

LEXICAL BUNDLES IN RHETORICAL MOVES OF ENGINEERING RESEARCH ARTICLE ABSTRACTS

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Abstract

Lexical bundles are the continuous phrases framing and shaping thoughts as the building blocks of the discursual units in rhetorical moves. These bundles are distributed across a variety of academic disciplines. This work aimed to identify lexical bundles in electrical engineering abstracts, to investigate the structures of lexical bundles and to analyze them to the rhetorical moves. The self-compiled corpus called Eng-Corpus was a collection of four prestigious journals in an engineering field the recent years. Using the form-first approach, this study found that 84 bundle types occurred in the corpus. Structurally, most of these lexical bundles were cooperated with noun phrase and prepositional phrase fragments, while those with dependent clause fragments were scarce. For the connection between lexical bundles and move, it was found that some bundles have multiple functions across different moves of abstracts. These findings are drawn to pedagogical use for engineering abstract writing discourse.

INDEX TERMS: lexical bundles, rhetorical moves, bundle-move, and engineering discourse, a corpus - based analysis

I. INTRODUCTION

With the rapid movement towards globalization, many academicians ranking from graduate students to professors are required to publish their academic work in international journals. Therefore, the attempt to publish internationally puts the professional and peer pressure on academic writers especially L2 writers as the notion “*Publish or perish?*” (Mittemeijer, 2022; Tie & Wang, 2022). Indeed, regardless of the languages for publication, English language is mandatory for the abstract sessions. An abstract is a concise picture of the research articles, outlining the significant contribution of knowledge. Furthermore, it serves to invite academic readers to read the full research article (Saengsai & Pramoolsook, 2017) and evaluate the quality of the academic work (Hyland, 2000). Therefore, research articles with well-crafted abstracts can encourage the readers’ engagement (Saengsai, 2021; Saengsai & Pramoolsook, 2017). However, it is noted that the available courses to service the English writing courses for publication are still the stereotype of academic disciplines and unsupportive of the specific communicative purposes (Chen & Flowerdew, 2018; Flowerdew, 2021; Alshahrani, 2015; Wang, 2020).

Lexical bundles should be implemented in second language writing classrooms with novice writers to facilitate their writing performance and to participate in the discourse community (Hyland, 2008a). Indeed, lexical bundles are the phrasal units in syntactic fragments that frame and contextualise learners' thoughts as building blocks of a discourse (Biber, Johansson, Leech, Conrad & Finegan, 1999). Because of English as one of the phraseological languages, most linguistic experts (Biber, 2006; Ellis et al., 2008; Simpson-Vlach & Ellis, 2010; Wray, 2000, 2006, 2013; Wray & Perkins, 2000) postulate that not only native but also non-native writers should study lexical bundles to master the language and use them naturally. When it comes to communication, lexical bundles connect the communication between readers and writers via discourse organizers understandingly (Wray, 2006). Moreover, such bundles, in the view of psycholinguistics, are deeply rooted in long-term memory (Wray, 2013), so they can increase the fluency of linguistics production (Cortes, 2002, 2013; Hyland, 2008a, 2008b) as found in the previous experiments (Birhan, 2021; Kim, 2018; Ranjbar, Pazhakh & Gorjian, 2012).

Groundbreaking research conducted by Biber et al. (1999) revealed that the structural and functional characteristics of lexical bundles varied among registers (both spoken and written). Therefore, this contribution motivated other works to research the contrastive study on different genres (Biber et al., 2004; Conrad & Biber, 2005) and disciplines (Cortes, 2004; Hyland, 2008b). With these variations, Hyland (2008a, b) underlined the critical concept that lexical bundles should be explored in different disciplines to benefit various discourse communities. As a result, many researchers conducted further research studies on other disciplines such as medical (Panthong & Poonpon, 2020a, 2020b), legal discourse (Alasmary, 2019), Ted Talk discourse (Rattanawaropas & Panthong, 2021), applied linguistics (Nasrabady, Shirvan & Golparvar, 2020; Shirazizadeh & Amirfazlian, 2021), mathematics (Alasmary, 2022), EU parliament discourse (Wu, 2021), and scientific research (Du, Jiang & Liu, 2021).

To date, the boundary of lexical bundle works is connected to other schools of thought, especially in rhetorical moves. This connection refers to Bundle-Move which the set of word strings frequently occurs in the rhetorical moves (see Cortes, 2013; Hong, 2020; Li, Franken & Wu, 2020). Moreover, Cortes (2013) strongly justified that lexical bundles are viewed as the discursual structures in the discursual units of rhetorical moves. Hence, she undertook the corpus-based approach to explore lexical bundles in introduction sessions of research articles. As Mizumoto et al. (2017) claimed, it should be noted that this connection is beneficial for language learners to implement lexical bundles as linguistic resources in the data-driven learning form. Furthermore, Cortes' revolutionary research motivates similar works in different academic disciplines such as Ph.D. social science abstracts (Li, Franken & Wu, 2020), multidisciplinary abstracts (Omidian et al., 2018), medical abstracts (Abdollahpour & Gholami, 2019), overall move of agriculture research articles (Shi, 2010), introduction sessions of research articles

(Hong & Hua, 2019), stand-alone literatures (Wright, 2019), result and discussion sessions of applied linguistics research articles (Le & Harrington, 2015).

One of the academic disciplines is engineering, and Hyland (2008a, 2008b) recognized this discipline as a clear picture of scientific discourse. For this reason, scholars in an engineering discipline paid attention to exploring lexical bundles (see Chen, 2010; Ha & Lee, 2019; Nekrasova-Beker & Becker, 2019, 2020; Rezoug & Vincent, 2018) and rhetorical moves (e.g., Guinda, 2015; Kuswoyo, Sujatna, Indrayani & Rido, 2020; Maswana, Kanamaru & Tajino, 2015; Rungnaphawet, 2016; Zubir, Suryani & Abdullah 2021). Nevertheless, the analysis of lexical bundles in abstract moves of an engineering discipline is relatively rare, even though some engineering students demand these linguistic resources to facilitate their research writings (Buswell, Tresiek, Troy, Essig & Boyd, 2019). Therefore, it is hoped that the results of this study would be maximally helpful for pedagogical use by language and content teachers, students, and engineering writers. The following are the research objectives: to explore lexical bundles in engineering abstracts, to investigate the structure of lexical bundles in engineering abstracts, and to analyze lexical bundles in rhetorical moves in engineering abstracts.

II. RESEARCH METHODOLOGY

A. Corpus Compilation

This study constructs the self-complied corpus titled 'Eng corpus' with 282, 387 running words. As shown in Table 1, This corpus is the collection of 1,771 abstracts of four prestigious high-scoring citation journals in an engineering field in www.scimagojr.com (the most extensive database for research articles), namely: Nature Biotechnology, Nature Materials, Nature Nanotechnology and Nature Electronics. These journals include many subdisciplines of engineering corpora. The rationale under this data collection introduces two criteria. First, selecting research articles and journals is associated with two suggestions. Nwogu (1997) suggested that the selection of research articles should be representative, accessible, and popular, so it is likely to ensure the generalization of the results. Another criterion is the time frame of publication. According to Guinda (2015), a five-year period allows the research to reflect the discourse analysis; moreover, Hyland and Jiang (2018) supported that lexical bundles can be changed because of scientific advancement.

Table 1: List of Journals in Eng Corpus

No.	Journals	Abstracts	Words
1	<i>Nature Biotechnology</i>	255	40,785
2	<i>Nature Materials</i>	575	91,663
3	<i>Nature Nanotechnology</i>	402	64,107
4	<i>Nature Electronics</i>	539	85,832
Total		1,771	282,387

B. Research Instruments

Based on the research objectives mentioned above, this research undertook the corpus-based analysis by introducing three research instruments: AntConc, a structural taxonomy and a rhetorical scheme of abstract sessions.

Firstly, AntConc version 4.0.1 for macOS was used to explore the lexical bundles. AntConc is the computational software invented and developed by Anthony (2022). With its function 'N-Gram', this software can yield the strings of words, frequency, and range. This software is freely available for corpus linguistics.

The second research instrument is Biber et al. (2004)'s structural taxonomy. Revising the old taxonomy (Biber et al., 1999), Biber et al. (2004) expanded a more comprehensive range of categories and types in the spoken and written corpora. For this reason, it is possible that the lexical bundles in this corpus can be correlated with the wide range of categories in this taxonomy. Biber et al. (2004)'s structural taxonomy included three categories namely (1) verb-phrase fragments, (2) dependent clause fragments, and (3) noun phrase and prepositional phrase fragments.

The last research instrument is a rhetorical scheme of abstract sessions invented by Hyland (2000). This scheme is an invention of eight academic disciplines between scientific and social sciences. It consisted of five moves including Introduction, Purposes, Method, Product, and Conclusion as displayed in Table 2.

Table 2: A Rhetorical Scheme of Abstract Sessions

Moves	Functions
Introduction	Establishes the context of the paper and motivates the research or discussion.
Purpose	Indicates purpose, thesis or hypothesis, and outlines the intention behind the paper.
Method	Provides information on design, procedures, assumption, approach, data, etc.
Product	States main findings or results, the argument, or what was accomplished.
Conclusion	Interprets or extends results beyond scope of paper, draws inferences, points to applications or wider implications.

C. Operationalization of bundle move

This study adopted the form-first approach invented by Cortes (2013) because of two motivations. First, this approach allows the researchers to explore lexical bundles within moves of a larger corpus size. Biber, Connor and Upton (2007) identified two approaches to analyze the rhetorical move: the bottom-up and top-down models. The top-down model is related to the investigation of communicative function, while the bottom-up counterpart is related to the frequency-driven corpus approach by exploring the linguistic features in moves. With these features, the frequency of lexical bundles can potentially represent a characteristic of certain discourses (Biber et al., 2007). Another reason is that this method could avoid the researchers' multiple bias. According to Jirapanakorn, Trakulkasemsuk and Keyuravong (2014), the qualitative-based method or top-down approach could be relevant to the preference of the researchers, and it

limits the ability to generalize the results because of the relatively small corpus (Li et al., 2020; Omidian et al., 2018). To this end, this study introduces three following stages to conduct the operationalization of bundle moves: (1) the identification of lexical bundles, (2) the structural analysis and (3) the connection between lexical bundles and rhetorical moves.

The first stage is to identify four-word lexical bundles which occurred in the engineering abstracts. This process involved three steps: i.e., the number of words, the cut-off criteria, and the elimination of unrelated bundles. A significant number of corpus linguistic experts (Biber, 2006; Biber et al., 1999; Biber & Barbieri, 2007; Csomay, 2013) found that two- and three-word bundles are too numerous while five- and six- words are relatively rare in a corpus. Even though Cortes (2013) professed that five-word bundles are more adhesive to rhetorical moves, our preliminary results found that English corpus provides only 11 five-word bundle types. Furthermore, this research focuses on lexical bundles appearing at least 11 times with a minimum of 5 ranges calculated by the normalization of Biber et al. (2004) and Biber and Barbieri (2007). It is widely known that the cut-off point is very arbitrary, so previous research may set it from 10 (Biber et al., 1999), 20 (Hyland, 2008a, 2008b), to 40 times per one million words (Biber & Barbieri, 2007). However, Biber et al. (2004) generalized that lexical bundles should occur with high frequency because they can represent the discourse. Apart from the frequency, the range is another consideration. The content of texts helps prevent the author's preference to use the repeatedly phrasal units. Usually, previous studies were set at five texts to avoid this matter. In addition, the process of elimination of unrelated bundles is based on Chen and Baker (2010)'s research to ensure the pedagogical benefits. Lexical bundles with sociocultural backgrounds and overlapped bundles are excluded. The reason to exclude sociocultural-background bundles is that they can reflect too specific discourse to benefit classroom use, and for collapsed bundles, they can cause the inflation of bundles.

The second stage is related to the structural analysis of the analytical process. Using Biber et al. (2004), the study uses computational software to observe and analyse each bundle type via concordance lines, classify it into different types, and calculate it into a percentage.

The final stage is to connect lexical bundles to rhetorical moves. It was achieved by exploring lexical bundles through the concordance lines. First, an analysis was based on the conceptual framework invented by Hyland (2000). Since Cortes (2013) advised that some lexical bundles are multifunctional in moves, the lexical bundles were extensively accessed via concordance lines to analyze their rhetorical moves. The researchers asked one engineering inter-coder who had previously studied in the U.K. to co-code the results. After that, those bundle types are classified by structure and separated into each move.

III. RESULTS

This study contributed three significant results to Eng corpus: the distribution of lexical bundles, their structures, and the connection between lexical bundles and rhetorical moves.

A. The distribution of lexical bundles

According to research objective one, it was found that there were 84 bundle types in Eng corpus. Table 3 reports the top ten frequencies of bundle types. To begin with, *'here we report a'* is the most frequent bundle type at 128 times with 128 ranges, while *'here we present a'* is the tenth bundle type at 32 times with 32 ranges. In addition, some bundles are related to engineering terms such as *'complementary metal-oxide-semiconductor'*, *'density functional theory calculations'*, *'van der Waals heterostructures'*, *'the mechanical properties of'*, etc..

Table 3: The Distribution of Lexical Bundles in Eng Corpus

No.	Bundles	F	R	No.	Bundles	F	R
1	here we report a	128	128	6	in the development of	40	40
2	can be used to	112	95	7	for the development of	37	35
3	here we report the	70	70	8	state of the art	35	35
4	we also show that	63	63	9	we show that a	35	35
5	complementary metal oxide semiconductor	42	42	10	here we present a	32	32

*F=Frequency, R= Range

B. Structure

The results of research objective 2 revealed 58.3 % of noun phrase and prepositional phrase fragments, 39.28% of verb phrase fragments, and 2.3% of dependent clause fragments.

There are many types for noun phrase and prepositional phrase fragments, including 22 bundle types of prepositional phrase expressions, 16 bundle types of noun phrase with of-phrase fragments, nine bundle types of other noun phrase expressions, and comparative expressions. Except 1 shows the structures of noun phrase with of phrase fragments labelled *'the rationale design of'* functioning to explain the research procession. At the same time, *'complementary metal oxide semiconductor'* is recognized as a technical term in engineering discourse as demonstrated in Expert 2.

Excerpt1

"The rational design of photonic nanostructures consists of anticipating their optical response from systematic variations of simple models." (Eng3.2017.12)

Excerpt 2

“... integrates a one-transistor–one-resistor ReRAM array with control and readout circuits on the same chip using an established 65 nm foundry *complementary metal oxide semiconductor* (CMOS) process.” (Eng4.2019.2)

The second category of bundle type of Eng corpus is the dependent clause fragments. Among many types within this category, only three types including 1st/ 2nd person pronoun + VP fragments, Verb phrase (with non-passive verb), and Verb phrase (with passive verb), while other types associated with a spoken register were not found. The most extensive type, 1st/ 2nd person pronoun + VP fragments, included 22 bundle types such as ‘*it is shown that*’, ‘*we show that the*’, and ‘*here we introduce a*’. The rest is related to verb phrase fragments. Verb phrase with the non-passive verbs are 12 types, i.e., ‘*be of use in*’ and ‘*has the potential to*’, while 12 bundle types such as ‘*can be applied to*’, ‘*is limited by the*’, ‘*can be used to*’ were classified as verb phrase with passive verbs. Excerpts 3 to 5 give examples of these three different types of verb phrase fragment categories.

Excerpt 3

“*Here we introduce a type of optical coatings that exhibit photonic Fano resonance, or a Fano-resonant optical coating (FROC).*” (Eng2.2021.16)

Excerpt 4

“The demonstrated characteristics suggest that the quasi-non-volatile memory *has the potential to* bridge the gap between volatile and non-volatile memory technologies and decrease” (Eng3.2018.13)

Excerpt 5

“We present a pathway-independent genetic control module that *can be used to* dynamically regulate the expression of target genes.” (Eng1.2017.35)

The lowest frequency was across the variety of dependent clause fragments. Only two bundle types were found in two structural types. ‘*to illustrate the capabilities*’ was recognized as the to-clause fragment (see Excerpt 6), whilst another type was that-clause fragments ‘*that can be used*’ as shown in Excerpt 7.

Excerpt 6

“*To illustrate the capabilities* of our silver–hydrogel composite, we use the material in a stingray-inspired swimmer” (Eng5.2021.4)

Excerpt 7

“The approach offers a facile method *that can be used* to manipulate the ballistic drop jumping via an electrostatic field, opening the possibility of energy efficient drop detaching techniques in various applications.” (Eng2.2018.30)

C. the Connection between lexical bundles and rhetorical moves

The connection found that there were 112 functions of 32 types of lexical bundles occurring in Move 3, followed by 30 types in Move 1, 29 types in Move 4, 17 types in Move 2, and 4 types in Move 5. As Cortes (2013) mentioned, some bundles can perform multiple functions in a discourse, so this causes several functions than the structure of bundles.

Move 1 Introduction

Move 1 contains the second largest proportion of bundle types for this corpus. As shown in Table 4, most of them are noun phrase and prepositional phrase fragments. Once again, these introduction bundles construct the contexts and attract the readers to read the paper as shown in Excerpts 8 to 9.

Table 4: Introduction Bundles

Move	Examples of lexical bundles
Introduction	<i>be used to create*</i> , <i>have been used to</i> , <i>complementary metal–oxide–semiconductor</i> , <i>in the development of*</i> , <i>for the development of</i> , <i>in the presence of*</i> , <i>in the presence of*</i> , <i>the rational design of</i> , <i>the anomalous Hall effect</i>

Excerpt 8

“... while their single-layer variants have become *one of the most prominent examples of two-dimensional materials beyond graphene.*” (Eng2.2018.17)

Excerpt 9

“CRISPR screens *have been used to connect genetic perturbations with changes in gene expression and phenotypes.*” (Eng1.2021.39)

Move 2 Purpose

Purpose bundles are associated with the pronoun ‘we’ (Table 5). Most writers use these bundles to declare their purposes after the introduction move. As seen in Excerpt 10 below, Excerpt 10 explicitly declares their purposes while other writers, whose purpose bundles are ‘*here we present a*’, implicitly explain their research purpose.

TABLE 5: PURPOSE BUNDLES

Move	Examples of lexical bundles
Purpose	<i>in this study we</i> , <i>for the first time</i> , <i>here we report on</i> , <i>here we demonstrate that</i> , <i>here we describe a</i> , <i>here we demonstrate a</i> , <i>here we report an</i> , <i>here we present a</i>

Excerpt 10

In this study, we investigated the efficacy and safety of ABEs in the livers of mice and cynomolgus macaques for the reduction of blood low-density lipoprotein (LDL) levels. (Eng1.2021.39)

Excerpt 11

Here we present a massively parallel protein activity assay, active TF identification (ATI), that measures the DNA-binding activity of all TFs in cell or tissue extracts. (Eng1.2018.36)

Move 3 Method

Of all bundle moves, method bundles contain the biggest number. As shown in Table 6, method bundles contextualized the scientific procedures of engineering research. Excerpt 12 demonstrates how *'to illustrate the capabilities'* functions to explain the research operationalization, and similarly, *'on the surface of'* signals the location of the research process (Excerpt 13).

TABLE 6: METHOD BUNDLES

Move	Examples of lexical bundles
Method	<i>a wide range of, three orders of magnitude*, on the order of*, in a range of, without the need for, the origin of the, on the surface of, as well as A, the mechanical properties of*, single walled carbon nanotubes, at room temperature and, to illustrate the capabilities</i>

Excerpt 12

"To illustrate the capabilities of the approach, we use it to examine the impact of carbon impurities in the epitaxial buffer layer of a device." (Eng5.2021.4)

Excerpt 13

"The patterning is implemented within operando laser crystallization of a thin HfO₂ film 'sheath' on the surface of a GaAs waveguide." (Eng2.2019.18)

Move 4 Production

The fourth move is production. The production bundles contain some words to identify the results such as *shown, find, and results* (see Table 7). For example, in Excerpt 15, the writers use *'it is shown that'* to announce the research results of the experiment. In the same way, *'a proof-of-principle'* was used to confirm the results of the study as displayed in Excerpt 15.

TABLE 7: PRODUCTION BUNDLES

Move	Examples of lexical bundles
Production	<i>it is shown that, can be used as a*, we find that the, we show that the, we show that a, state-of-the-art, in the presence of*, density functional theory calculations*, as a proof of, as a result of, in a variety of*</i>

Excerpt 14

“Here, *it is shown that* ladder-type polymers such as poly (benzimidazobenzophenanthroline) (BBL) can successfully work as stable and efficient n-channel material for OECTs” (Eng4.2018.30)

Excerpt 15

“As *a proof-of-principle*, we show a dynamic change of structural colours of the stack derived from this process.” (Eng3.2021.16)

Move 5 Conclusion

The last move is conclusion, where the least bundles occur. Conclusion bundles appear in both verb phrases, and noun phrase and prepositional phrase fragments (see Table 8). Both Excerpt 16 and Excerpt 17 were used to conclude the results of the study for further application.

TABLE 8: CONCLUSION BUNDLES

Move	lexical bundles
Conclusion	<i>can be used to, be used to create, of two-dimensional materials, a wide range of</i>

Excerpt 16

“This evidence of local defect migration and structural recovery in graphene sheds light on the complexity of chemical and physical processes at the grain boundaries *of two dimensional materials*.” (Eng2.2021.20)

Excerpt 17

“These results *can be used to* rapidly screen many compounds and design new ones with optimal transport characteristics.” (Eng2.2017.16)

IV. DISCUSSION

Based on the three key findings of this study, the discussion introduces the following points: the lexical bundles in Eng Corpus, lexical bundle structures and the connection between lexical bundles and rhetorical moves.

This study found 89 bundle types with some engineering-related bundles for lexical bundles in Eng corpus. The result of this study is in agreement with the previous research (Abdollahpour & Gholami, 2019; Du et al., 2021; T. Nekrasova-Beker & Becker, 2019; Panthong & Poonpon, 2020b). This phenomenon may be explained by the fact that due to disciplinary variations (Cortes, 2004; Hyland 2008a, 2008b), scientific corpora frequently produce a set of technical terms as a part of bundles. Theoretically, these bundles reflect the variation of discourse and break down the stereotypes of the whole pictures of scientific discourses; that is to say, they may be likely to only occur in the engineering disciplines. In practicality, however, these technical bundles are likely to facilitate those who aim to publish internationally or language and content teachers for pedagogical use to engage the discourse community.

In terms of structural categories, the highest percentage was noun phrase and prepositional phrase fragments, followed by verb phrase fragments, and dependent clause fragments. This study partially shares the similarity with the previous research. The biggest proportion of noun phrase and prepositional phrase fragments can be tentatively explained by the fact that both noun phrases and prepositional phrases are common in academic discourse (Biber et al., 1999; Conrad & Biber, 2005; Hyland, 2008a). Also, the verb phrase fragments in this study show the first pronoun 'we' very frequently in the corpus. This result is not in line with previous studies in the scientific disciplines (see Abdollahpour & Gholami, 2018; Al-Shujairi et al., 2020; Salazar, 2014). As Biber et al. (2014) remark, 1st and 2nd pronouns were more common in the spoken register than in writing registers. However, in the case of engineering, the first pronoun 'we' reflected the nature of engineering discourse according to genre experts in the engineering field (Maswana et al., 2015; Saengsai & Pramoolsook, 2017). Moreover, dependent clause fragments are very scarce in this corpus of abstracts so a plausible explanation can be the characteristics of lexical bundles in different registers. Biber et al. (2004) and Biber and Babieri (2007) postulate that these dependent clause fragments commonly occur in spoken registers.

The last point to discuss is the connection between lexical bundles and rhetorical moves. Most of the bundles appeared in Move Three (method session) and can perform as multifunctional bundles. The reason for a large number of method bundles could be answered by the fact that the engineering abstracts underlined the method as the essential part (Saengsai & Pramoolsook, 2017). . In the case of the multiple functions of bundles, it may be concluded that the lexical bundles can function differently in the

discoursal unit (rhetorical moves) (Cortes, 2013). This allows the variation of writing style in each move with the same bundles but different functions.

V. CONCLUSION

This study explored lexical bundles in an abstract session of four cited-score journals in the engineering field, investigated their structures, and analyzed them in rhetorical moves. The results found that 84 bundle types were found, and some of them are embedded within technical terms in engineering. Structurally, a majority of lexical bundles are incorporated with noun phrase and prepositional phrase fragments as the nature of academic discourse. For moves, most bundles occur in the method sessions functioning to explain the engineering process. This research is notable for its implantation in the pedagogical use to benefit the second language learners. Some experts (Ellis et al., 2008; Simpson-Vlach & Ellis, 2010) claimed that phraseology can work as the linguistics resource of the pre-task session and that they guide the students to write. Additionally, Mizumoto et al. (2017) suggested that the learners who use bundle-move have a positive attitude toward using corpora as data-driven learning. As a consequence, ESP or EAP teachers may use the results of this study in their academic writing for engineering students. These bundles would potentially facilitate their abstract writing to engage in the discourse community of an engineering field.

It should be noted that this study has some limitations. First, this research explored lexical bundles in an abstract session, so this may not fully generalize the whole picture of engineering research articles. Future research may consider exploring other sessions to contribute to the knowledge of bundle-moves. Secondly, this study applied the form-first approach (Cortes, 2013), so it is likely that some useful bundle-move under the cut-off point can disappear. Further studies should construct a bigger corpus to generate the results of repetitive writing bundles. The last limitation is that this study solely emphasized the discipline of engineering, so other research may take advantage of exploring other academic disciplines.

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