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# Bundle-Move Analysis in Research Article of Science and Technology: Connecting Lexical Bundles and Rhetorical Move

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**Abstract**

This research identifies lexical bundles which are connected to move analysis in research article of Science & Technology. The corpus-based analysis was used to acquire lexical bundles qualification of frequency and range. A number of bundles which were listed in the corpus were identified structurally and functionally using taxonomy approach by Biber et al., (2004). Further analysis was conducted to connect lexical bundles expression with rhetorical move. Connecting lexical bundles and move analysis in research articles aims to test whether lexical bundles can be used as move markers in academic discourse. The classification of move in a full-length research articles was adapted from Nwogu (1997). In the various structural and functional forms of bundles which are found in this study bring to the list of lexical bundles which indicate various move. The finding of this research is mainly supporting previous study where some bundles expressions have strong connection to rhetorical move in research article. Other finding shows that lexical bundles expressions could occur in more than one move. However, we found that not all of the bundles could express specific move (e.g. the value of the, the length of the, absorption process of the) and not all move is expressed by lexical bundles (move 8).

**Keywords**: lexical bundles, rhetorical move, corpus, research article, Indonesian writer

**Abstrak**

Penelitian ini mengidentifikasi lexical bundles yang dihubungkan dengan analisis move pada jurnal artikel Sains dan Teknologi. Analisis berdasarkan korpus digunakan untuk mendapatkan kualifikasi lexical bundles mengenai frekuensi dan rentang. Jumlah lexical bundles yang di hasilkan dari korpus kemudian diidentifikasi secara struktural dan fungsional dengan menggunakan pendekatan yang dikemukakan oleh Biber dkk., (2004). Analisis lebih jauh dilakukan untuk menghubungkan ekspresi *lexical bundles* dengan *rhetorical move*. Menghubungkan *lexical bundles* dengan *move* analysis pada artikel penelitian bertujuan untuk menguji apakah *lexical bundles* dapat digunakan sebagai penanda *move* dalam wacana akademis. Klasifikasi *move* terhadap artikel penelitian utuh diadaptasi dari Nwogu (1997). Dalam beberapa variasi struktur dan fungsi *lexical bundles* yang ditemukan dalam penelitian ini menghasilkan urutan *lexical bundles* yang mengindikasikan *move*. Hasil dari penelitian ini secara umum mendukung penelitian sebelumnya dimana beberapa ekspresi *lexical bundles* menunjukan koneksi yang kuat dengan *rhetorical move* pada artikel penelitian. hasil lain menunjukan bawaha ekspresi *lexical bundles* muncul pada lebih dari satu move. Namun begitu, kami juga menemukan bahwa tidak semua *lexical bundles* mengekspresikan *move* tertentu (contoh *the velue of the, the length of the, absorption process of the*) dan tidak semua move diekspresikan menggunakan lexical bundles (*move* 8).

**Kata Kunci**: *lexical bundles, rhetorical move, korpus, artikel penelitian, penulis Indonesia*

## INTRODUCTION

One of the aspects to build a reputation in the academic world is to do scientific publications. Besides that, scientific publications are also used for various requirements in obtaining professionalism such as graduation at a certain level of education or a certain degree. This fact brings academic life in a more  competitive situation in publishing research articles (Hyland, 2015). In addition, challenges and difficulties in the level of linguistics accuracy will be faced by writers whose English is not their first language. For this reason, genre analysis as a part of discourse analysis is done in employing pedagogical and descriptive purpose.

The rising of genre analysis in linguistics studies has attracted several academics and linguists due to the importance of language used in a specific context. There are at least two important goals of genre analysis and its implication for language teaching and learning: understanding the use of language for specific communicative purposes and employing language knowledge in an educational context where literary education is a kind of social practice (Hyland, 2002). Those two assumptions proposed by Hyland (2002) provide insight into how genre analysis in an academic context works.

One of the results of genre analysis is the emergence of a specific theory named *move* which was introduced for the first time by Swales (1981). The concept of Swales's work is shifted "from analyzing genre as pure linguistics unit to analyzing it as discursive unit" (Alamri, 2020, p.20).  Besides, move analysis is part of genre analysis where move marks characteristics in a particular genre which perform different communicative function (Li et al., 2020). General organizational pattern of text in move analysis could be identified through specific elements called *step* in each move of a whole text (Biber et al., 2007). As stated from Biber et al., (2007, p. 228-229) *step* are the multiple texts fragment "together, or in some combination, realize the move" in such a way that "the steps of a move primarily function to achieve the purpose of the move to which it belongs". The influential of move framework by Swales has stimulated various researchers in conducting the analysis of move in various educational discourses, such as research articles (Cotos et al., 2017; Jiang & Hyland, 2017; Moreno & Swales, 2018), theses presentations (Hu & Liu, 2018), student laboratory report (Parkinson, 2017), and PhD theses (Kwan, 2006; Soler-Monreal et al., 2011) from various academic disciplines. Those research have identified move from various linguistic elements. It proves that the conventional structure and communicative function of move could be realized through particular linguistics feature (Maswana et al., 2015) . In relation to the specific linguistic features of move, Cortes (2013, p.34) stated that:

> "These move-linguistic feature connections could bring about important developments in move-schema theory, because, once identified, these linguistic features could help better describe and illustrate the communicative functions of each move"

Her statement provides the view that frequently occurring linguistics features in specific discourses could be the basis of move analysis. Therefore, the output of research that links between move and linguistics features is important, especially in the field of academic writing of English for specific purposes due to the specific features that students need.
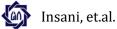
Regarding to the realization of linguistics features of move analysis, we can notice at *lexical bundles*. Lexical bundles is described as most frequently occurring multi-word expressions in specific register with the specific criteria of frequency and distribution (Biber et al., 2002, 2004; Hyland, 2008a). Related to move analysis, little attention has been paid to lexical bundles as specific linguistic features (Deng & Liu, 2022; Omidian et al., 2018) which define specific characteristics and communicative function in each move.

As a beginner, Cortes (2013) identified lexical bundles which connected to moves analysis in research article introductions from the Published Research Articles Corpus (PRAC). By analyzing the structural as well as the functional of four + words bundle, she established the connection between those bundles to rhetorical moves and steps. The results of this study prove that there is a strong relationship between lexical bundles and moves/steps in article introductions. For example, the bundle *studies have shown that* have high frequency which consist in move 1 and step 3 in the texts exclusively. Cortes's (2013) works has inspired several linguists in analyzing the connection of lexical bundles and move. More recently, Mizumoto et al., (2017) conducted a web-based analysis of lexical bundles which provides most frequent bundles used in specific move, such as *implications of these finding* is necessary found in Move 1 (summarizing research finding) of abstract. Since the beginning of bundles-move analysis which conducted by Cortes (2013), research interest to the identification of lexical bundles which connected to move analysis in academic writing are developing until today. Wealth studies have done in conducting the analysis of bundles-move relation from various academic genres, including article abstracts (Abdollahpour & Gholami, 2019; Omidian et al., 2018; Qi & Pan, 2020), PhD abstract (Li et al., 2020), and section of research article (Alamri, 2020; Al-Shujairi et al., 2020; Hong, 2019; Yang, 2022). Bundles-move analysis has also been examined from various contexts, such as disciplinary variation (Deng & Liu, 2022) and L1 and L2 variations (Kashiha, 2015; Kim & Lee, 2020). By identifying four+ words lexical bundles in medical science RAs abstract, Abdullahpour & Golami (2019) found that, in general, lexical bundles are found in move 2 which stating a problem and less frequency in move 1, 3, 4, and 5. Based on the communicative function, they found that general lexical bundles, such as *study was to investigate*, act as a triggers and complements. Those results are also in line with the study by Omidian et al., (2018) that lexical bundles are significantly found in move 2 in the field of soft science. However, they explained that this tendency characterized soft science academic writing, where they tend to "make extensive use of

certain bundles that are conventionally accepted for the realization of these two moves" (Omidian et al., 2018, p. 11).

Contrasting those two results, Qi & Pan (2020) discovered that a high frequency of lexical bundles, whether in the types and tokens, found in move 1 of medical research articles abstracts. The difference in the results of the analysis from some of those studies above shows that even though abstract is seen as a single genre, the content in the abstract is determined by many factors that affect each content in each move. Drawing on the proficiency of English level by native and non-native writers, several studies have also been conducted to identify bundle-move analysis in various article sections from various L2 English writer. Hong (2019) found that Korean graduate students "are in the developmental process of acquiring the bundle use in terms of structure" (p. 49) as evidenced by the difference in the accuracy of the use of lexical bundles with writers who have higher English proficiency. Kim & Lee (2020) also found the same results where Korean graduate student of medical science have a lack frequency of lexical bundles used in their abstract when compare it to English native writer. However, in relation to move identification, Kashiha (2015) found that English native writers tend to use a group of lexical bundles in one move or step while non-native English of Iranian writer used those expressions in more than one move or step.

Those researches that have been mentioned above show the evidence that bundles-move analysis need to be developed especially in research articles, to understand the writing structure and pedagogical knowledge of writers whether as a native and non-native English users. However, those studies tend to focus on a limited section of academic writing and disciplinary variation. Thus, this research attempts to broaden the knowledge of bundles-move identification in their entirety. In addition, little attention have been given to the writers of Indonesian research article, especially in the field of Science and Technology, to discover their characteristics and variation of bundles used in each move.

Generally, Biber et al., (2003, 2004) define lexical bundles as the most frequently occurring sequences of words which can be easily retrieved from the writer's memory as text building blocks. By using special software in a computer, lexical bundles could identify a large number of languages used whether in a spoken or written text. The sequences of multiword unit in lexical bundles usually start from two, three, four, five, or more bundles which frequently found a specific register as register markers (Biber et al., 2004; Cortes, 2013). Since this study is identified through corpus methodology and frequency-based approach, there are two requirements that should be followed as the basis analysis of lexical bundles, those are: frequency and distribution (Biber et al., 1999; Biber et al., 2004; Hyland 2008a). The frequency requirement helped to identify the high probability of bundle used in a text while distribution requirements helped to

avoid writer idiosyncries (Biber et al., 2004; Cortes, 2004; Hyland 2008a). Cortes (2013) mentioned that frequency and distribution requirements are arbitrary. Different studies tend to apply different category of frequency and distribution. For example, Biber at al., (2002) applied cut-off frequency in 10 times per million words in 5 different texts, Hyland (2008a) applied 20 times per million words in at least 10% of all texts, and Biber et al., (2004) applied 40 times per million words in 5 different texts.

Lexical bundles are also identified structurally and functionally. Biber et al., (2004) proposed structural and functional taxonomy approach which then used to identify lexical bundles in this study. There are three categories of structural classification which is proposed by Biber et al., (2004), those are verb-phrase fragment, dependent-clause fragment, and propositional/noun-phrase fragment. In addition, the functional classifications are divided into epistemic stance, discourse organizer, and referential expression.

However, move is categorized as genre-based analysis model which is proposed for the first time by Swales (1981). The concept of move was departed from the viewed that academic writing tends to have rhetorical organization which provides communicative purpose in each section of the text (Biber et al., 2007). Regarding to the genre-based analysis, move forms schematic structure of the text or discourse which shaped different style from different genre. By this argument, move could vary in a length and move which occur frequently in a given register known as conventional in a given genre (Biber et al., 2007).

The schematic-structure of move analysis by Swales (1981) which then updated in Swales works on 1990, are divided move, specifically in introduction into three types: Move 1 (*establishing a territory*), move 2 (*establishing a niche*), and move 3 (*occupying the niche*). Each move have specific step which break down the move itself in more specific function. Since move theoretical framework by Swales (1990) only focused on introduction section, several studies have developed this concept into other broaden types of academic writing. Hardjanto (1997) for example, was developing the move structure in abstract, specifically. He divided four-model of research abstracts structure: Move 1 (*creating a research space*), move 2 (*describing research procedure*), move 3 (*summarizing princikal result*), and move 4 (*evaluating results*). In addition, several linguists have been conducted move structure in a full-length research article such as Nwogu (1997) and Kanosiplatham (2005).  Those two concepts divided research articles into IMRD (Introduction, Method, Result, and Discussion). Each of categories were divided into several moves. Table 1 shows more detail move categories which proposed by Nwogu (1997).

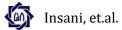| Section | Move | Function |
| --- | --- | --- |
| Introduction | 1 | Presenting Background Information |
| | 2 | Reviewing Related Research |
| | 3 | Presenting New Research |
| Methods | 1 | Describing Data Collection Procedure |
| | 2 | Describing Experimental Procedure |
| | 3 | Describing Data-Analysis Procedure |
| Results | 1 | Indicating Consistent Observations |
| | 2 | Indicating Non-Consistent Observations |
| Discussion | 1 | Highlighting Overall Research Outcome |
| | 2 | Explaining Specific Research Outcomes |
| | 3 | Stating Research Conclusions |

Table 1. Move analysis proposed by Nwogu (1997, p. 125)

Even though move analysis is related to the evidence of general organization in a whole text, it could be gain through the realization of specific linguistic feature. Anthony & Lashkia (2003) stated that sequenced of lexical items could be used to identify linguistics realization of move/step because it detects occurring keywords, phrases, and discourse markers. It proves that lexical bundles and move have strong connection to each other. There is at least one important similarity between lexical bundles and move in that they are text building blocks (Alamri, 2020; Cortes, 2013; Mizumoto et al., 2017).

Cortes (2013) introduces a strong rationale approach which combines lexical bundles analysis and move analysis. By using bottom-up approach, she defines lexical bundles as the linguistics realization of move analysis in RAs introduction section. Cortes (2013, p. 36) stated that "a description of the relationship between lexical bundles and moves in a particular register could provide more evidence towards a complete picture of the tendencies used in the organizational and lexico-grammatical patterns used to build discourse by different speech communities". The starting point of Cortes's (2013) work of bundles-move identification was the approach by Swales (1981). Swales (1981) claimed that the key markers of move analysis are lexical items. However, the communicative purposes of each move are realized through rhetorical choices (Swales, 2004).

This research is categorized as qualitative and quantitative research. The qualitative approach was used to describe lexical bundles function as a linguistic features in relation to move in the data. The quantitative approach, on the other hand, was used to identify the list of the number of lexical bundles emergence in the data. Therefore, this research can be categorized as exploratory research because the researchers combine two methods to identify the frequency of occurrence of lexical bundles associated with move analysis. The data of this research were collected from RAs (research article) of Science and Technology which comprise 105 RAs. Those articles were compiled from three journal publishers, namely *ASEAN Journal of Science and Technology Development* (AJSTD), *Indonesian Journal of Science and Technology*, and *Science and Technology Indonesia*. Those three journals were selected due to the high rank based on Sinta where writers who can publish their journals are considered to have good quality because they have gone through a rigorous review process from editors and journal administrators. The latest articles which published during 2021-2022 were also taken as the consideration to ensure the currency of publication (Ebrahimi & Chan, 2018). Following previous research (Mizumoto et al., 2017; Cheng & Usworth in Al-Shujairi,), the articles should follow I-M-R-D- (Introduction, Method, Result, Discussion) format with the abstract in the beginning. It means that all of the articles that have been taken as a data in this research have I-M-R-D structure. Then, the data were saved in the pdf format and converted to txt format. This study used *AntConc* (3.5.8) by Anthony (2019) as a tool to identify the data of this research. There are several tools in the AntConc application that can be used in corpus analysis such as Concordance, Cluster/N-gram, Collocation, Word List, and Keyword List. Each tool has its own function and purpose which can be adapted to corpus research. In particular, analysis of lexical bundles can be performed on the Cluster/N-gram tool. This tool allows researchers to see the set of words that make up a fixed expression and is based on frequency thresholds and distribution.

Since lexical bundles identification have specific key criteria of length of word combination, cut-off frequencies, and distributions threshold (Biber et al., 1999; Hyland, 2008a; Cortes, 2004), this research applied those specific bundles criterion. The four+ words and five+ word bundle string were taken as the data of this research. The four+ words bundles string were chosen since they are believed as the most frequent in research articles rather than five+ words and three+ words (Cortes, 2013). However, the five+ words bundles contain more information and represent single move rather than multiple moves (Cortes, 2013). For the cut-off frequency threshold, this research was set 10 times per million words. Even though 10 times per million words seems to be less conservative rather than other previous studies (Hyland 2008a). Li et al., (2020, p. 88) stated that "A lower cut-off point is usually established for longer and less common bundles in bundles studies". In addition, the distribution criteria of this research applied other trend of

lexical bundles studies by keeping bundles which occur at least in 5 different texts. After that, all of the bundles which have been listed based on the criteria, were identified structurally and functionally using taxonomy approach proposed by Biber et al., (2004). Then, we conducted move analysis by identifying move in which the bundles occur. The move classification which used in this study is the approach by Nwogu (1997). The rationale of using this approach was because Nwogu's work was inspired from Swales (1981, 1990) where Swales only focus on articles introduction while Nwogu broaden it into full-length articles. However, Maswana et al., (2015) stated that his approach seems clear and comprehensive as a reference in research articles.

Following Li et al., (2020) this study conducted the identification of lexical bundles first to see if any move could be aligned with those occurring bundles in Science and Technology research articles. By this step, we hope that we could discover the possibility of lexical bundles as linguistics features signaling specific move. This study is needed to develop bundles-move approach and argue against traditional move identification that move analysis could be done quantitatively and qualitatively (Biber et al., 2007). By this argument, this research aims to identify lexical bundles in research article of Science and Technology which linked to move classification. Since frequency is the ultimate characteristic of lexical bundles (Biber, 2009; Cortes, 2004), the emergence of lexical bundles in research articles of Science and Technology would be identified systematically and connected to rhetorical move to define the characteristics of bundle-move in the discipline that will be observed. By conducting this research, we hope that the list of lexical bundles in a specific move of this research could contribute to the teachers, researchers, and students to produce a right text in specific genre since mastering linguistics and rhetorical repertoire is the matter of academic writing (Paltridge, 2004).

## RESULTS AND DISCUSSION

### Structural Classifications of Lexical Bundles

The structural classification of lexical bundles, in this study, used structural taxonomy approach by Biber et al., (2004). Generally, this structural approach divided into 12 points, including sub-categories in each point. However, several studies grouped it into three major categories (Chen & Baker, 2010; Pan et al., 2016) to reduce the complexity of the identification of structure itself. Those are NP-based, PP-based, and VP-based. In more detail, Qi & Pans explained that

> "NP-based bundles included noun phrases with post-modifier fragments; PP-based bundles began with a preposition which might be followed by a noun-phrase fragment; and VP-based bundles included verb components"

The explanation above leads this study in classifying the structure of lexical bundles which found in the data.

Generally, the corpus identification shows all structural classifications which is proposed by Biber et al., (2004) in the research articles of Science and Technology. There are 215 types of bundles from the total token 3397 which detected in the corpus. Moreover, not all of the bundles which shown in the corpus were meet the criteria of bundles structure. There are 23 bundles which excluded because it comprises information formula that usually used in Science and Technology (e.g. *xb xc and xd*, *at xb c the*). From the calculation which done manually, there are 192 total bundles which identified as the data in this study.

In addition, the top three ranks of the most frequent lexical bundles used in research articles of Science and Technology represent three major structures of bundles sequentially. The most productive one is PP-based (e.g. *in the form of*), then followed by NP-based (e.g. *the result of the*) in the second rank, and VP-based (e.g. *is shown in figure*) in the third rank. This tendency shows writer flexibility in using lexical bundles variation in academic writing (Kashiha & Heng, 2014). Table 2 shows detail information regarding to the 5 most frequent structural classification of lexical bundles which found in this study.

| Rank | Freq. | Range | N-gram |
|---|---|---|---|
| 1 | 110 | 41 | *in the form of* |
| 2 | 101 | 49 | *the results of the* |
| 3 | 75 | 40 | *is shown in figure* |
| 4 | 72 | 38 | *as shown in figure* |
| 5 | 68 | 20 | *the value of the* |

Table 2. Top 5 of the most frequent lexical bundle

NP-based is believed as the key characteristics of lexical bundles in academic writing where previous studies (Biber & Berbieri, 2007) proved that it occur more frequent than other structure. However, this study is contrasting previous result. The most frequently used of lexical bundles of Science and Technology which wrote by Indonesia writer is PP-based (e.g. *in the form of*). The contrasting results from previous studies, speculatively, happen because Science and Technology have their own technical communication which rarely found in other discipline. As stated by Hyland (2008b), Engineering, which is a sub-discipline of Science and Technology, tend to have a nature of technical communication and dependence rhetoric representation since most of their studies is related to numeric and visual form.
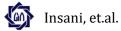
Even though, PP-based occurred as the most frequent lexical bundles used in RAs of Science and Technology which wrote by Indonesian writer, the most common lexical bundles structure is VP-based (e.g. *is shown in figure, is one of the, can be seen in, shown in figure the*) which distributed in a whole text. This common pattern of VP-based structure is rarely found in academic discourse, especially in soft science (Biber et al.,1999). Thus, the explanation is intended that the common pattern of VP-based which shown in this study is kind of academic variation of hard science. Hyland (2008a) also stated that passive verb followed by prepositional phrase is important to express graphical information (e.g. *is shown in figure, are shown in table*) and highlighting research observation (e.g. *can be seen in, it can be seen*).

The second most common pattern is NP-based then followed by PP-based and the last is other pattern which not consider as those three patterns. Table 3 presents data information of the total types of bundles structure.

| Structure | Total Types | Example |
|---|---|---|
| VP-based | 76 | *is shows in figure, is one of the, can be seen in, can used as, was carried out by* |
| NP-based | 67 | *the value of the, the form of a, the performance of the, the relationship between the* |
| PP-based | 45 | *in the form of, in this study the, on the result of, in the value of* |
| Others | 4 | *that the absorption process, that the use of, that there is a,* |

Table 3. Total types of each bundles structure

The VP-based, NP-based, PP-based with *of*-phrases are also found in the high frequency of bundle used in RAs of Science and Technology. The appearance of *of*-phrase structures is expressing several indications. Hyland (2008b) discovered various meanings of *of*-phrase fragment in academic writing such as indicating quantity, place, or size, marking existence, and

highlighting quality. Moreover, those three points of *of-*phrase were also found in this study, e.g. *in the surface area of* (indicating place), *at a temperature of* (indicating quantity), *indicate the presence of* (marking existence), *the value of the* (highlighting qualities). The use of those kinds of of-phrase is typically related to writer logical view in connecting particular argument between elements (Hyland, 2008a).
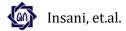
The analysis of lexical bundles structures provided us a notable linguistics features. The list of bundles structure leads us to the basis identification of bundles-move connection in RAs of Science and Technology. In order to provide deep analysis of bundles-move connection, the specific function of the bundles were also identified.

**Functional Classifications of Lexical Bundles**

The general functional classification of lexical bundles, in this study, was also departed from Biber et al., (2004) approach's. Generally, Biber et al., (2004) divided bundles function into four categories; stance expressions, discourse organizers, referential expressions, and special conversational function. This study excluded the last category of special conversational function since this study is categorized as academic register where there is no conversation in it.

From the functional analysis, this study discovered several bundles function in RAs of Science and Technology which wrote by Indonesian writer. From the total types and tokens of lexical bundles which found in this study, the distributional of functional categories was found in this study. The most frequent lexical bundles is functioning as referential expression in the sub-category of specification of attributes as tangible frames (e.g. *in the form of*) and intangible frames (e.g. *the results of the*). Those functions occur to specifying important aspect. The more specific functional classification of lexical bundles is presented in table 4.

| Category | Sub-category | Example |
| --- | --- | --- |
| **Stance expressions** | Epistemic stance | *indicates the presence of* |
| | Attitude/ modality | *to be able to, can be seen in, it can be seen, can be used as, can be concluded that* |
| **Discourse organizers** | Topic introduction | *the relationship between the, with a concentration of, with* |

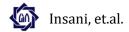| | | the addition of, on the other hand |
|---|---|---|
| | Topic elaboration | as well as the, based on the result, as a result of |
| **Referential expressions** | Identification/ focus | is one of the, one of the most |
| | Specification of attribute | in the form of, is the number of, to be used as, a wide range of |
| | Study/time/text reference | in this study the, used in this study, in this study was |

Table 4. Functional list of lexical bundles

Besides referential expression, other bundles function was also found in this study, as listed above. For example, stance expression which found in this study is divided into epistemic stand ad modality stance. The bundles e.g. *indicates the presence of* denote "speculative nature of the coming message" (Ren, 2021, p. 8). In addition, the bundle e.g. *to be able to* and e.g. *can be used as* denote the ability or the desire that would be achieve.

Other bundles function which found in this study is discourse organizers which generally reflect the relationship of prior and coming discourse (Biber et al., 2004). Besides, other bundles are functioned to elaborate topic to clarify the nature of the relationship between topic, such as the use of additional marker (e.g. *as well as the*), conditional (e.g. *with a concentration of*), and inductive (e.g. *as a result of*).

**Lexical Bundles and Rhetorical Moves Connection**

All of lexical bundles that have been listed as data in this study were examined structurally and functionally, those bundles were identified in term of their context to gain specific communicative function which then connected to move analysis. Following this, the move model of full-lenghth research articles which proposed by Nwogu (1997) were applied. In order to achieve detail classification of bundles-move connection, this studies presents the analysis of lexical bundles in each section which breaking down into several moves. More specifically, the

researcher will identify what kind of lexical bundles are used in each move and how are the characteristics of lexical bundles that differentiate one move from another.

**Introduction Section**

*Presenting background information (Move 1)*

As stated form Nwogu (1997), move 1 of introduction section is the initiation move which present background information of the topic that would be delivered by writers. The marker of move 1 could be persuasive (Swales 1981), anecdotal, and didactic. Lexical bundles which indicating communicative purposes related to present background knowledge were identified, as shown in the following example:

(1) RL value is between 0 and 1, which indicates *the adsorption process is* favorable.

(2) Non-Linear Kinetic model could attach to *the surface of the* zeolite.

As seen in the two examples above, bundles expression e.g. *the absorption process is* and *the surface of the* indicate the typical of move 1. However, those two examples are likely to present knowledge and highlight the main topic of the sentence.

*Reviewing related research (Move 2)*

Move 2 presents evaluated research which used to develop the discourse (Nwogu, 1997). It usually provides information of new or on-going related research. the example above show lexical bundles which indicating move 2 of the RAs of Science and Technology.

(1) Non-structural research *was carried out by* Shih et al. (2019).

The bundle expression e.g. *was carried out by* which presented in the example above is the only expression which intended to move 2 of review of related research. Specifically, that bundle express related research by placing author names. This finding indicates that the bundles expression above have strong influence in the field of Science and Technology. However, It also indicates that Indonesian writer of Science and Technology use limited expression in presenting related research of their RAs.

*Presenting new research (Move 3)*

Move 3 is mainly introduced the research which indicate method or the investigation of the study (Nwogu, 1997). As presented in the example below, bundles expressions which indicating move 3 is more varied rather than move 1 and move 2 in introduction section. In addition, in presenting the research RAs of Science and Technology used ether present tense and past tense. Nwogu (1997) stated that present tense play as dominant element which characterized move 3 of introduction section. Even though Nwogu (1997) do not mention about

the appearance of past tense, this study keeping it as data to be identified. The past tense used of bundles expression speculated the hypothesis which have been conducted by the writer before the study was conducted.

(1) The ultrasound prototype presented *in this study was* of a tubular configuration that had been developed previously

(2) *In this study, the* geomorphological conditions of the Bugel Coast were obtained directly through field observations by measuring the level of the slope of the foreshore, relief, coastal openness (exposure), sediment material, sediment size, landform foreshore and backshore, vegetation cover or density, and the impact of abrasion that has occurred.

*Describing data collection procedure (Move 4)*

Nwogu (1997) explained that move 4 discuss all aspect of data identification in research articles. The example of bundles expression below indicates writer intencity to present data processing and data categorizing. Moreover, the bundle expression e.g. *in this study the* is followed by past tense and passive voice sentences. This intended the rhetorical purpose of this move where RAs writers is commonly use past tense and passive voice to inform the data procedure.

(1) *In this study, the* data were standardized and divided into two, namely training and testing, which are used for construction and model testing respectively.

(2) *In this study, the* water elevation data was decomposed in to semi-diurnal (M2) and quarter-diurnal (M4) tidal constituents

*Describing experimental procedure (Move 5)*

The move 5 is related to experimental laboratory procedure of research where this move is mainly found in hard science. This move is presenting two main points "restating theoretical background and "explaining evaluation method". However, one optional point of move 5 is also included in RAs to describe numerical analysis. As shown in the example below, only one bundles expression which indicating move 5. The expression e.g. *used in this research*, specifically propose analytical method. This result indicates that RAs of Science and Technology not frequently used bundles expression in the move 5.

(1) The activated carbon *used in this research* is commercial activated carbon.

*Describing data analysis procedure (Move 6)*

Move 6 occurs to indicate data analytical instrument. The linguistics realization of this move is usually characterized by various linguistics feature such as explicit lexemes (e.g. *was*

*classified, was identified, was motivated*) and passive form. Thus, the bundles expression in the example below conveys which intended to move 6.

(1) This research was motivated by three factors: analyzing data *in the form of* phenomena, narrowing the data set into economic terms, and using data with a large number of labels.

## The result section

*Indicating consistent observations (Move 7)*

Move 7 present the information of the overall result of the study. Nwogu (1997) stated that it also report significant observation. The examples below are express lexical bundles which intended to highlight the specific of observation.

(1) The presence of functional groups of chitosan *in the form of* NH2 and OH bonded to methylene blue.

(2) This *is based on the* fact that the nanomaterial design adapts to individual drug requirements.

In addition, move 7 is also serve significant observation which present visually such as table, graph, and picture. The bundles expression wich aligned to the information above was highly found in this study. It is speculatively because RAs of Science and Technology serve more specification attribute of bundles function. The example below served bundles expression which connected to move 7 of table/figure presentation.
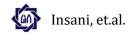
(1) The flood hydrograph at the watershed outlet for the design storm with a 25-year return period *is shown in Figure* 6.

(2) *As shown in Table* 4, all of the independent variables had a VIF value under the condition (n < 10).

## The discussion section

*Highlighting overall research outcome (Move 9)*

As stated by Nwogu (1997), move 9 present the information of the research result which usually found in the first segment of discussion section. The identification of bundles expression found that lexical bundles could express move 9 by using explicit preparatory statement, as seen in the example below. The expression e.g. *the result of the*, *the result of a*, *as a result of the*, and *based on the result* spread in a discussion section of Science and Technology RAs. It indicates that the writers used more variation in presenting their main research objective.

(1) Based on *the results of the* analysis of the chemical composition of taro tubers, stems, and leaves in Table 2, the highest total protein content in corms was shown by the Sukabumi

taro (V3), which was 4.09% as well as the total protein content in taro stems and leaves which was 2.02%.

(2) _Based on the results_ of the compressibility index evaluation has a pretty good value so that all four formulas have good weight diversity.

_Explaining specific research outcomes (Move 10)_

When move 9 present result information generally, move 10 present research outcome in more specific which restated main observation of the study. The examples below show bundles expression which connected to move 9. The bundles expression showed in the example inform the significant of the result by using explicit lexical items (e.g. _important, noted_)

(1) _It is important to_ note that the classifier performance also depended on subjectivity during manual labeling.

(2) _It should be noted_ that result A and the comparison between aggregate and water volume is one of the suggestions for early warning of collapse.

_Stating research conclusion (Move 11)_

Although with the less frequency, the bundle e.g. _be concluded that the_ was found in the list of bundles expression in this study. That bundles is the only one bundles type which related to move 11 of research conclusion. The example below intended to sum up the research result. Nwogu (1997) claimed that move 11 generally signaled by specific words e.g. _summary_ and _conclusion_.

(1) Overall it can _be concluded that the_ adsorption of Cd (II) is affected by changes in the temperature of the solution.

## CONCLUSION

This study combined two theoretical frameworks of academic discourse analysis related to linguistics feature and discourse structure. Those frameworks are the combination of lexical bundles analysis and rhetorical move analysis of Science and Technology RAs which wrote by Indonesian writer. The combination aligned this study to analyze lexical bundles as the linguistics feature realization of rhetorical move. Previous study proved that there is a strong relation between lexical bundles and rhetorical move (Cortes, 2013). The main results in this study indicate that lexical bundles have a strong relationship as a marker of move in research articles. In addition, several important results were found which will be described in the following explanation.

Structurally, this research found that RAs of Science and Technology used more variation of lexical bundles where VP-based (e.g. *is shown in figure, is one of the, can be seen that* ) dominate all the distribution in the whole text. This result indicates that VP-based mark the characteristics of Science and Technology field of the RAs. Functionally, all of the listed bundles perform as function of three major classification approached by Biber et al., (2004) such as stance expressions, discourse organizer, and referential expressions.

Other specific finding which need to emphasized is that several bundles expression occur in more than one move. For example, the bundles e.g. in this study the occur in move 3 to present new research, move 4, move 4 to describe the data, and move 6 of procedure of analysis. Abdollahpour & Gholami (2019) was also found that the number of bundles occur ubiquitously in more than one move of medical science RAs. This result indicate that bundles expression "may have a higher degree of occurrence predictability in a particular type of move" (Abdollah & Gholami, 2019, p. 345) which share similarity between medical science and science & technology.

Besides, bundles expression which function as resultative markers (e.g. *is shown in figure, as shown in figure, are shown in table, be seen in table, is presented in figure*) have various structure overwhelmingly. Those expressions occur in move 7 to present significant observation in tabular form. Speculatively, this finding indicates the key characteristic of Science and Technology RAs where they tend to serve result of the study in visual form. In addition, lexical bundles which express and indicate move 8 was not found in this study. This might be because most writers used other linguistics feature in presenting non-consistent observation.

For the further analysis of structural and functional categories, several lexical bundles served as communicative purposes which indicating move in the RAs of Science and Technology. In line with previous study by Cortes (2013), some bundles play as a trigger of communicative purpose of move while others play as complement which marked the beginning of each move. However, the researcher hopes that the results of this research can contribute to further studies in Indonesia, especially in lexical bundle and move analysis studies. In addition, several lexical bundles which are characterize certain moves are expected to be a teaching materials and learning materials for researchers, students, and teachers in using lexical bundles according to the right move.

With regard to future research, the analysis of lexical bundles which connected to rhetorical move need to be developed since this study still have some gap such as such as disciplinary variation. The output of disciplinary variation analysis would extent important pedagogical implications to English academic writer in specific field.

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