

# Assessing Complexity in the Introduction Part of Bachelor's Theses: A Systemic Functional Linguistic Framework

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## Abstract

It is possible to assess the complexity of text to determine the level of lexical density (LD) and grammatical intricacy (GI). This study seeks to discover how much complexity can be identified in the introduction part of bachelor's theses. Qualitative analysis was utilized as the research design in this study. The words, phrases, and clauses were used as the data taken from the data sources of 20 introductions of the undergraduate theses in the English department of Universitas Sumatera Utara. The findings showed that the lexical density score is 53.54% and grammatical intricacy score is 2.542. The LD score obtained means that the characteristics of the written language used is suitable because the written text has a lexical density of more than 40%. Meanwhile, the grammatical intricacy shows that many clauses were used by students in writing the introduction of their thesis. This means that the students' text were complex and more intricate.

**Keywords:** text complexity, lexical density, grammatical intricacy, theses

## 1. Introduction

One of the requirements for student in obtaining the bachelor degree in Universitas Sumatera Utara (USU) is by producing an academic writing called as thesis. This is a compulsory for students since it is regarded as one of the determinants for measuring students' successfulness both in educational and research publications chasing (Nguyen & Edwards, 2015). For English literature students at USU, the thesis should be written in English. This becomes more complicated since writing is an integrated skill and it needs complex grammar to state the comprehensive ideas (Ma'mun, 2017). Bachelor's theses commonly encompass a complex macrostructure (Zhang & Pramoolsook, 2019). Moreover, it can be used to judge the students' proficiency level through linguistic production realized in it (Lee, 2019) since the evaluation on language is possible to be conducted through the speaker or writer's language use (Tobing et al., 2016). Linguistic realization in thesis is prominent since it affects the meaning conveyed (Syarif & Putri, 2018). The clearness of ideas expressed in the introduction part is crucial since it is the foundation in developing the thesis. This part presents the background, the problem and question, the significance, the objective, and the scope of the study. One of frameworks to observe language is systemic functional linguistics (SFL) (Egins, 2004). It has metafunctions covering ideational, interpersonal, and textual meanings (Halliday & Matthiessen, 2004) and those are innate in every single language use (Sinar, 2007). SFL theory provides two types of text complexity named by Halliday (1985) as grammatical intricacy (henceforth GI) and lexical density (henceforth LD). He further defines LD as the number of lexical items ("content words") per

ranking clause, and GI as the intricate construction of clauses in a text. In relation with the metafunction system, GI has close relationship with the logical metafunction and LD is with experiential metafunction. The proportion of LD is significant in determining written language complexity and the information density provided from the lexical items tightness (Halliday & Matthiessen, 2004).

GI is worth applicable in the measurement of written text complexity since it can show the complexity at the level of words as well as at the level of clauses (Halliday, 1985). As Sinar (2007) stated in the explanation (EP) - definition (DE) sequence, the DE sub-phase occurs for example when one provides the definitions of certain concepts or techniques after stating the concepts or techniques under discussion. In the EP^DE sequence the DE sub-phase occurs for example when the speakers further explain the conceptual definitions: naming, meaning, comparing and contrasting the defined terms or concepts. In this sequence, text complexity, GI was measured.

The complexity in a thesis as one of academic writing products is used as the prominent aspect in deciding the students' success presenting their ideas. The density of information packed in the clause represented by high LD score shows the proficiency of the students in writing technical concepts, viewpoints, terms. Consequently, the clause simplexes and complexes appear, as Sinar (2007) acknowledges, explanation may come into existence by going through expansion, i.e. elaboration, extension and/or enhancement as ones clarify, amplify or strengthen certain ideas, concepts, by way of explanation as such that the ideas are properly understood and accepted.

There are many works dealing with the complexity in any discourses. To et al. (2013) in their research examine the level of LD and readability in English. They figure out that the data perform high LD in upper-intermediate levels. They more argue that there is relevancy between levels of texts and readability levels. The difference of the research from this prospective research is the level of analysis. Hanafiah & Yusuf (2016) in their research deal with the analysis of LD and GI in linguistic thesis abstract. This study is intended to identify the abstract characteristics regarding either as spoken or written discourse. The analysis made they conclude that the data possess high degree of LD index and the dominant simple language representation which leads to low degree of GI. This makes the written discourse category if fulfilled. The difference of this research from the writer's research is in the object of the analysis namely abstract in English department student's thesis and English textbook. Sujatna et al. (2017) conducted a research about complexity through the analysis of difficult words, and assessing the score of GI and LD in English short story book for children. Descriptive analysis was applied as the method of the research.

Essentially, bachelor thesis is to give information to the readers. Hence, its complexity obviously affects how the information is comprehended by the readers even though the subtlety of the text is one of academic writing characteristics. It is critical to the current situation of teaching-learning process, but its clear definition is still debatable (Kwapien et al., 2010). Al-Wahy (2017) defines that LD is as text richness level covering aspects such as ideas and information. The illustration is the lexical words is upper, the LD is higher.

Ghasemi & Jahromi (2014) in their research of English texts emphasize that the function of LD and GI is to be factor of determining a text regarded as either spoken or written text.

The research on the bachelor theses' text complexity is crucial to be done. The significances of this study would contribute as the resource for students in order to improve the quality of their thesis by considering the proportion of the clause complex employment to make the text more academic, and as the reference for thesis supervisor in guiding the supervisee in accomplishing their thesis writing with a good thesis as the product of academic writing.

### ***1.1. Research Questions***

Looking at the fact stated in the previous section, it poses the problems which are formulated as the followings:

1. What is LD percentage presented in introduction part of bachelor students' theses?
2. What is GI index in introduction part of bachelor students' theses?
3. How are the complexity characteristics portrayed based on complexity analysis in bachelor students' theses?

## **2. Review of Literature**

### ***2.1. Lexical Density***

This term is familiar in order to assess the difficulty and the readability of text. This term is regarded as one of complexity factors to find out text difficulty (Sujatna et al., 2017). Higher density realization in a text makes it tend to be more subtle to be comprehended but it is more informative (Alami et al., 2013). Academic writing product such as graduate thesis should use academic language style which tends to be lexically dense. Ure (1971) gives the standard to differentiate the spoken and written text. He argues that the majority of the spoken texts possess LD score under 40%. Conversely, written text, he states that it has at least 40% or higher proportion of LD.

Johansson (2008) also clarifies that density is understandable as a term to describe the count of content words (CW) such as nouns, verbs, adjectives, and often also adverbs compared to total words. Halliday (1985) states the kind of intricacy arises in the use of words. In order to measure LD, some ways can be executed such as by counting the ratio between the total of CW and the running words in total, and the other one is by considering the number of CW per clause. In addition, function word is regarded as grammatical item. The grammatical and lexical items classification proposed by Eggins (2004) is utilized in this research.

### ***2.2. Grammatical Intricacy***

The term GI has connection to the total clauses per sentence. In other terms, it is related to clause complexes. It is obtained by stating the number of clauses in a whole text. To exemplify, two sentences are presented in the following:

(1) Andira didn't come to school because she was sick.

(2) Andira didn't come to school because of her sickness.

From those two sentence presented above, sentence (1) is regarded as clause complex comprising of two clauses in a sentence and grammatically intricate. Sentence (2) has only one clause and regarded as simple clause but it lexically dense from sentence 1. The high ratio of GI in text is beneficial as determinant of categorization whether it is grouped either as spoken or as written text.

### 3. Method

This study employed qualitative analysis. Miles et al. (2014) state that this method produce clear and rich detailed accounts of human experience. It is done by observing intense contact with participants in unset circumstances. The data were in the form of words, clauses, and sentences obtained from 20 introduction parts of undergraduate students of English department covering linguistic and literature scope at Universitas Sumatera Utara. The theses chosen are publish from 2018-2019. The linguistic thesis covers the areas such as sociolinguistics, psycholinguistics, translation studies, pragmatics, semantics, discourse analysis, and semiotics. Then, the literature thesis covers the areas such as modern literature and psycho-literature.

The data sources were retrieved from website of repository.usu.ac.id. The researchers used keywords to ease the search for data base and categories to simplify the search. The introduction part of the thesis selected as the source of the data has at least 3 pages. The data were analyzed manually using the calculation formula proposed by Halliday & Matthiessen (2004) and Ure's (1971) calculation. First step, the calculation of the number of clauses in order to assess grammatical intricacy index. The guideline for clause identification was based on Halliday and Matthiessen (2004). The clauses were categorized in terms of simple and complex clauses (paratactic and hypotactic clauses). To calculate LD, it is processed

electronically through text statistic analyser from <https://www.usingenglish.com/resources/text-statistics/>. In order to test the reliability of the data, the researchers used triangulation technique. The last procedure is making inference based on the findings and drawing conclusion.

## 4. RESULTS

### 4.1. Lexical Density Calculation

The results present that the LD score obtained was 53.54% in average. This shows that the introduction in the student thesis has fulfilled the written language criteria in general, which has a lexical density score of more than 40% (Ure, 1971). Text 5 (Lit 5) becomes the text that has the highest LD score of 58.51% while the lowest is text 14 (Ling 4) with a score of 49.03%. The details of the calculation are described in the following table.

Table 1. Lexical Density Calculation

No	Text	Lexical Density		
		Content Words	Total Words	Lexical Density Score
1	LIT 1	1031	1920	53.69%
2	LIT 2	282	503	56.06%
3	LIT 3	529	1002	52.79%
4	LIT 4	624	1140	54.73%
5	LIT 5	584	998	58.51%
6	LIT 6	828	1644	50.36%
7	LIT 7	488	927	52.64%
8	LIT 8	399	720	55.41%
9	LIT 9	1243	2283	54.44%
10	LIT 10	644	1216	52.96%
11	LING 1	438	846	51.77%
12	LING 2	453	817	55.44%
13	LING 3	506	925	54.70%
14	LING 4	735	1499	49.03%
15	LING 5	782	1423	54.95%
16	LING 6	614	1125	54.57%
17	LING 7	792	1442	54.92%
18	LING 8	846	1663	50.87%
19	LING 9	777	1481	52.46%
20	LING 10	606	1199	50.54%
<b>Average</b>				53.54%

The LD calculation is believed as an important factor to measure written discourse complexity. In this study, it was searched by applying Halliday and Matthiessen's (2004) formula. Table 1 presents that the average score of LD is 53.54%. The example above shows that there are six lexical items (in *italic style*) and seven grammatical items (in **bold style**).

(3) *Translation is the activity of changing something spoken or written into another language.* (Ling 1)

The example above indicates that there is a share of six lexical items. Dealing with Ure's (1971) calculation method, the LD proportion is forty-six per cent or 0.47. The LD portion is also affected by the use of nominalization (To, 2018). The example presented in sentence (3) contains the transformation of verb '*change*' into noun '*changing*' which absolutely shows nominalization process. The process of nominalization is a very economical means of packaging information and becomes prominent thing in academic writing (Arizavi et al., 2015). Nominalization process simply increases the use of noun in the clause. As a result, the LD proportion becomes higher due to the increasement of content words. In

relation to the data, it was found that nominalization plays its significance role in elevating the LD score which directly affects the packaging information in a clause.

The other aspect which affects LD is grammatical metaphor (GM). This process is considered having close relationship to LD and nominalization as asserted by Halliday & Matthiessen (2004). They also argue that nominalization is powerful resource in constructing GM. Normally, an action will be represented through the use of process. Participants are coded by using noun. This is called as congruent coding. In some condition it can be coded metaphorically or incongruent. The example of GM found in the data is presented below.

(4) It may *cause* problem when it is pronounced in the wrong way. (Ling 10)

The sentence (4) shows that there is a phenomenon of experiential metaphor. It happens since there is a change of process 'change' into 'changing'. The other form of GM found in the data is logical metaphor. The utilization of '*cause*' instead of '*because*' is one of the examples of logical metaphor. This is to transform conjunction into verb which then construes causal relationship (Martin, 1992) such as the following example.

Written language usually becomes complex with the presence of LD. Therefore, the introduction written by students is already complex and the students as the thesis writer successfully present their ideas in the written form and provide great information in their clause.

#### 4.2. Grammatical Intricacy Index

Ranking clauses found in clause complexes are influenced by two facets i.e. taxis and logico-semantics systems relationship. Regarding to taxis, it is divided into parataxis and hypotaxis. In relation to the logico-semantics systems, it comprises of projections (locution and ideas) and expansion (extention, elaboration, and enhancement) (Eggins, 2004; Hajar & Sinar, 2019; Halliday & Matthiessen, 2004; Sinar, 2007). To exemplify, the sentence below is taken from the data.

The public were not happy with it and showed their support to the victim on social media and became viral. (Lit 2)

The public were not happy with it	1
and showed their support to the victim on social media	+2
and became viral.	+3

The sentence taken as example contains three clauses in a sentence. It means that this sentence has GI index as 3.0. It is obtained from the calculation that three ranking clauses (coded by 1, 2, 3) are divided by one clause complex. This sentence is regarded as parataxis

clause and it has logico-semantic relation as expansion → extention. This happens since the second and the third clause extend the primary clause (1) meaning (Hajar & Sinar, 2019; Halliday & Matthiessen, 2004). Further finding is hypotactic clauses are also found in the data. The data also present that GI index found in the introduction parts in students' theses are quite complex. The complete calculation of GI index can be seen in table 2.

Table 2. Grammatical Intricacy Index

No	Text	Grammatical Intricacy		
		Ranking	Clause	Grammatical
		Clauses	Complexes	Intricacy Index
1	LIT 1	181	66	2.74
2	LIT 2	35	11	3.18
3	LIT 3	95	36	2.63
4	LIT 4	98	41	2.39
5	LIT 5	78	31	2.51
6	LIT 6	142	54	2.62
7	LIT 7	98	36	2.72
8	LIT 8	38	15	2.53
9	LIT 9	186	65	2.86
10	LIT 10	94	40	2.35
11	LING 1	45	18	2.5
12	LING 2	69	28	2.46
13	LING 3	59	21	2.8
14	LING 4	129	48	2.68
15	LING 5	98	37	2.64
16	LING 6	61	29	2.1
17	LING 7	67	36	1.86
18	LING 8	112	45	2.48
19	LING 9	113	44	2.56
20	LING 10	58	26	2.23
<b>Average</b>				<b>2.542</b>

The average GI score as displayed in table 2 is 2.542. It means that in a complex clause there are at least 2.5 clauses. The text that has the highest GI index is text 2 (Lit 2) with a score of 3.18 which indicates that the complex clause contains 3 more clauses. On the other hand, the text which has the lowest GI score is text 17 (Ling 7) with a score of 1.86. The other form of logico-semantic relation found in the data is projection. It is very obvious that in writing a thesis student cites other opinion in relation to the theory used. They can employ the style of reporting or quoting (Jomaa & Bidin, 2019). Moreover, it can be in the form of locution or ideas. Those can be differentiated by the use of process in the secondary clause either verbal process (‘) or mental process (‘). The example is as presented below.

Halliday in Teich (1999: 8) states that the language as a social semiotic. (Ling 8) (finite hypotactic locution clause) Halliday in Teich (1999: 8) states that the language as a social semiotic.



### 4.3. Discussion

The results of the study have been described in particular with the focus on the research questions: What is the lexical density percentage presented in the introduction of students' theses? What is the grammatical intricacy index in the introduction of students' theses? And, how are the characteristics of complexity portrayed based on the complexity analysis? The discussion provides an overall picture to interpret them.

Firstly, it can be stated that the introduction parts of students' theses have a high LD score. The fact the high proportion of LD indicates that students' ability in writing introduction part is academically acceptable in accordance with the rules of written language even though it is still classified as complex. To a great extent this is because it contains a large number of lexical items in each clause. The findings of the research by Raeisi et al. (2019) are similar to this research finding. They also discover that, on average, the LD in abstract articles that focus on educational psychology written by native and non-native speakers of English are more than 50%.

The data also shows that the students successfully pack the information by providing high number of CW. This is affected by the use of nominalization since it was mostly used as a means of theorization. Moreover, lexical nominalization was used in phrases and clauses surrounded by quantifiers and adjective clauses to function as a summarizing strategy in the text (Arizavi et al., 2015). Nominalization is the representation of GM. The contribution of high GM existence makes the LD higher in written English text (Sáenz, 2000).

The other fact is both thesis categories (linguistic and literature) have similar characteristic in terms of LD score. To a great extent, this is because both types text contains a large number of lexical items in each clause. Looking at the data, it shows that all the texts fulfil the general standard of a written text by having a lexical density of more than 40% as Ure (1971) had been found out previously. The realization of LD in the data has connection to the students' proficiency. This is supported by Kondal (2015) stating that the score of LD has effect in students' language performance and proficiency. High proportion of LD indicates that students' ability in writing introduction part is good in accordance with the rules of written language even though it is still classified as complex.

Secondly, in relation to GI index, it shows that the texts have average score more than 2.5. This number is to show that the texts are being grammatically complicated because they construct complex clauses of parataxis and hypotaxis. The higher the GI index of a text, the more intricate or complex the clause representation of that text will be (Putra & Lukmana, 2017). This means that the students are proficient in presenting paratactic and hypotactic clauses and applying them in the text (Ma'mun, 2017) whereas this is in contrast to the findings of LD. If the results of LD present that the texts can be categorized as written discourse, the GI index shows a different phenomenon that the texts seem to follow the style of spoken discourse, or the features of spoken language present in written language of bachelors' theses. The assumption is that the writers of the theses are not aware of this

concern because they are novice writers (Zhang & Pramoolsook, 2019) and have little knowledge concerning what language should be typically utilized in academic writing (Syarif & Putri, 2018). The other possibility is that they intentionally combine the characteristics of both categories in order to ease the comprehension of the readers (Putra & Lukmana, 2017). They provide beneficial information for readers by trying to use clause complexes and avoid the nominalized words. This is in line with what is found by Sujatna et al. (2017) which states that LD and GI as part of complexity influences the text readability.

Last, as the characterization of the complexity present that the introduction to the theses written by students has motivated more clause complexes and clause simplexes to occur affect the functional participant of the texts. The assumption is that longer sentences are harder sentences, and longer words are harder words (Rawian, 2019). The goal of the thesis in academic writing is to provide beneficial information for readers, and, hence, it is ironic if the text is too hard to comprehend as it makes the readers reluctant to read. Therefore, the pedagogical implication is that the discussion of complexity should be inserted in the syllabus of academic writing. This is relevant to what was reported by Syarif & Putri (2018). They argue that if the students have sufficient knowledge of LD and GI and apply them in their writing, their bachelor thesis could be more qualified. Then, to overcome the problem of LD, the students can be given encouragement to improve their mastery of vocabulary (Dakhi & Hutabarat, 2018).

## 5. Conclusion and Suggestion

In relation to the results of complexity, the LD score obtained is 53.54% which means that CW is dominantly used due to grammatical metaphor and nominalization effect. The GI index presented in the data is 2.542. It means that clause complexes were dominantly utilized by the writers comprising of paratactic and hypotactic clause. Quite understandably, in terms of text complexity, the LD score in the data has average more than 50% thereby simply indicating the suitability of the characteristics of the written language used and the majority written text which possesses 40% of LD proportion. Conversely, the data shows the different angle seen from GI index. The texts tend to be fulfill spoken text characteristics since the dominant employment of clause complexes by the writers. It can be assumed that the writers of the theses are not aware of this concern. There are some reasons to support this condition to occur namely writing experience, language proficiency, or it is done on purpose to show their writing style. Acknowledging the findings concerning the complexity in the introduction is informative and immediately useful to study, there will be potential research formulated for future works. It is suggested that further researcher explores the other parts of the thesis as a product of academic writing. Then, the other are such as gender differences can be examined in order to see the similarities and the differences in the characteristics. Finally, it is also suggested for further researcher to explore the interdependency of clauses in the body of the thesis. This study has demonstrated through its analysis of the comprehensibility results and discussions of text complexity. Using SFL

approach formulas provides understanding and guidance framework to enhance the ability of language teachers to help students improve their academic writing, while also benefit from the analysis themselves.

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