

A VARBRUL Analysis on the Reporting Verb *Propose* in Electrical Engineering Research Articles

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Abstract

Choosing an appropriate reporting verb is not only a technique to report a claim but also a tool to imply the writer's stance or attitude towards the claim. The way the reporting verb is employed can reflect the writer's underlying implication. By using a variations framework, this study is an in-depth investigation on how reporting verbs are affected in Electrical engineering research articles, taking *propose* as a variation. With the assistance of VARBRUL program, 397 tokens from 160 Electrical research articles were analyzed. Past tenses of *propose* was selected as an application value. The results show that time periods that the articles are published and verb voices are two factors independent from the application value. Meanwhile, tense choice of the verb has a significant correlation with journal editions and verb types. In different journals, frequency of *propose* used in past tenses can vary, and a significant proportion of self-reporting *propose* is used in past tense. Regardless the limitation of sample size and verb types, the study is potential in analyzing reporting verb from the sociolinguistic approach in future.

Subject Areas

Reporting Verb

Keywords

Propose; electrical engineering; research articles; VARBRUL; significant factors; application value

1. Introduction

It is widely recognized that language use can be determined by the context or discourse where the communication takes place. It implies that with different context and audience, the language is used in a selective way. However, as reported in Geeslin & Long (2014), language users are not always consciously aware of these choices which are defined as sociolinguistic variation. This term refers to “the choices a speaker makes when selecting the forms necessary to convey a message that is appropriate in a given context” (p.3). As observed, there have been an increasing number of studies done on how languages are used in various settings. Swales (1990), in addition, identifies the shared norms which can establish a discourse community with a broadly agreed set of common public goals. Besides, the genres owned by the discourse community also acquire some specific lexis. In academic discourse community, research articles (RAs) are recognized as a genre

which plays a prominent role. By means of RAs, not only can researchers share their knowledge in their fields but also announce the new claims to the rest of scholarly world. Good academic writing is crucial to succeeding in higher education. When we examine the text of scientific articles, it is obvious that there is a generally accepted way of writing them (Harley, 2008). In linguistics, analyses of RAs have been carried out by many linguists. According to Lin and Evans (2012), the past three decades have witnessed a remarkable upsurge of scholarly interest in the structural and linguistic features of RAs. As mentioned in Swales (1990), the examination of structures and linguistic factors in RAs started early in 70s when Lackstrom et al. (1972; 1973) analyzed tenses and paragraph development. Following this pioneering research, many studies were conducted concerning RA analysis such as types of lexis (Inman, 1978), modals, voices and clauses (Tomlin, 1981), structure (Stanley, 1984), citation patterns (Jacoby, 1987), etc. The results from these examinations imply that RAs do own identities which distinguish RAs from other genres.

Hyland (2005) stresses that academic writers must be aware of not only how to report claims but also how to set their stances or, in other words, their own position in the claims. To accomplish these goals, writers need to adopt various academic writing techniques. One of the techniques that is considered beneficial to reporting claims and setting stances is the appropriate use of reporting verbs (Swales 1990, 2004; Thompson & Ye, 1991; Hyland, 1999, 2001; Charles, 2006; Bloch, 2009, 2010; Thong, 2013). In other words, reporting verbs are one of the effective academic devices which can help in achieving the writer's rhetorical purposes of stating claims (Charles, 2006).

As stated in Bloch (2010), there has existed an argument during the last four decades that the rhetorical context of an academic paper is the combination of the clear, concise presentation of new claims with a review of previous related research; but in practice, the manner that writers build up a paper has been seen "in more classical rhetorical terms as a process of developing an argument to support the writer's claims" (p. 222). Bloch explains this situation. Traditionally, when constructing research, writers often consider claims to be built on logical certainty; therefore, they are "the natural outcome of scientific research". As a result, being clearly and concisely located within the previous research is believed as the only condition of setting up a claim. In Hunston and Thompson (2000), it was stressed that, to have their own research situated within the network of previous studies, writers must not only evaluate the strength of each claim but also clearly set their own attitude towards the claims that are being made or reported. Therefore, Hunston & Thompson concluded that reporting verbs should be chosen with a high attention of carefulness and exactness, which can enhance the credibility of both the writer and the claims; and as a result, the readers will be more likely to accept the position that the writer is taking.

In discourse analysis, a great deal of literature has focused on reporting verbs in academic discourses in different perspectives (e.g., Swales, 1990, 2004; Thompson & Ye, 1991; Shaw, 1992; Thomas & Hawes, 1994; Hyland, 1999, 2001; Hunston & Thompson, 2003; Charles, 2006; Bloch, 2009, 2010). Swales & Feak (2004), for example, examine the

variety of reporting verbs used in summary writing, which is assumed to both reveal the writer's personal stance towards the source material and convey his/her attitude. Hyland (1999) further identified 400 different reporting verbs which are most frequently used from his corpus of 60 research articles. His finding shows that nearly fifty percent of these reporting verbs are used only one time and a much smaller number of verbs tend to predominate. As a matter of fact, reporting verbs specially play a key role in writing citations which are considered vitally important in academic writing (Charles, 2006). According to the author, citation indicates "how a new piece of research arises out of and is grounded in the current state of disciplinary knowledge and thus constitutes an overt manifestation of the ongoing conversation of the discipline" (Charles, 2006: 311).

Recently, recognizing the fact that there has been very little research done to compare how reporting verbs are used between English native and non-native speakers (Vietnamese), Nguyen (2013) conducted a study to investigate the phenomenon across disciplines and cultures. In his study, 167 research articles in three disciplines – Engineering, Mathematics, and Applied Linguistics – are chosen as research data. The framework of Nguyen's study is a combination of Charles's (2006) and Bloch's (2010) models. The findings show that disciplinary – not cultural – variation is the major factor that affects the reporting verb usages in journal articles in both groups of speakers. It determines verb groups, tenses rhetorical implications of the verbs. It means that in different disciplines, writers tend to use reporting verbs in different manners no matter what group of speakers the writers belong to.

Regarding reporting verbs used across disciplines, Rau (2017) has observed the phenomenon in electrical engineering and categorized reporting verbs occurring in research articles of this field into three types. *Citation verbs* are defined as verbs to report the action of a previous author. *Self-reporting verbs* are used to report the processes and contribution of the writer of the current study. Third, Rau defined *Pointing verbs* as verbs that direct the readers' attention to a graphic and highlight certain information in a graphic. Since this categorization is closely relating to the current study, the author decided to adopt this model to his reporting verb analysis. It means that the reporting verb in this study will be categorized into three types as mentioned in Rau.

Previously, Hyland (1999) explored how academic citation practices contribute to the construction of disciplinary knowledge. By examining 80 research articles in eight disciplines and interviewing experienced writers, the author found that in different fields, the frequencies of using certain reporting verbs are varied. For example, in linguistics, *suggest* is the verb with the highest frequency while *propose* occurs the most in electrical engineering. The author then concluded that discourse decisions are influenced by the epistemological and social conventions of their disciplines.

Later, in Chen's (2009) study, the matter of tenses in reporting verbs was investigated thoroughly. It was addressed that using an appropriate tense is one of the most effective ways to convey not only the information but the judgement of the writer. By examining the Literature reviews in PhD dissertations, Chen found that in both hard and soft sciences, roughly 80% reporting verbs are used in present tenses while only 15% are

in past tenses. In the current study, tenses in which *propose* is used are considered dependent variables with the attempt to find out whether reporting verbs' tenses are varied according to external factors (time periods and journals) or internal factor (verb types). It means that the results may imply if tense feature becomes a tendency in academic writing.

To continue Hyland (1999), Chen (2009), and Nguyen's (2013) work, the author of the current study attempts to deeply examine whether differences in reporting verb usage happen within a discipline. By taking *propose* as a key verb, the study aims to investigate how it has been used across time periods since Geeslin & Long (2014) identifies time among the social factors affecting the language use. In short, the study aims to answer these two questions:

1. *Within the field of Electrical Engineering, are the tenses for the reporting verb "propose" affected by external factors (time periods or journal editions) and internal factors (verb types and voices)?*
2. *How should the tendency in reporting verbs employed in Electrical Engineering research articles be generalized?*

2. Method

2.1. Corpora

This study is based on a corpus of 160 English research articles written by scholars in the field of Electrical Engineering in four journals published in two separate time periods. The first criteria for the selection of time is attributed to the publication time of Hyland (1999). It was decided that the first group consists of RAs written approximately from 1994 to 1998. To compare with the current reality in the field, the second group of RAs was collected from the publication time of 2014 till present. **Table 1** describes the corpora in detail.

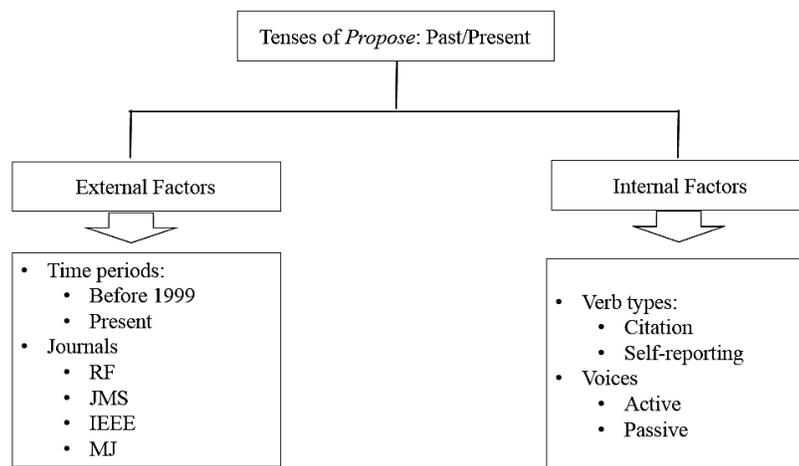
It should be noted that the selection of journals was carefully considered. The decision was completely based on the list of journals employed as data in Hyland (1999), so that the comparison can meet certain reliability standard. In addition, the chosen articles should be relatively identical in length with the others in each journal category. It is noted that the text length excludes the tables, figures, acknowledgements, autobiographies, appendixes, and references.

Table 1 Text corpora

Journals	Before 1999		Present	
	No of Texts	Text Length (words)	No of Texts	Text Length (words)
1 International Journal of Microwave & Millimeter-wave Computer-aided Engineering (Now known as <i>Int. J. of RF & Microwave Computer-aided Engineering</i>) (RF)	20	110,789	20	89,140
2 Journal of Microelectromechanical Systems (JMS)	20	125,237	20	162,608
3 IEEE Transactions on Microwave Theory and Techniques (IEEE)	20	126,418	20	148,053
4 Microelectronics Journal (MJ)	20	143,661	20	139,464
Total	80	506,105	80	539,265

2.2. Procedures of analysis

This study is a corpus-based analysis on the reporting verb *propose*. To investigate the frequency of *propose* in the samples, *AntConc 3.2.1* (Anthony, 2011), a corpus tool, was used to make concordances on the search verb. All the tokens found by the tool were categorized into two groups: *propose* in past tenses and *propose* in present tenses, which are two dependent variables. With the assistance of GOLDVARB program (Sankoff et al., 2015), this study aims to investigate the correlations between the dependent variables and independent variables which include internal factors and external factors (see Appendix A). The description of the data analysis procedures is demonstrated in Figure 1.

**Figure 1.** Data analysis procedures

First, all the tokens were analyzed in terms of publication time and journals. This step of analysis is expected to reveal whether tenses of reporting *propose* are used in a similar or different way between the two corpora: *Before 1999* group and *Present* group. Moreover, it is attempted to examine whether there is any correlation between the verb tenses and the journals where they occur. The results from this step of analysis may infer whether tenses are affected by external factors.

Similarly, an analysis was done on internal factors. It was hypothesized that tenses of reporting verbs depend on their types, or in other words, their functions in the sentences consisting of citation and self-reporting. Moreover, it is also expected to investigate the correlation between tenses and voices. The VARBRUL analysis can indicate which tense is favored to use with which voice. All the procedures of analysis aim to figure out a generalization on how the verb *propose* is used in the Electrical field across time periods and genres.

3. Results and Discussion

The following section provides results in response to the research questions, which are mainly about the correlation between the factors and the tenses of *propose*.

As mentioned above, the results derive from the VARBRUL analysis, in which a factor with a probability weight above .50 favors the use of the variant *past tenses* that was chosen as the application value. Meanwhile, a weight below 0.50 restricts the use of the variant, and a weight of .50 implies that there is no influence on the past tense choice. It should be noted that the factor group with the notification from the program to be eliminated fails to have significant effect on the application value. In the current study, the result generated by VARBRUL shows that among the four factor groups, there are three significant groups which are journal editions, verb types, and voices. It means that time was recognized as an insignificant group, which means that it has no effect on the tense choice of *propose*. The following analysis targets on the significant groups selected by VARBRUL to predict the frequency of past tense for reporting *propose*. Table 2 addresses the factors significantly affecting past tense usage based on the result of a step-up/step-down analysis.

Table 2 Significant factors that affect past tense choice

Factor group	VARBRUL Weight (Pi)	Tokens past/total	Percentage
Journals			
RF	0.596	68/92	73.9
MJ	0.532	102/153	66.7
IEEE	0.511	63/81	77.8
JMS	0.304	33/71	46.5
Verb types			
Self-reporting	0.696	181/215	84.2
Citation	0.273	85/182	46.7
Voice			
Active	0.361	75/133	56.4
Passive	0.571	191/264	72.3
Total		266/397	67.0
Input 0.710			
Total Chi-square = 3.6059			
Chi-square/cell = 0.2404			
Log likelihood = -206.673			
Limited Chi-square = 12.592 ($df = 6, p = .005$)			

It can be seen in table 2 that all the factor weights are ranked from the highest to the lowest, meaning from the factor with better influence on the application value to factor with less influence. The total Chi-square value equals 3.61 ($df = 6, p < .05$), which implies that past tense choice and the factor groups are independent. This is considered a crucial assumption in VARBRUL analysis. The result shows the input probability has a value of .710, meaning that the occurrence of past tenses for *propose* is averaged at 71.0% among the data.

In terms of journal editions where the past *propose* occurs, it can be observed that different journals have different effect on the verb tenses. Examples (1) -(4) illustrate how *propose* is used in each journal edition.

- (1) In this study we *proposed* a novel identification scheme which takes advantage of the device self-heating to effectively reduce the amount of experimental information required to extract the model. (RF1-10)
- (2) In [19], a data scrambling technique *was proposed* to protect cache data as follows: the first half of a word is scrambled with the first bit of the first half, and the second half is then XORed with the scrambled result of the first half. (MJ2-20)
- (3) The mm-wave bidirectional front end has been previously reported in [18] at 45 GHz, and recently, the wideband version at the E-band *was proposed* in [36]. (IEEE2-16)
- (4) The *epi-seal* encapsulation process *was proposed* by researchers at the Robert Bosch Research and Technology Center in Palo Alto and then demonstrated in a close collaboration with Stanford University. (JMS2-6)

With the highest VARBRUL weight (.60), RF shows that it has the greatest influence on the past tense choice of *propose*. MJ and IEEE similarly indicate rather high VARBRUL weights except JMS which has the value of .30, which implies that past tenses are relatively disfavored by JMS. Compared to Hyland (1999) which ignored this factor, the current study can be considered as an in-depth investigation on reporting verbs when examining how the verbs are used across journals within the discipline. The finding of this study conveys an implication that there seems to be a tendency in verb tense choice across different journals. This phenomenon can be attributed to the characteristics of each journal, which are carefully observed by the writers. This characteristic can be considered as an identity of each journal.

The VARBRUL results also indicate that types of *propose* decide its past tense usage. With a considerably high weight (.70), it can be understood that self-reporting *propose* are far frequently employed in past tenses. It means that to report their own study, procedures, and contribution the writer tends to use past tenses rather than present tenses. However, when citing other authors' work, writers tend not to use past tenses for *propose* (VARBRUL weight = .28). The weight reveals that past tenses are disfavored by citation *propose* in Electrical engineering. Examples (5) (6) address the phenomenon.

- (1) In previous theoretical studies, we *had proposed* a thermodynamic analytical model to study the performance of a multi-stage configuration to generate high pressure. (JMS2-4)
- (2) Computing zeros of the determinant of arbitrarily complex matrices being numerically inefficient, Rizzoli et al. [13] *have proposed* a good alternative, by making use of the Nyquist approach.

As defined above, *propose* in example (5) is a self-reporting verb while it reports the writer's own work. With this function, past tenses are favored with 84.2% of probability. Example (6) indicates a case *propose* functioning as a citation verb when it is used to cite the other authors' work. Different from self-reporting verb, citation *propose*

is tended to use in present tenses with the probability percentage of 53.3. This phenomenon can be generalized as a tendency in *propose* usage in Electrical engineering research articles. Compared to the other studies on reporting verbs, this study emerges with its contribution to the field when it finds out the interaction between the verb types and tense choice.

The factor of voices is also recognized to have a significant effect on tense usage. The VARBRUL weight of .58 shows an interesting finding that *propose* in past tenses tends to be slightly preferred to use with a passive voice. Examples (7) and (8) show how *propose* is used in passive in the field.

- (1) Although this expression has no specific meaning, it *has been proposed* to make a distinction with 'layer-by layer' growth. (MJ1-16)
- (2) To create a DC-pumped REE laser, the idea of introducing REEs into covalent semiconductors *was proposed* by Bell in 1963[1]. (MJ1-14)

It can be seen from the examples that a passive voice is used to emphasize the research process, activity, or action rather than the agent. According to this analysis, its voice decides whether *propose* should be used in past or present. This phenomenon can be also seen as one of the identities of research writing in Electronic engineering.

In the current study, one factor group which is time periods was eliminated since the results showed that it had no interaction with the tense choice in research articles. Table 3 reveals why these two factors are independent with the application value.

Table 3. Eliminated factor groups that does not affect tense choice

Factor group	VARBRUL Weight (Pi)	Tokens past/total	Percentage
Time periods:			
Before 1999	0.410	73/115	63.5
Present	0.537	193/282	68.4

Even though the analysis indicates the insignificant effect of the two groups on verb tense choice, the results have certain implication. Regarding the factor of time, the VARBRUL weights of before 1999 (.41) and present (.54) show that the choice of past tenses for the reporting *propose* is slightly increased. However, the percentages of *propose* in past tense used in both time periods imply that past tenses are more favored than present tenses. This finding can conflict with Chen's (2009) claim that present tenses are more preferred for reporting verbs in hard science research articles. Therefore, it could be implied that tenses of reporting verbs can vary from each verb.

According to Swales & Feak (2004), reporting verbs are used in past tenses when the author implies that the cited work is not very close to the current study, which means that the cited claims can be invalid now. This means that *propose* is used in electrical research articles when the author tends to argue toward the cited works. Nevertheless, the finding from time factor of this study can indicate that *propose* has been constantly preferred to use in past tenses in electrical engineering across time. This tendency becomes nearly unchanged in this discipline.

Concerning the second research question which attempts to generalize in what pattern *propose* is used, the results can infer clearly that tenses of the verb are dependent with the journal editions and verb types. Even though the VARBRUL analysis showed that time periods and voices are independent with the verb tense choice, there was certain difference in frequencies of past tense in each factor. Therefore, it can be concluded that the most common pattern of *propose* in Electrical journal is as a self-reporting verb put in past tense and passive voice.

4. Conclusion

While attempting to have an in-depth investigation of the reporting verb *propose*, this study has found factors that significantly affect the verb tenses, which has not been done before. The study demonstrates the usefulness of VARBRUL in sociolinguistic variation analysis.

The results show that verb tenses are not dependent on the time periods and voices. This confirms that verb tenses of *propose* have become a tendency across time. This finding once again confirms the result of Hyland (1999) that *propose* is still used in the same manner regardless time. Although it is realized as an independent factor, the result on verb voices expresses a tendency of using *propose* in the passive in the field. Regarding significant factors, journal editions and verb types somehow decide whether *propose* is used in past or present tenses. In different journals, *propose* is used in different manner, which tends to become an identity of the journal. It is interesting to find that self-reporting *propose* is more frequently used in past tenses.

The sample size of the study is still restricted, which can affect the result of the study. Moreover, the study only focuses on two types of the verb, so it can be difficult to generalize the whole phenomenon of the verb in the field. However, the study can provide an interesting direction for future studies on reporting verb analysis from sociolinguistic approach. This study introduces a new effective analysis method for investigating reporting verbs which has never been done before: VARBRUL analysis.

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