

# **Exploring nominalization and lexical density deployed within research article abstracts: A grammatical metaphor analysis**

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## **ABSTRACT**

In research articles published for international reputable journals, the crucial role of abstracts to attract readers, especially reviewers or editors, is not in doubt. The article is expected to not experience direct desk rejection due to non-impressive and persuasive lexical choices in the abstract for further reading. This paper proposes a corpus study to scrutinize ideational grammatical metaphor (IGM) from the abstracts of successfully published articles in four applied linguistic quality indexed Scopus journals (Q1 and Q2) managed by Asian countries. The data were analyzed based on Halliday's SFL framework focused on the realization of IGM in nominalization and lexical density. The pattern of IGM examined was on the transference of process and quality nominalization through morphological derivations. The findings show that the shift from process to thing dominates the other with many variations of suffixes within the words. In addition, the abstracts' lexical density results ranged from 45 to 72 percent. Thus, it is suggested that English teachers consider raising students' awareness of nominalization to produce lexically dense but informative texts in their academic writing classes.

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## **1. Introduction**

With the high demand for writing opted for international standards for various purposes, scholars submit their articles to reputable international journals. Such publications are obligatory for pursuing a higher level of education or career. Even though highly accredited journals have numerous choices in English, being accepted in those journals is never easy. In fact, many articles could instantly be rejected or so-called ‘desk rejection’ even before the editors read the whole text, but perhaps only the abstract. Therefore, the rhetoric of abstracts should be given special attention by the ‘author abstract’ (Koltay, 2010), especially in the way they demonstrate their ability in lexically dense but informative writing. Although with the advance of technology, writers may be helped by the generated AI such as ChatGPT to write abstracts, yet this remains detectable (Gao et al., 2023).

An abstract is part of the academic writing genre whose role is to either mention the research method employed or highlight newness obtained from the data. The first role is called ‘indicative abstract’ which shows the design of the research, while the latter is ‘informative abstract’ which focuses on underlining the remarkable findings of the study (Swales, 2012). Nevertheless, an abstract of a research article needs to be not just outlining the article or playing as the miniature of the whole writing but also has to impress the readers (Gustilo et al., 2021), demonstrate the authors’ stance (Hyland & Tse, 2005), indicate formality (Kondowe, 2014), follow the international discourse community rhetoric (Basthomi, 2006), and perform density in its completeness (Ezeifeika, 2015).

Lexical density within academic writing can be characterized by the use of nominalization as the most powerful resource of lexical packing known as a grammatical metaphor (Ezeifeika, 2015) and to capture the complexity of the semantic dimension of the academic genre (Ryshina-Pankova, 2015). Nominalization is a form of the complex noun phrase, which contributes to the richness of the clauses and increases the density of the lexical words. Lexical density is considered to be an important indicator of advanced academic writing linguistic features (Biber et al., 2013 as cited in Lei & Yang, 2020; Nasserri & Thompson, 2021). However, there seem to be only few studies on research article abstracts related to the linguistic features which include the lexical choice for economical yet rich information writing using nominalization as part of ideational grammatical metaphor deployment. This study could contribute to the development of the academic writing genre, especially in abstract writing for reputable publications.

This study investigates research authors’ ideational grammatical metaphor (IGM) in their article abstracts to show lexical density in their academic writings through nominalizations. The explorations are in the following questions:

1. How do the research writers employ nominalizations in the realization of ideational grammatical metaphors within their research abstracts and their frequency?

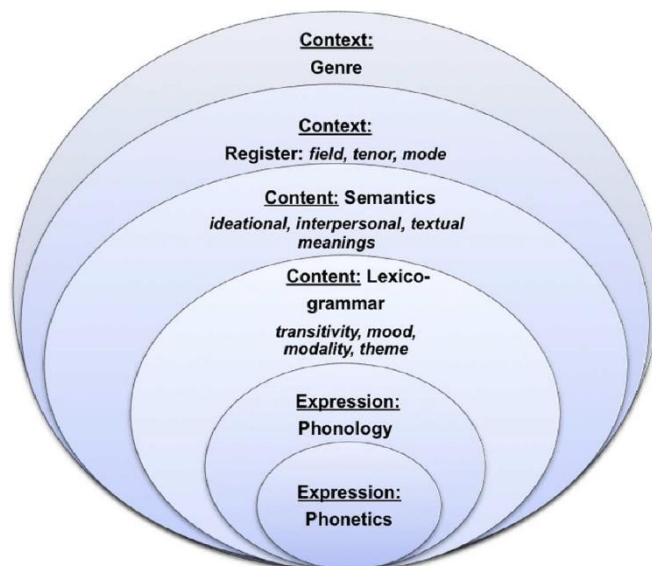
2. How does the deployment of nominalizations relate to the lexical density embodied in the abstracts?

## 2. Literature review

### 2.1. Grammatical metaphors in systemic functional linguistics

Taverniers (2004) defines metaphor etymologically as movement from a certain thing such as literal meaning to another new meaning or figurative meaning. Yet, this definition is called lexical metaphor which differs from grammatical metaphor. Grammatical metaphor is part of systemic Functional Linguistics (SFL) attention in which language is seen as the resource for meaning-making which includes the influence of context to the text (Butt, 2001; Halliday & Matthiessen, 2004). Grammatical metaphor is the remapping process of semantic discourse into lexicogrammar (Devrim, 2015). Lexicogrammatical changes result in meaning extension, not just merely lexical change. For instance, the word “money” in “time is money” is a lexical metaphor. Meanwhile, “introduction” in “the introduction of new policies” is an instance of Halliday’s grammatical metaphor (GM). Some dimensions in SFL have a close relation to GM including stratal tension and metafunctions (Taverniers, 2017).

Stratification of stratal tension shows language organization into the interface flexibility between lexicogrammar and semantics in different strata through realization. ‘Language has a metaphoric power’ (Taverniers, 2017; p. 356) caused by the stratification of language contents from lexicogrammar to semantic and context levels. These strata are phonology/graphology, lexicogrammar, and discourse semantics. The stratal tension needs a clearly articulated model of discourse semantics and lexicogrammar based on realization (Martin, 2020). Realization means the expression of meanings in an upper stratum by meanings in a lower stratum. For example, the meanings in the discourse semantics stratum are realized by the meanings in lexicogrammar in the form of wordings (Devrim, 2015). The strata can be seen in the following figure:



**Figure 1.** Halliday and Matthiessen's language stratification (Rasyina-Pankova, 2015)

From the figure, at least three strata are apparently seen which include expression in the lowest level layered with content level with semantic discourse realized in lexicogrammar. The expression level can also contain gesture and graphology. Butt, et al. (2001) also regarded the two lowest levels as linguistics levels, while the upper strata are extralinguistic levels, which is known as context levels covering the context of situations with special registers and the context of culture recognized in genre or text type. For the metafunctions, Halliday and Mattiessen (2004) further divide the meanings and functions of a text or the language produced by humans (Butt, et al., 2001) into three: experiential, interpersonal, and textual meanings.

The lexicogrammar of experiential meaning construes human experience in the real world with processes to construe verbal groups, participants for the nominal groups in the position of subject or complement of a clause, and circumstances in the form of adverbial groups, preposition phrases, or nominal groups showing the time or situation. The interpersonal meaning realizes the relationship of the speaker or writer and the listener or reader into two domains. First is using the language to demand or give information or goods and services which results in three kinds of mood: declarative, interrogative, and imperative. The second is showing the speaker or writer's stance or attitude toward the text produced or the putative audiences known as appraisal (Martin and White, 2005). The third meaning is textual or theme and rheme discussion that focuses on the rhetoric of the text, the choices on themes, and cohesion.

## *2.2. Ideational or experiential grammatical metaphor*

The realization can expand metaphorically to show more complex relationships between lexicogrammar and semantics (Halliday & Matthiessen, 2004), creating two types of metaphors: ideational or experiential grammatical metaphor and interpersonal grammatical metaphor. The first metaphor is the focus of this study. Tavernier (2017) contends that ideational GM (IGM) is more about form variation distinguishing between congruent to metaphorical by deconstructing or unpacking the grammatical structure and nominalization is part of a larger shift set that occurs simultaneously. The IGM includes grammatical shift and transcategorization (Derewianka, 2003; Hao, 2015) such as nominalization on which an element or a word shift its grammatical class from quality (adjective) to thing (noun) or from process (verb) to thing (noun). The semantic shift from the congruent or typical element realized in incongruent one or metaphorical through nominalization adapted from Halliday and Matthiessen (1999), Derewianka (2003), and Ryshina-Pankova (2015) is shown in Table 1 below.

### **Table 1**

Semantic shift from congruent to incongruent GM realization through nominalization.

Type	Semantic Shift from Grammatical Class and Function	Congruent Realization	Incongruent Realization: GM as Nominalization
1.	Process Event to thing	Verb (e.g., involve)	Noun (e.g., involvement)
2.	Quality Epithet/attribute to thing	Adjective (e.g., flexible)	Noun (e.g., flexibility)

In their work, Halliday and Matthiessen (1999) categorize IGM into 13 types with 5 types for nominalization including 1) Adjective to noun/ quality to thing; 2) Verb to noun/ process to thing; 3) Preposition to noun/ circumstance to thing; 4) Conjunction to noun/ relator to thing; 5) Noun to quality, possessive deictic, or classifier/ thing to the expansion of thing. Three out of these five types are considered the major types of nominalizations which are process to thing, quality to thing, and relator or conjunction to thing (Ryshina-Pankova, 2015). However, this present study only focuses on two major types of nominalizations as shown in Table 1 above. The relator nominalization is excluded because there are usually very minimum numbers of relators within the corpus as found by Afifi (2021) and Mahfudurido, et al. (2021). In addition, the two chosen major nominalizations can be easily identified from the morphological features attached to the words, whereas the relator nominalization is not likely to be identified from its affixes.

### 2.3. Nominalization and Lexical density

There have been many studies on ideational grammatical metaphor of nominalization in scientific writings (Fatonah, 2014; Kazemian, 2013), EFL or ESL academic writing articles (Afifi, 2021; Ezeifeke, 2015; Feng, 2010; Nguyen & Edwards, 2015), in thesis (Mahfudurido, 2021), dissertation (Thompson & Nasser, 2021), or research article abstracts written by native and non-native speakers of English (Holtz, 2011). Fatonah (2014) found EFL students having difficulty understanding scientific writings which in nature contain nominalization and she recommended explicit teaching on nominalization, while Kazemian et al.'s (2013) study resulted in the nominalization followed by definitions and clarification within the scientific articles. Kazemian et al. (2013) argued that nominalization led to 'the greater volume of information, lexical density and objectivity' (p.166).

Similarly, Afifi (2021), Ezeifeke (2015), Feng (2010), Holtz (2011), Le et al. (2013), Nguyen and & Edwards (2015), and Mahfudurido et al. (2021) supported the close relationship of nominalization to lexical density in the academic discourse. The results of these studies revealed the importance of helping students practice and raising their awareness of nominalization in their writing. Meanwhile, lexical density is important to show the higher quality of academic writing as stated by Nasser and Thompson (2021) even though dense lexical clauses result in greater readability (Thida, 2019; To et al. 2013). However, Crossley (2020) argues that the more proficient the writers, their writings tend to contain more difficult words. The reason may be that they

are more frequently exposed to the words or due to “the properties inherent to the words” (Crossley, 2020).

### **3. Method**

This study is based on a corpus of 40 research article abstracts from four high-quality ELT and applied linguistic journals from four Asian countries (Philippines, South Korea, Indonesia, and Thailand). Ten abstracts were taken from each journal published ranging from 2020 to 2021 depending on the number of article availability. The reasons for choosing these journals are that they were listed on the website of scimago.com with the highest SJR (Scimago Journal Rank indicator) accessed in November 2021 with the specification of category as Linguistics and Language and in the Asiatic region where the researchers originated from. Two journals were indexed as Q1 and the others were Q2. The reason for choosing ten abstracts for each journal is to obtain equal numbers of texts from different sources since each volume of the journals contained various numbers of abstracts and articles.

Furthermore, these volumes were chosen since the researchers were interested in investigating the ways authors from Asian countries construct abstracts for journal articles, for both native and non-native speakers of English as shown within the articles that the writers were affiliated with universities from different countries. However, it is likely that most of the writers are non-native speakers seen from the names and university affiliations. The detailed information of the articles is presented in the following table:

**Table 2**

The selected journals.

<b>No.</b>	<b>Name of Journal</b>	<b>SJR</b>	<b>Country</b>	<b>Publication Year</b>
A.	TESOL International Journal	Q1, 0.430	Philippine	2021
B.	Journal of Asia TEFL	Q1, 0.347	South Korea	
C.	IJAL	Q2, 0.283	Indonesia	
D.	PASAA	Q2, 0.208	Thailand	

The data set from a corpus of 8.476 total words/tokens or with 2.425 word-types was analyzed both using some analyser tools and checked manually. This total number was obtained from Q1 journals with 4.215 total words and 1.202 word-types, and Q2 with 4.261 total words and 1.223 unique words/ word types (resulted from voyant-tool analysis). The tools being used for this study were AntConc, Voyant-tool, and ADA Adelex analyser. AntConc corpus analyser was used to identify the nouns and their suffixes from each abstract, while Voyant-tool was utilized to show some features including the total number of words, the number of word types, the vocabulary or lexical density, and information on the average number of words per sentence within the abstracts. Meanwhile, the last tool was employed to check the trustworthiness of the data

revealed from the previous tool, especially in terms of lexical density since ADA Adelex analyser was considered the trusted tool to check lexical density (Nguyen & Edwards, 2015). Yet, the main data were analysed by using Voyant-tool due to its richer features.

The procedure of data collection and analysis was first the researcher searched through the website of scimago.com and selected journals which websites were available. When the full texts of the articles in the journals could be accessed, then the researchers downloaded the articles from the websites, and then the abstract sections from each article were copied into Notepad and Microsoft Word documents. Next, the researchers inserted the abstracts one by one into an AntConc application downloaded previously to identify IGM based on the nominalization quality and nominalization process from the morphological features of the words within the abstracts. The data, then, were coded based on the journal and numbered based on the order of the file which was not always in the sequence of their page number. The data were put in the checklist form to show different types of nominalizations. Later, the frequency of nominalization was counted and analysed.

To answer the second question, the researchers utilized corpus analysis tools to find the number of words for each abstract as well as the type of words, lexical density percentage, and the average number of words per sentence. The main tool employed was voyant-tools, the analysis tool developed by the Office of Information Technology of the University of California Irvine (UCI) in 2014, and ADA Adelex Analyser, the analysis tool developed by ADELEX team of Granada University (see the appendix for the link to the tools). The data was obtained mainly from the first tool, while the second tool was just used to confirm the results of the first tool. The procedure for data collection for both tools was very easy and did not require downloading the tools. However, each file of the abstract must be copied and pasted one by one to obtain the results of the analysis.

The three examples of comparing data resulted from Voyant-tool and ADA Adelex are as follows: for the first abstract (A1) the Voyant-tool counted 171 words, 115 types, and 67.3%, while the ADA tool counted 169 tokens, 114 types, and 67.4%. For the second abstract (A2) the voyant-tool counted 301 words, 157 types, and 52%, while the ADA tool counted 295 tokens, 153 types, and 51.8%. For the third abstract (A3) the voyant-tool counted 335 words, 187 types, and 55%, while the ADA tool counted 323 tokens, 175 types, and 54.1%. This shows similar results obtained from the two tools.

## 4. Findings and discussion

### 4.1. Nominalization and its frequency

The findings are based on two kinds of nominalizations: the first is from processes or verbs to things/nouns, and the second is from quality or adjectives to things/ nouns. The frequency based on the different journal Quartile (Q) is shown in the table below:

**Table 3**

Nominalization frequency in the abstracts.

<b>Journals</b>	<b>Process Nominalization</b>	<b>Quality Nominalization</b>	<b>Total</b>
Q1 journals	148	65	213
Q2 journals	131	66	197
Total	279	131	410

This is shown in Table 3 that the number of occurrences for process nominalization is higher in both Q1 and Q2 journals although the margin is not that big. It is interesting to know that the quality nominalization for Q2 journals is more frequent than Q1 in a very small different number. The total number for both nominalizations is also closely similar. From Q1, there are 1.202 word-types and 213 words are nominalizations. This means that the nominalization is actually less than 20 % of the total word types. Similarly, for Q2, the total word types are 1.223 so 197 words of nominalization are also less than 20%. The nominalization derived from verbs and adjectives employed by the writers of these journals seems to be not much preferred. The writers might utilize other types of nominalizations.

From these realizations of IGM, all nominalization in process and quality were identified from the presence of derivation or morphological features, such as suffix –ment and –tion for common noun makers (Holtz, 2011) from process and either process or quality. The detailed suffixes used within the abstracts can be seen in the following table.

**Table 4**

Suffixes within the nominalization.

<b>Journals</b>	<b>Process nominalization</b>	<b>Frequency</b>	<b>Quality nominalization</b>	<b>Frequency</b>
Q1 journals	- tion	68	- ency	15
	- tions	15	- ences	6
	- sion	8	- ence	11
	- ances	5	- ity	15
	- age	1	- ness	4
	- ment	36	- ance	6
	- ments	3	- ties	3
	- ism	1	- ty	2
	- ance	4	- ise	1
	- son	1	- ities	2
	- al	1		
	- ure	1		
	- ence	3		
	- ity	1		
<b>Total</b>	<b>14 types</b>	<b>148</b>	<b>10 types</b>	<b>65</b>
Q2 journals	- tion	73	- ency	13
	- tions	38	- ences	4
	- ment	11	- ence	11
	- ments	1	- ity	17
	- ance	1	- ness	5
	- son	1	- ance	4



	- al	1	- ties	2
	- ence	4	- ty	5
	- ency	1	- ism	1
			- th	1
			- age	1
			- encies	1
			- ities	1
<b>Total</b>	<b>9 types</b>	<b>131</b>	<b>13 types</b>	<b>66</b>

The data shown in the table above that suffix –tion dominates the nominal group formation both in Q1 and Q2 abstracts. Meanwhile, different domination is found in the quality nominalizations that suffix –ency is the most frequent for the abstracts in Q1 journals, but for Q2 the suffix –ity is employed the most. The variation of the suffix types is similar for the Q1 and Q2 journals, but still, the nominalization of process to thing is more in Q1, while the variation of quality nominalization is more in Q2. It seems to be apparent here that writers of a higher quartile journal may choose fewer types of derivation in their abstracts. This does not mean that those writings in Q1 will always have the highest variation in all types of nominalizations.

The following are examples of explanations on the appearance of nominalization with codes based on the order of the journals. The first journal is coded as A and the first article within this journal is coded as A1 and the second article is coded as A2, and so on. Likewise, B1 is the code for the first article for the second journal in Table 3 above.

#### 4.1.1. Process nominalization

As shown in Table 3 above, process nominalization is the most frequent shift realization found in the texts. This finding is similar to Afifi's (2021) and Mahfudurido et al.'s (2021) studies on grammatical metaphors. Also, the shift congruent realization of the semantics process in verbs into nouns as the incongruent nominalization employs derivational suffixes and zero affixes. The zero affixes show the changing of word class without any difference in its form (Derewianka, 2003) such as the words change, impact, spread, attempt, and shift. However, this study does not focus on this type of affixes. Meanwhile, the fifteen types of suffixes to form thing in the text (as shown in Table 4) include -tion, - tions,- sion, - ances, - age, - ment, - ments, ism, - ance, - son, - al, - ure, - ence, - ity, and -ency.

The following four examples, one from each journal, from the 279 occurrences of process nominalization, are shown to see the relationship of congruent to incongruent realization by unpacking the possible original clauses before the nominalization shifting:

1. Physical, intellectual, and emotional *involvement* is needed to learn a second language, to successfully send and interpret linguistic messages. (A3)

This sequence can be unpacked into:

Emotional involvement > involve emotion

Learners need to *involve* emotion, intellect, and physical skills to learn a second language and to successfully send and interpret linguistic messages.

2. The national curriculum is investigated in accordance with the *classification* of the lower- and higher-level reading processes (B1)

This sequence or clause complex can be unpacked into:

The national curriculum is investigated. The reading processes are *classified* into lower and higher levels.

3. It was found that the students had an *agreement* on the importance of learner autonomy in their language learning. (C3)

This sequence can be unpacked into:

The students *agreed* that learner autonomy is important for their language learning.

4. The results showed that a number of factors influenced their *selection* of TED videos (D4)

This sequence can be unpacked into:

Students *select* TED videos based on a number of influential factors as the results showed.

#### 4.1.2. Quality nominalization

The number of the shift from quality or epithet to thing is in second place with 131 occurrences. The morphological distribution of thirteen suffixes (as shown in table 3) in this shift include –ency, - ences,- ence, - ity, - ness, - ance, - ties, - ty, - ism, - th, - age, - encies, and - ities.

The following are four examples of quality nominalization found from the abstracts at each journal and given explanations of their unpackaging to show the shift.

1. Findings revealed that there are *differences* between the results of reading- listening and writing – speaking (A2)

This sequence can be unpacked into:

The results of reading – listening and writing – speaking are *different*.

2. In terms of their educational contexts, the sudden change to online platform seemed to have caused *confusion* among teachers, students, and parents (B10)

This sequence can be unpacked into:

Teachers, students, and parents are *confused* because of the sudden change to online platforms.

3. The analysis shows that product, purpose, and method moves were given more *prominence* by most of the writers across disciplines (C8)

This sequence can be unpacked into:

Product, purchase, and method moves are *prominent* according to most of the writers across disciplines.

4. While literature suggests the *significance* of peer interaction for language learners, little is known about how the interaction specifically works to benefit them (D5)

This sequence can be unpacked into:

Peer interaction for language learners is *significant* as suggested by the literature

#### 4.2. Lexical density and nominalization of the research article abstracts

The results of the analysis from <https://voyant-tools.org/> are presented in the following Tables 5 and 6. The tables consist of the article codes grouped based on the journals, followed by the number of words of each abstract or the number of tokens, and the unique word forms which mean the type of the token. The sixth column contains the information on the vocabulary or lexical density which counts the ratio between token and type, and the last is the information of the average words within each sentence in the abstract.

**Table 5**

Lexical density with the number of words within each abstract in Q1 journal.

No.	Article code	Number of words	Unique word forms	Lexical density	Average words per sentence
	A1	171	115	0.673	34.2
	A2	301	157	0.522	20.1
	A3	335	187	0.558	27.9
	A4	208	112	0.538	23.1
	A5	139	70	0.504	17.4
	A6	243	119	0.490	20.3
	A7	341	182	0.534	28.4
	A8	241	109	0.452	21.9
	A9	113	82	0.726	18.8
	A10	224	119	0.531	20.4
	B1	175	96	0.549	21.9
	B2	236	121	0.513	29.5
	B3	177	100	0.565	29.5
	B4	172	94	0.547	24.6
	B5	159	97	0.610	39.8
	B6	159	89	0.560	31.8
	B7	255	145	0.569	28.3
	B8	195	114	0.585	24.4
	B9	157	97	0.618	52.3
	B10	214	124	0.579	26.8

**Table 6**

Lexical density with the number of words within each abstract in Q2 journal.

No.	Article code	Number of words	Unique word forms	Lexical density	Average words per sentence
1.	C1	225	123	0.547	22.5
2.	C2	190	115	0.605	27.1
3.	C3	228	128	0.561	25.3
4.	C4	237	119	0.502	19.8
5.	C5	267	146	0.547	26.7

6.	C6	236	124	0.525	23.6
7.	C7	255	130	0.510	28.3
8.	C8	160	92	0.575	26.7
9.	C9	188	92	0.489	23.5
10.	C10	239	139	0.582	21.7
11.	D1	180	86	0.478	22.5
12.	D2	233	132	0.567	23.3
13.	D3	168	98	0.583	28.0
14.	D4	194	124	0.639	21.6
15.	D5	196	121	0.617	32.7
16.	D6	201	118	0.587	33.5
17.	D7	214	128	0.598	30.6
18.	D8	202	122	0.604	25.3
19.	D9	200	118	0.590	25.0
20.	D10	248	152	0.613	22.5

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It is apparent from the tables that the abstracts had different numbers of words with the longest one containing 335 words, and the shortest of 113 words. It is interesting to notice that the highest percentage of vocabulary density of 72 % was in the abstract with the least number of words with almost the least number of average words per sentence, 18.8. The lowest lexical density was 45% which still can be considered as quite high for an academic text (Nguyen & Edwards, 2015). The higher the density, the richer the content of the abstracts which may add the level of complexity and difficult readability of the text (To et al., 2013).

The results on nominalization show the deployment of derivations to shift the semantic category realized in the grammatical forms from process to thing in the highest percentage. This is in line to previous research done by Khazemian et al. (2013), Afifi (2021), and Mahfudurido et al. (2021) even though these three studies examined a distinctive part of the academic genre, the first is scientific text, the second is undergraduate EFL students' essays, and the third is undergraduate EFL thesis abstracts. However, similar results seem to prove that the language shift from verbs to nouns is frequent and needs more attention from educators to ensure that the application of this transcategorization is accurate and help students express their arguments in more precise and lexically dense in the content of their writings.

The findings showing a high percentage of vocabulary or lexical density in the abstracts confirm Nguyen and Edwards (2015) study that high-quality academic writings have a high percentage of density in the ratio between token and type. Since Nguyen and Edwards (2015) discovered an unequal improvement in students' deployment of nominalization and lexical density after a certain period of time, and with these research results, nominalization training for students to frequently practice it is required for successful academic writing. In addition to writing students' own texts, nominalization is proven to also be beneficial for English translation (Warshmarr, 2019) and understanding scientific text with many technical definitions (Fatonah, 2014).

## 5. Conclusion

The findings of this study present the emergence of three types of nominalizations within the research abstracts with the dominant shift from process (verb) to construct the thing (noun). The abstract writers use more morphological reconstrue in the forms of suffixes and zero affixation to pack their clauses. It is interesting to discover that although process to thing shifts outnumbered the shift of quality to thing, both have the same variation numbers of suffixes. Even though this study focuses on only two nominalization types of IGM, it can be learned that the complexity of clauses in the abstract through the use of nominalization has helped writers produce dense, rich, and economically lengthy abstracts without losing the chance to give clear and informative sentences.

This study is limited to the investigation of small numbers of research abstracts due to the time limitation and not to conclude generalizations. Thus, it is recommended for future researchers to conduct a study with a larger amount of data or to derive the data from certain corpora. The research on action research or experiment research on the explicit teaching of nominalization and lexical density could also provide more fruitful insight into the study of grammatical metaphors. For pedagogical implication, it is highly suggested that language teachers, especially writing classes for academic discourse, introduce and strengthen students' understanding and application of nominalization to obtain high-quality writing for wider publication acceptability.

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