore, this web-based research information system offers convenient access to publications from Indonesian higher education and research institutions while evaluating their performance.

The chosen journals are the Indonesian Journal of Electrical Engineering and Computer Science (IJEECS), Makara Journal of Science (Makara J.Sci), and Gadjahmada International Journal of Business (GamaIJB). Each of these journals represents distinct academic domains. IJEECS serves as the flagship journal for electrical engineering and computer science, encompassing telecommunications and information technology applications, applied computing, instrumentation and control engineering, electrical engineering (power), and electronics engineering. Makara J.Sci is a representative journal for interdisciplinary research in the material sciences (e.g., physics, biology, chemistry), biochemistry, genetics, and molecular biology (e.g., microbiology, physiology, ecology, taxonomy, evolution), and biotechnology. GamaIJB is a key journal in the field of business, covering areas such as marketing management, finance management, strategic management, operation management, human resource management, e-business, knowledge management, management accounting, management control systems, management information systems, international business, business economics, business ethics, sustainability, and entrepreneurship.

Our selection of these journals is founded on the opportunity to explore the commonalities and distinctions within their respective academic writing styles, aiming to understand how Indonesian writers employ relative clauses and pronouns in these distinct areas. To carry out our analysis, we examined ten journal articles, each representative of one of these disciplines, to discern trends in the usage of relative clauses and pronouns (Celce-Murcia & Larsen-Freeman, 1983; Master, 2002; Downing, 2015; Cho & Lee, 2016). Our methodology used the "Find" function to locate relative clauses using relative pronouns like 'that,' 'which,' 'who,' and 'whose,' followed by manual tabulation. Similarly, relative clauses without relative pronouns were examined manually, with careful scrutiny of each sentence featuring such structures. We did not categorize the data based on section articles (e.g., introduction, method, result) as this study aims to describe the use of relative clauses in general. To ensure data credibility, we adhered to a rigorous data collection process, involving multiple rounds of verification and cross-checking to ensure accuracy and consistency in identifying and categorizing relative clauses. Table 1 presents a sample of our data collection.

A corpus is a vast compilation of texts in spoken and written languages that machines can read (Gries, 2009). Machine-readability of a corpus refers to its storage in a plain text format and UTF-8 encoding, enabling it to be processed on many computer platforms, such as Excel or the programming language (Rajeg et al., 2018). The increasing utilization of data science in corpus linguistics has led to recent advancements in quantitative linguistics for conducting statistical analysis, especially in Malay and Indonesian (Denistia & Baayen, 2019; Denistia et al., 2022; Rajeg & Rajeg, 2023; Mohamed & Jared, 2024). Using a corpus-based analysis allows for a systematic and large-scale examination of language use, providing robust and empirical data.

The corpus-based analysis involves the empirical study of language based on real-life text samples (Arnon & Priva, 2013; Tomaschek et al., 2018; Tian & Baayen, 2022; Denistia et al., 2024). We compiled a corpus of 1453 sentences containing relative clauses from the articles. The database's word tokens were 35872, and the word types were 6708. In our database, we included several pieces of information related to 1) whether the clause is reduced or not, 2) whether the clause is restrictive or not, 3) what connector introduces the clause, and 4) what syntactic category is modified by the clause. The classification of modifying X (denoted by the "ModX" column in the database) consists of 4 levels, namely OO, OS, SO, and SS, following (Sheldon, 1974; Ioup & A, 1977; Wong, 1991; Abdolmanafi & Rahmani, 2012; Cho & Lee, 2016). In this study, we applied the frequency distribution (Baayen, 2005) and cross-classification analysis (Fienberg, 1980) to identify patterns and trends in the usage of relative clauses across different disciplines. By analyzing a large corpus of journal articles, we can obtain detailed insights into the linguistic strategies employed by Indonesian authors, helping us understand how they navigate the complexities of relative clauses in academic writing.

Table 1. Examples of entries in the relative clause database: Red: reduced, Res: restrictive, Con: connector, Part: participle, ModX: modifying X.

Field	Example	Red	Res	Con	Part	Mod X
Business	In addition, a comparison of the number of users of P2P lenders and the productive age population of Indonesia shows that there are still many people *who do not use P2P lending*.	False	True	who		OS
Business	Globally, the funds *invested in fintech in various countries* reached $98 billion in the first half of 2021	True	True		past	SS
Engineering	The hardware is mostly made up of an Arduino and a pulse width modulation (PWM) to direct current (DC) converter, *which can be easily installed in electric vehicle*.	False	False	which		OS
Engineering	Five samples with unusual total energy usage (largely deviating from the average of the sample population) were then excluded, *leaving only ten samples*.	True	False		present	SS
Science	New methods for the evaluation of accuracy and precision are mentioned in the latest edition of the United States Pharmacopoeia (USP), whereas other validation parameters, *that is, selectivity, linearity, range, and robustness*, remained relatively unchanged.	False	False	that		SS
Science	This present review will focus on the implementation and discussion of the accuracy	True	True		past	OS

Field	Example	Red	Res	Con	Part	Mod X
	and precision evaluation *based on the current USP and Indonesian pharmacopoeia*.					

Results and Discussion

A relative clause is defined as a clause that provides descriptive information about a noun or pronoun. A non-reduced relative clause displays a relative clause's complete element, consisting of a relative pronoun followed by an active or passive verb. In contrast, a reduced relative clause is a clause that is reduced to a shorter form without altering its meaning. Turning the relative clause into a reduced relative clause can be made possible in English as it has so-called non-finite verbs headed by a participle. Thus, a reduced relative clause is not marked by relative pronouns such as who, which, or that.

Regarding the challenge of relativization faced by Indonesian authors, a consistent trend emerges, emphasizing a preference for relativizing the subject (SS and OS) in various forms of relative clauses. Notably, authors often employ a strategic shift by adopting the passive voice when faced with the need to explain an object. This pragmatic choice facilitates the transformation of the object into the subject within the passive sentence structure, streamlining the process of relativizing the object.

We analyzed all instances of relative clauses from three different fields of subject, including both non-reduced (892 data) and reduced (561 data) forms, restrictive (1121 data) and non-restrictive (332 data) clauses, the use of participle in reduced form (403 data for past participle and 158 data for present participle), and what syntactic category is modified by the clause (5 data of SO, 6 data of OO, 398 data of SS, and 1045 data of OS). Generally, Indonesian authors use non-reduced and restrictive relative clauses that modify objects. Furthermore, our data show that the past participle is more frequently used than the present participle regarding the reduced relative clause. The following analysis will compare each classification (e.g., reduced versus non-reduced and restrictive versus non-restrictive) by subject (i.e., business, engineering, science).

1. Reduced versus non-reduced clauses

An insightful finding from this research lies in the distinct distribution of reduced and non-reduced clauses within the three academic disciplines. In terms of distribution, it can be observed that business articles employ a greater proportion of non-reduced forms than those in engineering and science. As shown in the left panel of Figure 1, business articles preferred non-reduced forms more than engineering and science articles. The reason for this is to strategically enhance context and persuasiveness to align with communication objectives. This choice suggests a tendency toward greater clarity and explicitness in conveying information, as non-reduced relative clauses provide more detailed and specific information about the modified noun.

To further support the preference for non-reduced forms in business articles, consider the following examples:

5. *This paper examines the factors <u>that make Indonesians avoid P2P lending</u>.*
6. *Further, the Minister for Communication and Information stated that from 2018 to August 17, 2021, the Ministry of Communication and Information in Indonesia cut off access to 3,856 sources of fintech-related content <u>that violated the laws and regulations, including unauthorized/illegal online lending platforms</u>.*

Sentence (5) utilizes a non-reduced relative clause, “that make Indonesians avoid P2P lending”, to provide comprehensive details about which factor becomes the research focus in the article, enhancing the reader's understanding of the context and ensuring the information is explicit and detailed. Similarly, Sentence (6) uses a non-reduced relative

clause to specify the timeframe and actions taken by the Ministry, adding clarity and detail that is essential for understanding the extent and nature of regulatory actions. Examples (5) and (6) from business articles emphasize the strategic use of non-reduced relative clauses to enhance context and persuasiveness.

By providing more detailed and specific information about the modified noun, authors in business disciplines ensure that their communication is clear and explicit, aligning with the objectives of academic and technical writing (Guffey, 2013).

Conversely, engineering publications primarily favored the use of reduced forms. This finding aligns with the field's demand for precise and concise technical communication. This distribution suggests a subject-specific tendency in selecting relative clause types, probably influenced by the distinct communicative requirements and preferences within each field. Here are two examples from our data:

7. The hardware, made up of an Arduino and a pulse width modulation (PWM)-to direct current (DC) converter, can be easily installed in electric vehicle.
8. The throttle curve can be adjusted to avoid sudden jump or shock effect using the software dedicated to the electric vehicle.

Sentence (7) demonstrates how reducing the relative clause results in a more concise sentence, eliminating "which is" words while retaining essential information. This conciseness is crucial in technical writing, where clarity and brevity are valued. In addition, Sentence (8) replaced "that uses" with "using", making the sentence more direct. This simplification aligns with the need for precision in technical writing, ensuring the information is conveyed efficiently. Sentences (7) and (8) illustrate how reducing relative clauses can streamline technical descriptions, ensuring that information is conveyed efficiently and clearly (Bazerman & Prior, 2004; Swales & Feak, 2012).

Cross-classification is conducted to determine whether there is a statistically significant over-representation or under-representation between the variables under investigation (Denistia et al., 2022; Denistia & Baayen, 2019, 2022). The presence of blue and purple hues signifies an over-representation of observed data concerning the expected data within the corpus. The colors red and pink indicate under-representation, suggesting that the observed data is less than the desired data within the corpus.

Figure 1 (right panel) presents the mosaic plot for cross-classifying the clause forms by subject. Cross-classification refers to the process of categorizing a single variable into multiple categories. In this instance, we categorize two clause forms (reduced and non-reduced forms) into three subjects (business, engineering, and science). Notably, non-reduced clauses were over-represented in business articles, reinforcing that authors in this field prefer using these clauses. Conversely, engineering articles exhibited a pronounced over-representation of reduced clauses, underscoring the prevalent use of this relative clause type in engineering publications. Our data confirms that non-reduced clauses are over-represented in business articles. In contrast, reduced clauses are over-represented in engineering articles ($\chi^2_{(2)}$= 33.636, p < 0,0001). This finding is consistent with Master's (2002) finding, demonstrating that authors in technical research articles used more reduced forms than non-reduced ones.

Journal of Language and Literature
ISSN: 1410-5691 (print); 2580-5878 (online)

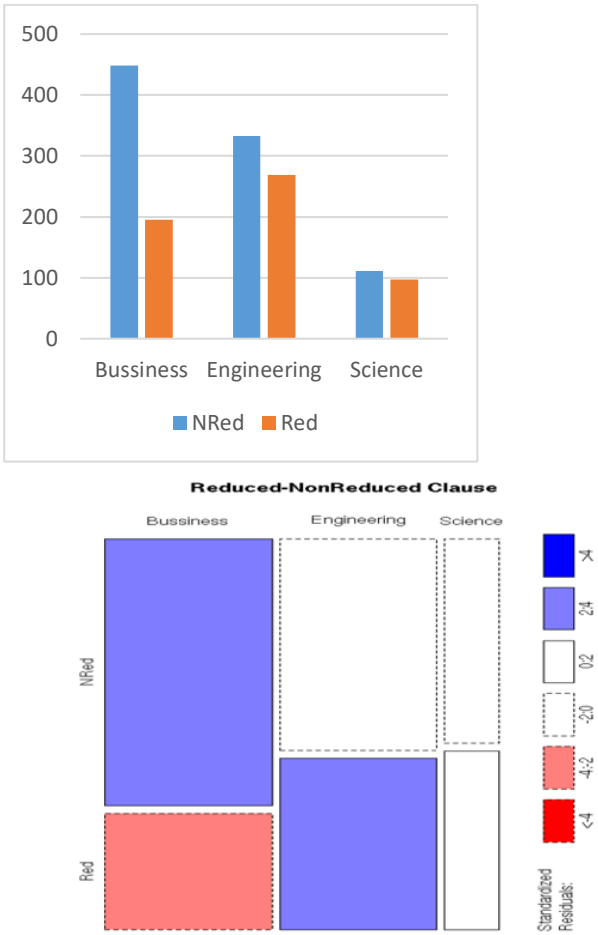
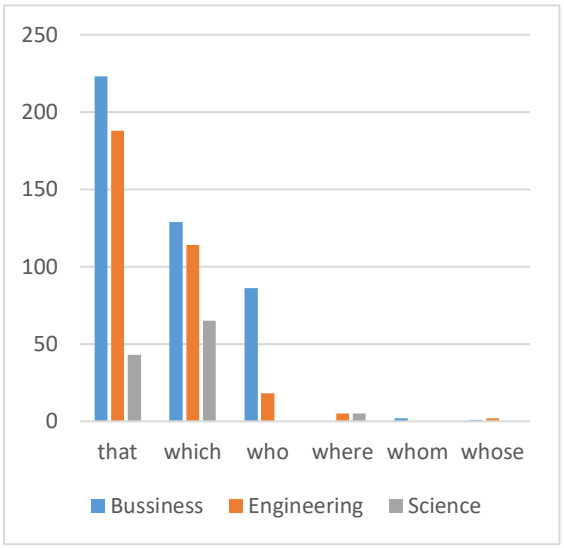


Figure 1. Left: Count distribution of non-reduced and reduced clauses among three subjects: business, engineering, and science (NRed = NonReduced clause and Red = Reduced clause). Right: Cross-classification of the non-reduced and reduced clauses in three disciplines of research articles.

The key distinguishing factor between non-reduced and reduced forms lies in the presence of connectors, which are absent in the reduced form. An examination of the connectors employed in non-reduced clauses emphasized the prevalence of 'that,' 'who,' and 'which.' We found that the most commonly used connectors for non-reduced clauses are 'that', 'who', and 'which'. The other connectors (e.g., 'where', 'whom') appear in less than ten counts in our corpus. Interestingly, as presented in Figure 2, although 'that', 'who', and 'which' are primarily found in business publications, the Chi-square test confirms that 'who' is over-represented for business articles and 'which' is over-represented in science articles ($\mathcal{X}^2_{(4)}$= 73.956, p < 0,0001). The intriguing nuances in their usage are worth noting, particularly in business publications. 'Who' exhibited an over-representation, indicating a specific preference within this field, while 'which' stood out in science articles. This variation underscores the discipline-specific subtleties in connector usage, likely linked to the intricacies of these subjects and their distinct writing styles.

In brief, our analysis of connector choices within non-reduced clauses unveils nuanced patterns, with 'that,' 'who,' and 'which' extensively utilized. These choices reflect the authors' deliberate efforts to enhance precision and clarity, showcasing unique stylistic distinctions within each discipline. Notably, 'who' is prominent in business articles, emphasizing the human element, while 'which' prevails in science articles,

potentially aiding in technical attributes and categorization.



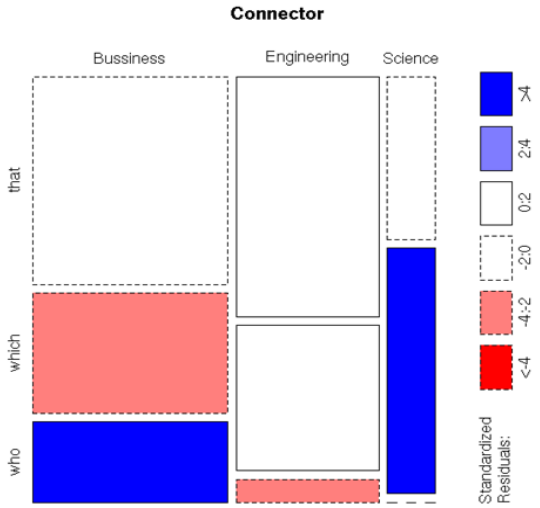


Figure 2. Left panel: Count of connectors in non-reduced clauses among three subjects: business, engineering, and science. Right panel: Cross-classification of the connectors in non-reduced clauses occurring in three disciplines of research articles.

A notable distinction arises in the use of participle forms within reduced clauses. Engineering articles predominantly employ past participles, aligning with the technical nature of the field, while science articles prefer present participles to enhance clarity in explaining complex scientific concepts. Examining restrictive and non-restrictive clauses underscores the authors' meticulous consideration of the importance of information. The prevalence of restrictive clauses in business and engineering articles signifies the necessity for precise entity identification. Conversely, although primarily present in business publications, the proportion of present participles did not align with the cross-classification results. The analysis revealed that present participles were significantly over-represented in science articles, implying a unique linguistic choice in scientific writing.

As shown in Figure 3, for reduced clauses, we observed that past participles dominantly occur in engineering articles. Furthermore, this finding is supported by the over-representation of the past participle in engineering articles. However, the proportion of present participles, which by number, mainly occur in business publications, is not reflected in the cross-classification as the use of present participles is over-represented in science articles ($\mathcal{X}^2_{(2)}$= 33.061, p < 0,0001). This preference may stem from considerations of tense and the nature of the action described. The past participle is often employed when describing completed or past actions, which might be more relevant in academic and technical writing. Additionally, using the past participle in reduced relative clauses can contribute to brevity and conciseness in writing.

Journal of Language and Literature
ISSN: 1410-5691 (print); 2580-5878 (online)

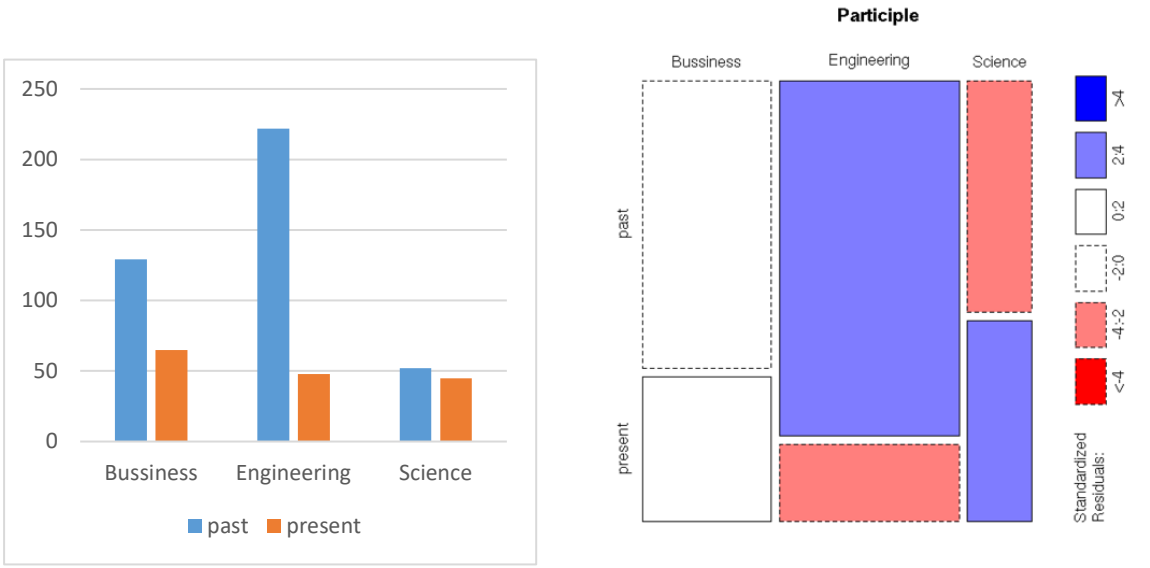


Figure 3. Left panel: Count of participle forms in reduced clauses among three subjects: business, engineering, and science. Right panel: Cross-classification of participle forms in reduced clauses in three research articles disciplines.

2. Restrictive versus non-restrictive clauses

The form of restrictive and non-restrictive clauses depends on the degree of importance of the information brought in the clause. A restrictive clause, sometimes called a 'defining relative clause,' provides essential information about the antecedent in the main clause, which is necessary for the complete identification of the noun. In contrast, a non-restrictive relative clause or 'non-defining relative clause' provides supplementary information that is not essential for the precise identification of the noun so that it can be omitted without affecting the contents of the sentence. As shown in Figure 4 (left panel), our data show that restrictive clauses are prevalent for business and engineering articles. The prevalence of restrictive clauses in business and engineering reflects the need for precise and unambiguous communication. In contrast, the higher usage of non-restrictive clauses in science articles may signify a commitment to enhancing clarity and the ease of comprehension within the often complex scientific subject matter.

Non-restrictive clauses are primarily used in business discipline. However, the proportion of non-restrictive clauses is statistically over-represented in a science discipline ($\mathcal{X}^2_{(2)}$= 58.902, p < 0.0001) (see right panel of Figure 4). This implies that the scientific discourse in Indonesian-authored research articles incorporates non-restrictive clauses more than expected. The overrepresentation of non-restrictive clauses in science articles reflects a prioritization of clarity when conveying intricate scientific content. This practice may stem from the inherent complexity of scientific concepts and the desire to ensure clarity and comprehensibility for a broader audience. Restrictive relative clauses are typically employed to define or identify the noun they modify, indicating that Indonesian authors prioritize providing precise details that directly contribute to understanding the main clause. Our research also revealed an apparent inclination towards using restrictive relative clauses, which is consistent with Swales & Feak (2012) in that the ability to use relative clauses effectively can contribute to the precision and coherence of scientific discourse. These findings highlight the role of these distinct clause types in conveying crucial information and offering supplementary details, ultimately enhancing our understanding of how these linguistic choices vary among different subjects.

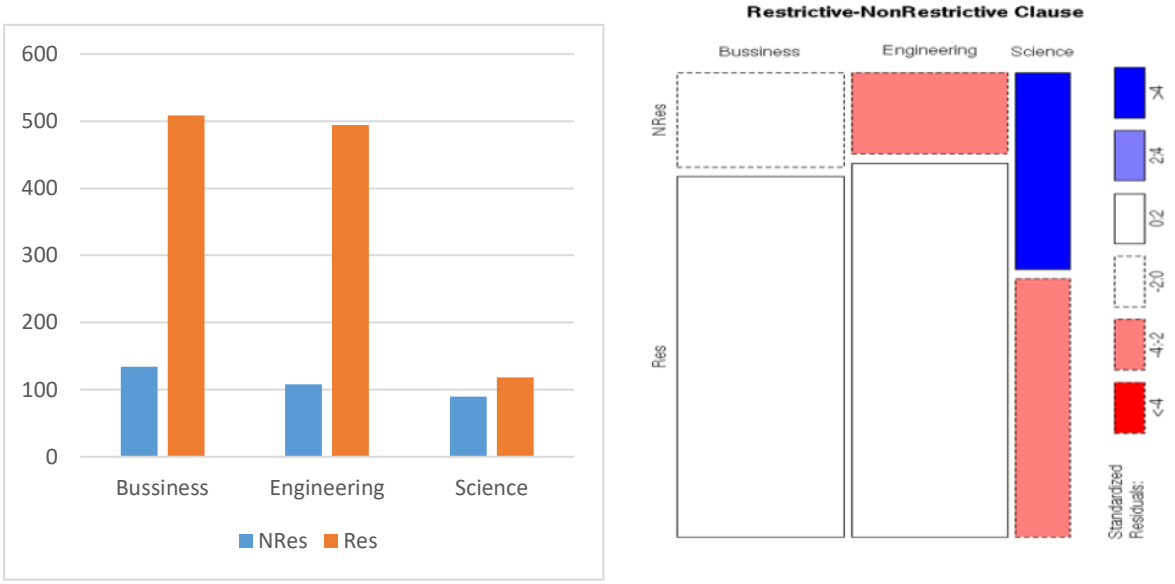


Figure 4. Left panel: Count of participle forms in restrictive and non-restrictive clauses among three subjects: business, engineering, and science (NRes = Non-Restrictive clauses, Res = Restrictive clauses). Right panel: Cross-classification of restrictive and non-restrictive clauses in three different disciplines of research articles.

Conclusion

This study aimed to explore how Indonesian authors use relative clauses across different disciplines—business, engineering, and science—and how these usages meet their specific communication needs for each discipline. By analyzing 30 journal articles, we identified significant differences in the use of reduced and non-reduced relative clauses, restrictive and non-restrictive clauses, and participle forms. Business articles showed a preference for non-reduced relative clauses to enhance context and persuasiveness while engineering articles favored reduced clauses for precision and conciseness. The choice of connectors such as 'that,' 'who,' and 'which' varied significantly between disciplines, reflecting unique stylistic preferences. Engineering articles predominantly used past participles in reduced clauses, aligning with the technical nature of the field, while science articles preferred present participles for clarity in explaining complex concepts. Restrictive clauses were more prevalent in business and engineering, highlighting the need for precise entity identification. In contrast, non-restrictive clauses were more common in science articles to emphasize clarity and comprehension.

In essence, this research provides valuable insights into Indonesian authors' linguistic strategies across three academic disciplines (engineering, business, and science). Our initial findings emphasize the importance of adapting writing styles to meet specific communicative demands, ultimately enhancing the quality and clarity of academic writing, especially for business versus science articles. Language educators can draw invaluable insights from this research as understanding the differences helps in tailoring linguistics strategies to improve academic writing skills for students in business, engineering, and science programs. Due to our relatively small corpus in relative clauses (1453 sentences), we suggest future studies consider more extensive and more diverse corpora (e.g., linguistics article, psychology article).

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