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# A Corpus-Based Study Of Move Analysis And Lexical Bundles Of Chemical Engineering Research Article Introductions

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## Abstract

Move analysis and lexical bundles of Chemical Engineering Research Article Introductions (CERAIs) were investigated in this research. To create the CERAI Corpus, 90 CERAIs were chosen randomly from three prestigious journals: Chemical Engineering Journal, Chemistry of Materials, and Industrial & Engineering Chemistry Research (30 RA introductions from each journal published between 2020 and 2022). In the first phase, 30 CERAIs were chosen at random for move analysis. Then, lexical bundles in all CERAIs were identified by Antconc program, which were then evaluated for structural and functional patterns. Finally, the relationship between move structure and lexical bundles was studied by analyzing the specific lexical bundles in each move. The findings revealed that CERAIs have three conventional moves, namely Move 1: Establishing a territory, Move 2: Establishing a niche, and Move 3: Occupying the niche. Pattern 1: (M1-M2)n-M3, Pattern 2: (M1-M2)n-(M1-M3)m, and Pattern 3: M1-M2-(M1-M3)n-(M1-M2)m-M3 were the three primary move patterns discovered in the CERAIs. The structural and functional pattern analysis was performed on 42 lexical bundles after conducting the exclusion criteria. The most common lexical bundles' structures observed in the CERAIs were noun phrase and prepositional phrase fragments, while the most common functional pattern was research-oriented function. Based on the analysis of lexical bundles frequently found in each move, the specific lexical bundles were discovered in each of the CERAIs' three moves to highlight the move's unique characteristics. For students, professors, and novice researchers in chemical engineering, the findings can be used as a guideline for effectively writing research article introductions.

**Keywords:** chemical engineering, corpus, research article introduction, lexical bundle, move analysis, corpus-based study.

## 1. Introduction

Recently, there has been wide interest in move analysis and lexical bundles in writing academic research articles. One of the most crucial abilities of a researcher is to create a good research article. Brod & Hazelwood-Smith (2014) stated that "even with high-quality data, you can jeopardize your chances of publication if you don't have a high-quality paper". The research article introduction is one of the most significant parts that researchers should pay attention to when writing a research article in academic genres. According to Swales (1990), the introduction is the most difficult section to write among the many sections of a research article applying the standard Introduction-Method-Results-Discussion (IMRD) structure. The introduction can help the reader understand an overview of the study's background, research gaps, objectives, significance and some findings. As a result, research article introductions have become popular topics for both move analysis and lexical bundles analysis.

However, many researchers have had difficulty writing research articles in English in recent years. Not only are they doubtful of how to prioritize the move structure in research articles but they are also having trouble selecting proper lexical bundles. Previous studies in numerous fields have delved into move analysis (e.g., Samraj, 2002; Kanoksilapatham, 2005; Stoller & Robinson, 2013; La-o-vorakiat & Singhasiri, 2021) and lexical

bundles (e.g., Salazar, 2011; Kwary et al., 2017; Lee & Lee, 2018; Panthong & Poonpon, 2020); however, there is little research in chemical engineering.

The main aim of this study is to examine the moves and lexical bundles identified in the Chemical Engineering Research Article Introduction (hereafter CERAI) during the period 2020-2022. The findings will greatly assist new researchers in their use of move analysis and lexical bundles. It can guide the researcher in recognizing move patterns in research article introductions and common lexical bundles for further chemical engineering research. In order to bridge the gap between lexical bundles and the language used in this discipline, this study aims to evaluate and analyze both structural and functional patterns of lexical bundles in chemical engineering research article introductions. Furthermore, the specific lexical bundles detected in each move are presented in this study to further clarify the characteristics of lexical bundles in each move.

## 2. Theoretical Background

Corpus-based studies have been widely applied in a variety of areas, including language acquisition, analysis, and teaching. Sinclair (2005, p.16) defines a corpus as "a collection of pieces of language text in electronic form, selected according to external criteria to represent, as far as possible, a language or language variety as a source of data for linguistic research". A corpus can be used to study the linguistic patterns that contribute to lexis and grammar. It can present evidence of language use throughout a large set of data for analyzing structural patterns and functional patterns. This study is focused on using a corpus to analyze the frequency of lexical bundles and their structural patterns. Four research questions in this study are:

1. What are the moves found in CERAIs?
2. What are the most frequent lexical bundles found in CERAIs?
3. What are the structural and functional patterns of the most frequent lexical bundles found in CERAIs?
4. What are the lexical bundles specific to each move in CERAIs?

### A. Move Analysis

Swales (1990) was the first to investigate rhetorical moves in the research genre. He examined the introduction parts of research articles and create the CARS (Creating A Research Space) model with a three-move structure. This model has been applied to a wide range of writings in the academic, professional, and research genres. The CARS model is divided into the following three moves and eleven steps:

Move 1: Establishing a territory
- Step 1: Claiming centrality, and/or;
- Step 2: Making topic generalization(s), and/or;
- Step 3: Reviewing items of previous research

Move 2: Establishing a niche
- Step 1A: Counter-claiming, or;
- Step 1B: Indicating a gap, or;
- Step 1C: Question-raising, or;
- Step 1D: Continuing a tradition

Move 3: Occupying the niche
- Step 1A: Outlining purposes, or;
- Step 1B: Announcing present research
- Step 2: Announcing principal findings
- Step 3: Indicating RA structure

Many researchers have studied Swales' (1990) CARS model for their move analysis. Swales' CARS model was used by Samraj (2002) to examine 12 research article introductions from two related fields, wildlife behavior and conservation biology. There were some move structure differences between the two subfields, and it seems that the presence of literature reviews can be found in both Move 1 and Move 2. Following Swales' (1990) move analysis, Kanoksilapatham (2005) studied move analysis on 60 biochemistry research articles to establish their whole rhetorical structures. Three moves have been identified for the introduction. Some variations from Swales' CARS model have been discovered, including cyclical configuration patterns between Moves 1, 2, and 3; besides, Move 2 may not be included in the biochemistry discipline; lastly, Swales' step 3 of Move 3: Indicating RA structure was not explicitly found in biochemistry research articles. After conducting genre analysis in chemistry journal articles, Stoller & Robinson (2013) compared their findings with Kanoksilapatham (2005) and discovered that neither the chemistry nor the biochemistry introductions end with indicating research article structure in Move 3. A move analysis on chemical biology research article introductions was explored by La-o-vorakiat & Singhasiri (2021). According to the results, all of the introductions use the same three moves with other fields: Move 1: introducing the research area; Move 2: pointing out the need(s); and Move 3: presenting the current research. The majority of submoves in

these three Moves are considered conventional; however, only two submoves are regarded as optional, i.e., Submove 2 of Move 2: Presenting positive justification, and Submove 1 of Move 3: Announcing current research.

### B. Lexical bundles

Lexical bundles are collections of words with no clear semantic or pragmatic meaning. Lexical bundles, according to Biber & Conrad (1999, p. 183), are "the most frequent recurring lexical sequences, which can be regarded as extended collocations: sequences of three or more words that show a statistical tendency co-occur". In this study, four-word lexical bundles were chosen since the longer the bundle, the lower the frequency. However, three-word lexical bundles can be part of four or more-word lexical bundles since its small fragment. On the other hand, five- or more word lexical bundles are too long and rarely occur (Biber et al., 1999). As a result, four-word lexical bundles are the most capable of analyzing their frequency and structural patterns. Biber et al. (1999) used a frequency cut-off of at least ten times per million words to specify lexical bundles; however, Biber et al. (2004) used a more pragmatic approach, claiming that frequent lexical bundles should be determined with a cut-off point of forty times per million words because it can indicate the validity of lexical bundles. Thus, the actual size of the CERAI Corpus in this study applied normalized frequency.

### 1. Structural Classification

Biber et al. (2004) studied a corpus of university registrations, including classroom teaching and textbooks, and came up with the structural taxonomy indicated in Table 1. The structural taxonomy proposed by Biber et al. (2004) was used to examine the structural patterns of four-word lexical bundles in this study.

**Table 1** Biber et al.'s (2004) Structural Taxonomy

| |
|---|
| **1. Lexical bundles that incorporate verb phrase fragments** |
| 1a. (connector+) 1st/2nd person pronoun + VP fragment: |
| 1b. (connector+) 3rd person pronoun + VP fragment: |
| 1c. Discourse marker + VP fragment |
| 1d. Verb phrase (with non-passive verb) |
| 1e. Verb phrase with passive verb |
| 1f. Yes-no question fragments |
| 1g. WH-question fragments |
| **2. Lexical bundles that incorporate dependent clause fragments** |
| 2a. 1st/2nd person pronoun + dependent clause fragment |
| 2b. WH-clause fragments |
| 2c. If-clause fragments |
| 2d. (verb/adjective +) to-clause fragment |
| 2e. That-clause fragments |
| **3. Lexical bundles that incorporate noun phrase and prepositional phrase fragments** |
| 3a. (connector+) Noun phrase with of-phrase fragment |
| 3b. Noun phrase with other post-modifier fragment |
| 3c. Other noun phrase expressions |
| 3d. Prepositional phrase expressions |
| 3e. Comparative expressions |

### 2. Functional Classification

Functional patterns are vital to determine how lexical bundles are employed to refer to their meaning (Biber et al., 1999; 2004). Hyland's (2008a) classification approach was utilized to find four-word lexical bundles in this study. The following are the three main categories:

**1. Research-oriented:** enhance authors in guiding their work and real-world experiences, as follows:

(1) Location: Time and place is indicated (e.g., in the present study).

(2) Procedure: The objective or methodology is described (e.g., the operation of the).

(3) Quantification: The number is reported (e.g., one of the most).

(4) Description: The qualities and properties of materials are specified (e.g., the structure of the).

(5) Topic: The relevant field of research is identified (e.g., in the Hong Kong).

**2. Text-oriented:** focused in the text's structure and meaning as a message or argument as follows:

(1) Transition signals: establishing additive or contrastive links between elements (e.g., in contrast to the).

(2) Resultative signals: mark inferential or causative relations between elements (e.g., these results suggest that).

(3) Structuring signals: text-reflexive markers that organize discourse stretches or lead the reader elsewhere in the text (e.g., as shown in figure).

(4) Framing signals: Limiting conditions are specified to show arguments. (e.g., with the exception of).

**3. Participant-oriented:** these are centered on the writer or reader of the article (Hyland,2005) as follows:

(1) Stance features: express the writer's attitudes and evaluations (e.g., it is possible that).

(2) Engagement features: address readers directly (e.g., as can be seen).

## 3. Corpus Compilation and Method

The CERAI Corpus was used to investigate both move analysis and lexical bundles in this study. To build the CERAI Corpus, 90 Chemical Engineering Research Article Introductions (CERAIs) were collected from three notable English Chemical Engineering journals which are Chemical Engineering Journal, Chemistry of Materials, and Industrial & Engineering Chemistry Research. These three journals were chosen based on their well-established reputations, relevance to the Chemical Engineering subject, and SCImago Journal & Country Rank website rankings. They also have the highest H Index and Q index is Q1. In the subject of chemical engineering, research articles are primarily separated into two categories: experiments and equations. In this study, the chosen research articles were controlled in experiment category only. Thirty articles from each of the three journals published between 2020 and 2022 were chosen at random and combined to the CERAI Corpus. Finally, there are a total of 105,499 words in the CERAIs corpus.

This research study was divided into three stages. The move structure of CERAIs was examined in the first phase by referring to theoretical frameworks from Swales' Create a Research Space (CARS) model. Then, lexical bundles were identified by using the Antconc 4.0.2 software program in the second phase, and the structural and functional patterns of the frequent lexical bundles were analysed using the theoretical frameworks of Biber et al. (2004) and Hyland (2008a), respectively. In the third phase, a sub-corpus of the three moves in CERAIs was created to identify specific lexical bundles in each move.

### A. Move Analysis

Move analysis was performed on thirty RA introductions chosen from Chemical Engineering Journal, Chemistry of Materials, and Industrial & Engineering Chemistry Research (10 RA introductions from each journal). Swales' Create a Research Space (CARS) model was used to investigate the move analysis of the RA introductions as shown in Table 2.

**Table 2** Swales' Create a Research Space (CARS) Model

| Move | Step |
|---|---|
| **1) Establishing a territory** | Step 1: Claiming centrality, and/or;<br>Step 2: Making topic generalization(s), and/or;<br>Step 3: Reviewing items of previous research |
| **2) Establishing a niche** | Step 1A: Counter-claiming, or;<br>Step 1B: Indicating a gap, or;<br>Step 1C: Question-raising, or;<br>Step 1D: Continuing a tradition |
| **3) Occupying the niche** | Step 1A: Outlining purposes, or;<br>Step 1B: Announcing present research<br>Step 2: Announcing principal findings<br>Step 3: Indicating RA structure |

**B.**

### Lexical bundles

By using an Antconc software, the most frequent lexical bundles in the CERAI corpus were explored. The criteria for selecting the lexical bundles were established. Since four-word lexical bundles can present the most significance in terms of evaluating frequency and structural patterns, the length of bundles is set to four. Due to the normalized frequency of the corpus size, the cut-off frequency is set to 4 times. Finally, the distribution threshold or range is set to 5 in order to vary the number of research articles. The lexical bundles were examined after the aforementioned criteria were established. Then, the structural and functional patterns of the selected lexical bundles were then examined. Finally, the specific lexical bundles discovered in each CERAIs move were investigated.

### 1. Analysis of lexical bundles' structural patterns

Structural taxonomy (Biber et al., 2004) was used as a theoretical framework in this study to investigate structural patterns. The three main types of structural patterns are shown in Table 3.

**Table 3** The Three Main Types of Structural Patterns and their Sub-types

| No. | Structural pattern | Number of sub-types | Example |
|---|---|---|---|
| 1 | Verb phrase fragments | 7 | is going to be |
| 2 | Dependent clause fragments | 5 | what I want to |
| 3 | Noun phrase and prepositional phrase fragments | 5 | one of the things, the way in which |

### 2. Analysis of lexical bundles' functional patterns

This step demonstrates how lexical bundles are used in discourse to refer to their meanings (Biber et al., 1999; 2004). The functional patterns of lexical bundles were identified using Hyland's (2008a) framework as shown in Table 4.

**Table 4** The Three Main Types of Functional Patterns and their Sub-types

| No. | Functional patterns | Sub-types |
|---|---|---|
| **1** | Research-oriented | Location; Procedure; Quantification; Description; Topic |
| **2** | Text-oriented | Transition signals; Resultative signals; Structuring signals; Framing signals |
| **3** | Participant-oriented | Stance features; Engagement features |

### 3. Analysis of lexical bundles in each move

Three move sub-corpora for 30 CERAIs were created to investigate lexical bundles in each move. Lexical bundles can be retrieved automatically from each move sub-corpus using the AntConc program's N-gram function. The relationship between move structure and lexical bundles was determined in order to demonstrate the specific lexical bundles present in each CERAIs move.

### C. Inter-Coder Reliability

Inter-coder reliability was incorporated to confirm the reliability of the findings. An expert was asked to be the coder in this study. He has a doctorate in English language teaching and teaches English at the university level, as well as conducting research on lexical bundles and move analysis. The coder was assigned to code 9 CERAIs for move analysis, which accounts for 30% of 30 CERAIs analyzed by the researcher. Moreover, the coder also coded 20 lexical bundles, which accounts for 30% of 66 four-word lexical bundles for lexical bundles identification.

The percentage agreement was obtained using the equation below to verify inter-coder reliability:

$$\text{Percentage agreement} = \frac{\text{Agreed coded units}}{\text{Total coded units}} \times 100$$

The percentage agreement of move analysis was 97.12 percent, while the percentage agreement of lexical bundle was 90%.

### 4. Results and Discussion

The findings of move structure are firstly discussed in this section, followed by the most frequent lexical bundles found in CERAIs and their structural and functional patterns, and the lexical bundles specific to each move in CERAIs, respectively.

### A. Move Structure in the CERAI Corpus

Based on Kanoksilapatham's (2005) criteria, a cut-off frequency of 60% was chosen as the measure of move frequency for every move and step proposed in this study. A move or step is defined as conventional move when the occurrence is 60 percent or above. It's considered an optional move if it happens less than 60%. The findings revealed that three moves discovered in the CERAIs are Move 1: Establishing a territory, Move 2: Establishing a niche, and Move 3: Occupying the niche. Although each move is deemed conventional, several steps in each move were determined to be optional, as seen in Table 5.

**Table 5** The Occurrence of Moves and Steps in the CERAIs

| Move/Step | Frequency (N=30) | Percentage |
|---|---|---|
| **Move 1: Establishing a territory** | **30** | **100** |
| Step 1: Claiming centrality, and/or; | 30 | 100 |
| Step 2: Making topic generalization(s), and/or; | 19 | 63 |
| Step 3: Reviewing items of previous research | 30 | 100 |
| **Move 2: Establishing a niche** | **30** | **100** |
| Step 1A: Counter-claiming, or; | 0 | 0 |
| Step 1B: Indicating a gap, or; | 30 | 100 |
| Step 1C: Question-raising, or; | 0 | 0 |
| Step 1D: Continuing a tradition | 7 | 23 |
| **Move 3: Occupying the niche** | **30** | **100** |
| Step 1A: Outlining purposes, or; | 19 | 63 |
| Step 1B: Announcing present research | 29 | 97 |
| Step 2: Announcing principal findings | 14 | 47 |
| Step 3: Indicating RA structure | 0 | 0 |

## Move 1: Establishing a territory

The role of Move 1 is to offer the reader with background information about the study area and present research field. The introduction is basically started with this move.

a. Move 1, Step 1: Claiming centrality

According to Swales (1990), "Centrality claims are appeals to the discourse community whereby members are asked to accept that the research about to be reported is part of a lively, significant or well-established research area" (p.144). Claiming centrality is shown in all 30 CERAIs in this study, and over 60% of CERAIs start their introduction with this step. This step seems to claim the importance and the popularity of the research area; however, some current issues are also mentioned in this step. Half of the CERAIs contains a single sentence of centrality claims; on the other hand, 11 CERAIs contain two sentences of centrality claims, and 4 CERAIs contain three sentences of centrality claims. Moreover, 5 out of 30 CERAIs showed claiming centrality twice in a research article. Example of this step is shown as follows:

Water desalination therefore **plays an important role** in solving the problem of freshwater scarcity. Membrane distillation (MD), which was invented in the late 1960s through integrating membrane technology with distillation, has gained a great attention as a promising technology of desalination. (CERAI No.68)

b. Move 1, Step 2: Making topic generalization(s)

Step 2 is a more generalized explanation of the research topic that is used to provide the knowledge or explain phenomena. This step is discovered in 19 CERAIs and is considered as a conventional move in this study. It has been discovered that step 2 frequently occurs concurrently with step 3, making it difficult to differentiate between the two steps. Example of this step is shown as follows:

Electrochemical energy storage (EES) devices **have traditionally been manufactured** as layered composites with a two-dimensional (2D) architecture, but the achievement of a three-dimensional (3D) nanoarchitecture in an energy-storage device vastly increases areal power density. (CERAI No.45)

c. Move 1, Step 3: Reviewing items of previous research

The final step in establishing a territory is to review previous studies. It is necessary to provide the related findings from previous research and show the significant information before giving the reader the gap in the following move. To state the citation, some reporting verbs were found in this step, e.g., found that, suggested that, and reported.

All 30 CERAIs were found this step and most of them account for a large portion of the introduction part; however, the result found that this step not only found in Move 1, but also found in Move 2 and 3 as well to refer to the vital data from previous studies. Example of this step is shown as follows:

Zhang et al. (35) **investigated** the effect of the amount of deposited SiO2 for the MTA reaction by varying the cycles of CLD treatment and **found** the Zn/P/Si/ZSM-5 catalyst coated with a 8% SiO2 layer showed 89.6% selectivity for PX in X.

(CERAI No.63)

In conclusion, Move 1 is essential in establishing the significance and relevance of the research topic. The findings are similar to Swales' (1990) and Kanoksilapatham's (2005) frameworks. Move 1 begins with claiming centrality (Step 1), followed by topic generalizations (Step 2), and reviewing previous studies (Step 3). In CERAIs, step 1 and 3 occur 100 %, while Step 2 only occurs 63 %.

## Move 2: Establishing a niche

The purpose of Move 2 is to show the gap from the previous study. It shows the connection between Moves 1 and 3. After providing the research area and relevant information, Move 2 highlights what has been overlooked in previous studies before moving on to the information for the current study in Move 3. As a result, this move was regarded as a conventional move that occurred 100 percent in CERAIs. The findings revealed that only Step 1B: Indicating a gap was considered a conventional step, whereas Step 1D: Continuing a tradition was considered optional. Moreover, Step 1A: Counter-claiming and Step 1C: Question-raising were not discovered in CERAIs.

a. Move 2, Step 1A: Counter-claiming

Counter-claiming 's purpose is to suggest that something might be wrong; however, it was not discovered in CERAIs.

b. Move 2, Step 1B: Indicating a gap

The importance of this step is to describe the research area's inadequacy. It identifies what has been missing from previous research in order to prepare the reader for what will be provided in this study. This step was discovered in all 30 CERAIs, thus, it can be concluded that indicating a gap is regarded as conventional in this field. The linguistic indicators or signal word, for example, Yet, Although, Despite, However, are often used to begin this step. Example of this step is shown as follows:

**Although** the outlet flow rate was monitored in this work, its fluctuation and the coupled flow instability were not analyzed and explained.

(CERAI No.18)

c. Move 2, Step 1C: Question-raising

Step 1C: Question-raising is not discovered from this study in comparison to Swales' (1990) CARS model. As a result, it is probable that CERAIs will not identify a niche or issue in terms of question raising. In CERAIs, on the other hand, the niche will be indicated in an affirmative or negative sentence.

d. Move 2, Step 1D: Continuing a tradition

Only three CERAIs showed continuing a tradition. Its purpose is to elaborate the literature review with additional information on the required action for further research, especially, interests, needs, and desires can all be expressed. “It is necessary to, it is important to” are some of the lexical bundles discovered in this step. Example of this step is shown as follows:

To control the production flow rate of hydrogen, **it is necessary to** understand the kinetic behind the vanadium-mediated process for HER.

(CERAI No.25)

According to Swales (1990), if a weak challenge is shown in previous studies, continuing a tradition will be found as a part of indicating a gap. Similarly, Move 2 Step 1D appears to be found together with Move 2 Step 1B in CERAIs., The sentence connective "therefore" found in the context is evidence to support this claim.

Furthermore, we discovered a Positive Justification, which is Step 2 of Move 2 in Samraj's (2002) framework. It appears only once in CERAI No.61 to explain the reason why the research is vital. Example of this step is shown as follows:

**For this reason,** the influence of temperature on NCO for photocatalytic **degradation is a significant area of investigation.**

(CERAI No.61)

In summary, Move 2's function is mostly concerned with stating the gap. As a result, Move 2 can indicate the gap by gathering all of the information together in one move. It is not necessary to divide it into several steps.

## Move 3: Occupying the niche

The final move is to give information from the current study to fill in the gaps left by Move 2. The first two sub-steps of Step 1, outlining purposes and announcing present research, are both conventional. In contrast to Swales (1990), Step 2: Announcing

principal findings is considered as optional. On the other hand, Step 3: Indicating RA structure is not seen in CERAIs. In the discipline of chemical engineering, it appears that there is no need to illustrate the structure of a research article.

a. Move 3, Step 1A: Outline purposes

The objective of the study is explained in this step. It's usually only found in a couple of sentences. Despite the fact that this step is found in 63% in CERAIs and is considered a conventional move, many RAs have discarded it and focus on the present research and findings instead. In this step, the lexical bundles used to signal the objective are including "with the aim of", "this work aims to", "the objective of this work", and "the purpose of this study". Example of this step is shown as follows:

**In this paper, we present** a new, copolymer-based additive approach for improving the thermal stability of MAPI perovskite and PSCs and **propose** a new mechanism to **explain** the observed stability enhancement.

(CERAI No.48)

b. Move 3, Step 1B: Announcing present research

This step is required to be reported in the present study, with a frequency of 97 % in CERAIs. Only one RA omits this step because it focuses on the purpose instead. Nonetheless, it appears to recognize that this step is necessary to explain how the study was conducted to fill the gap in Move 2. In this step, the lexical bundles used to signal the present study are including "In this study, we investigate", "Herein, we report", "in this work we attempt", "we will present", "to this extent". Example of this step is shown as follows:

**To this extent, we will present** the properties (acid uptake, conductivity, vanadium ion permeability, mechanical properties, and crystallinity) of PBI membranes after SA pre-treatment for several doping temperatures and concentrations. Also, the flow battery performance of optimized membranes **will be shown in this paper**.

(CERAI No.2)

c. Move 3, Step 2: Announcing principal findings

The results of the study are normally revealed in Step 2 of Move 3. This step was regarded as optional in CERAIs because it only appeared in 14 CERAIs, which is accounted for 47%. Lexical bundles found in this step, e.g., "results demonstrated that", "we show that", "we reveal that", and "the obtained result". Example of this step is shown as follows:

Overall, **the results show** feasible ASD of PEDOT on nanoscale-patterned surfaces, thereby expanding the range of materials available for advanced deposition-based patterning

(CERAI No.41)

Additionally, the findings of this study suggest that predicting results announcing step in Samraj (2002) was detected once in the last paragraph of CERAI No. 22. The purpose of this step is to highlight the study hypotheses. Lexical bundles found in this step, e.g., "we predicted that", "can be expected to", "this would further promote", and "we hypothesized that".

**We hypothesized that** by using these high turbulence intensities, the initially immiscible phases would be well dispersed in each other leading to a homogenous emulsion mixture with improved reaction rates.

(CERAI No.22)

According to the above findings, the refined move structure of CERAIs is proposed in Figure 1.

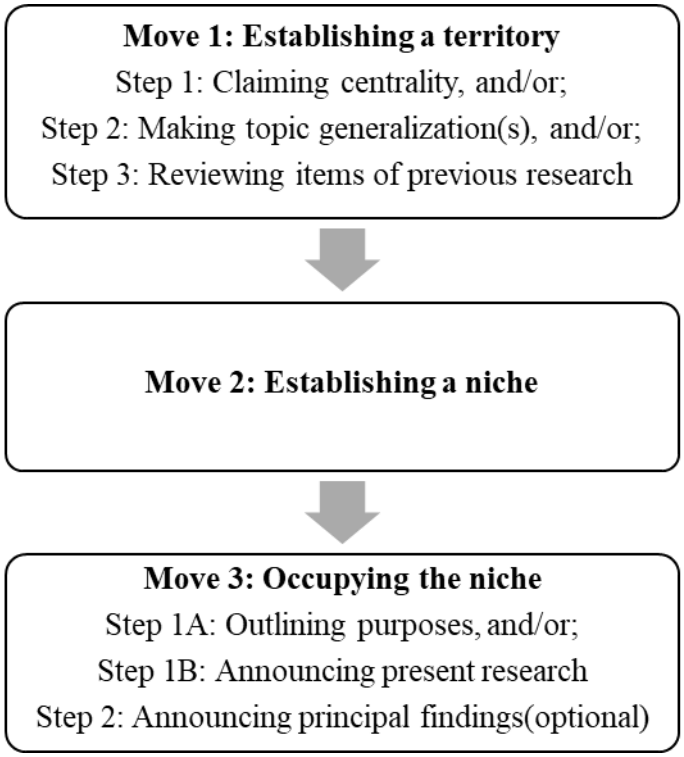


Figure 1 Move Structure of Chemical Engineering Research Article Introductions

## Move and Step Sequence

The move analysis of this study revealed that moves and steps can occur in a cyclical pattern in CERAIs and do not have to follow the M1-M2-M3 priority pattern. Move and step sequences are shown in Table 6.

**Table 6** Sequence of Move-Step in Chemical Engineering Research Article Introductions

| No. | Move and Step Sequence |
|---|---|
| 1 | M1S1, M2S1B, M1S2, M2S1B, M1S2, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M3S1B |
| 2 | M1S1, M1S2, M2S1D, M1S3, M3S1A, M1S3, M3S2, M1S3, M2S1B, M3S1A, M3S1B, M3S2, M3S1B, M3S2 |
| 3 | M1S1, M1S2, M2S1B, M1S3, M1S2, M2S1B, M1S3, M1S1, M2S1B, M1S3, M2S1B, M3S1A, M3S1B, M3S2 |
| 4 | M1S3, M1S1, M1S3, M1S2, M2S1D, M1S3, M1S1, M2S1B, M1S3, M2S1B, M1S3, M3S1A, M3S1B |
| 5 | M1S1, M1S3, M1S2, M1S3, M3S1B, M1S3, M2S1B, M1S3, M3S1A, M3S1B |
| 6 | M1S3, M1S1, M1S3, M2S1B, M1S3, M3S1A, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M3S1A, M3S1B |
| 7 | M1S1, M1S2, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M3S1A, M3S1B, M3S2 |
| 8 | M1S3, M3S1A, M1S3, M1S1, M1S3, M3S1B, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M3S1A, M3S1B, M1S3, **M3S2B (Samraj)** |
| 9 | M1S1, M1S2, M1S3, M2S1B, M1S3, M3S1B, M1S3, M3S1B, M1S3, M2S1B, M2S1D, M1S3, M2S1B, M3S1B |
| 10 | M1S1, M1S3, M1S2, M2S1B, M1S3, M2S1B, M1S3, M3S1A, M3S1B |
| 11 | M1S1, M2S1B, M1S2, M1S1, M2S1B, M1S3, M2S1D, M1S3, M2S1D, M1S3, M3S1B, M3S2 |
| 12 | M1S3, M2S1B, M1S1, M2S1B, M1S3, M2S1B, M1S3, M3S1A, M3S1B, M3S2 |
| 13 | M1S3, M1S1, M1S3, M2S1B, M1S3, M2S1B, M1S3, M3S1B, M2S1B, M3S1B, M1S3, M3S1B, M3S2 |
| 14 | M1S3, M1S1, M1S2, M2S1B, M1S1, M1S3, M3S1B, M3S2 |

| | |
|---|---|
| 15 | M1S1, M1S2, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M3S1B, M1S3, M3S1A, M3S1B, M1S3, M3S1B, M3S2 |
| 16 | M1S1, M1S2, M1S3, M2S1B, M3S1A, M3S1B, M2S1B, M3S2 |
| 17 | M1S1, M2S1B, M1S2, M2S1B, M1S3, M2S1B, M1S3, M3S1A, M3S1B |
| 18 | M1S1, M1S3, M2S1B, M1S2, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M3S1A, M3S1B, M3S2 |
| 19 | M1S3, M1S1, M1S3, M2S1B, M3S1B, M3S2 |
| 20 | M1S3, M1S1, M1S2, M2S1B, M1S3, M2S1D, M1S3, M2S1B, M1S3, M2S1B, M3S1B, M3S2 |
| 21 | M1S3, M1S1, M1S3, M1S1, M1S3, M2S1B, M1S3, M1S1, M1S3, **M2S2(Samraj)**, M1S3, M2S1B, M3S1A, M3S1B |
| 22 | M1S3, M2S1B, M1S2, M1S3, M1S1, M1S3, M2S1B, M1S3, M2S1B, M2S1D, M3S1B |
| 23 | M1S1, M1S2, M1S3, M2S1B, M1S3, M2S1B, M3S1B |
| 24 | M1S1, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M3S1B, M2S1B, M3S1A, M3S2 |
| 25 | M1S1, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M3S1A |
| 26 | M1S3, M2S1B, M1S1, M1S3, M2S1B, M1S3, M3S1B |
| 27 | M1S1, M1S2, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S1, M1S2, M1S3, M2S1B, M3S1A, M3S1B |
| 28 | M1S1, M1S3, M2S1B, M1S3, M2S1D, M1S3, M2S1B, M1S3, M2S1B, M1S3, M3S1A, M3S1B, M3S2 |
| 29 | M1S1, M1S2, M1S3, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M3S1A, M3S1B |
| 30 | M1S1, M2S1B, M1S2, M2S1B, M1S3, M2S1B, M1S3, M2S1B, M1S1, M1S2, M1S3, M2S1B, M1S1, M1S2, M1S3, M2S1B, M3S1B, M1S3, M3S1B, M1S3, M3S1B |

According to the findings, all CERAIs begin with Move 1, establishing a territory. It seems that starting with Move 1 is significant in emphasizing the relevance of the research area and previous studies. Moreover, moves and steps are found occurring in cyclical patterns; however, move levels tend to be found as cyclicity more than step levels. Lastly, all CERAIs closed the introduction part with Move 3.

## Move patterns

The move pattern in CERAIs is shown in Table 7. Pattern 1: (M1-M2)n-M3 is mostly found in CERAIs with 37% occurrence; followed by pattern 2: (M1-M2)n-(M1-M3)m with 33% occurrence; followed by pattern 3: M1-M2-(M1-M3)n-(M1-M2)m-M3 with 7% occurrence. Other patterns were also found once of each pattern; thus, it cannot be recognized as a significant pattern.

**Table 7** Move Pattern in Chemical Engineering Research Article Introductions

| Pattern | Move pattern | No. of CERAI | % |
|---|---|---|---|
| **Pattern 1** | $(M1\text{-}M2)_n\text{-}M3$ | 11 | 37 |
| **Pattern 2** | $(M1\text{-}M2)_n\text{-}(M1\text{-}M3)_m$ | 10 | 33 |
| **Pattern 3** | $M1\text{-}M2\text{-}(M1\text{-}M3)_n\text{-}(M1\text{-}M2)_m\text{-}M3$ | 2 | 7 |
| **Other patterns** | M1-M3-M1-M2-M1-M3 | 1 | 3 |
| | $M1\text{-}M2\text{-}M1\text{-}M3\text{-}(M2\text{-}M1)_n\text{-}M2\text{-}M3$ | 1 | 3 |
| | $(M1\text{-}M3)_n\text{-}(M2\text{-}M1)_m\text{-}M3\text{-}M1\text{-}M3$ | 1 | 3 |
| | $(M1\text{-}M2)_n\text{-}M1\text{-}M3\text{-}M2\text{-}M3\text{-}M1\text{-}M3$ | 1 | 3 |
| | $M1\text{-}(M2\text{-}M3)_n$ | 1 | 3 |
| | $(M1\text{-}M2)_n\text{-}(M3\text{-}M1)_m\text{-}M3$ | 1 | 3 |
| | $(M1\text{-}M2)_n\text{-}(M1\text{-}M3)_m\text{-}M2\text{-}M3$ | 1 | 3 |

Note. n, m = a counting number

In summary, three moves are conventional in CERAIs. Three steps in Move 1 are identified to be conventional, whereas only step 1B is regarded as conventional in Move 2, and only steps 1A and 1B are conventional in Move 3. Furthermore, CERAIs are likely to occur in cyclical patterns. The most common move pattern in CERAIs is (M1-M2)n-M3. Moreover, Move 1 is used to begin the CERAIs, and Move 3 is used to close it.

## B. Lexical bundles in the CERAI Corpus

The detailed results of lexical bundles are presented in the following part.

### 1. Frequent Lexical Bundles in the CERAI Corpus

66 types of four-word lexical bundles occur at least 4 times and in a minimum of 5 ranges were found in CERAI Corpus as shown in Table 8.

**Table 8** Full List of Four-word Lexical Bundles in CERAI Corpus

| No. | Type | Rank | Freq | Range |
|---|---|---|---|---|
| 1 | in the presence of | 1 | 26 | 15 |
| 2 | on the other hand | 2 | 24 | 17 |
| 3 | one of the most | 3 | 22 | 18 |
| 4 | is one of the | 4 | 16 | 15 |
| 5 | best of our knowledge | 5 | 14 | 13 |
| 6 | for the production of | 5 | 14 | 9 |
| 7 | the best of our | 5 | 14 | 13 |
| 8 | to the best of | 5 | 14 | 13 |
| 9 | as well as the | 9 | 13 | 12 |
| 10 | for the first time | 9 | 13 | 12 |
| 11 | in the case of | 9 | 13 | 9 |
| 12 | in this work we | 9 | 13 | 12 |
| 13 | in the present work | 13 | 12 | 10 |
| 14 | on the surface of | 13 | 12 | 9 |
| 15 | a wide range of | 15 | 11 | 10 |
| 16 | et al investigated the | 15 | 11 | 8 |
| 17 | et al reported the | 17 | 10 | 9 |
| 18 | the effect of the | 17 | 10 | 9 |
| 19 | an increase in the | 19 | 9 | 8 |
| 20 | can be used to | 19 | 9 | 8 |
| 21 | density functional theory dft | 19 | 9 | 9 |
| 22 | in the aqueous phase | 19 | 9 | 5 |
| 23 | in the field of | 19 | 9 | 8 |
| 24 | x ray photoelectron spectroscopy | 19 | 9 | 9 |
| 25 | as a function of | 25 | 8 | 8 |
| 26 | et al reported a | 25 | 8 | 7 |
| 27 | in the range of | 25 | 8 | 8 |
| 28 | in this study we | 25 | 8 | 7 |
| 29 | it is necessary to | 25 | 8 | 7 |
| 30 | ray photoelectron spectroscopy xps | 25 | 8 | 8 |
| 31 | the performance of the | 25 | 8 | 5 |
| 32 | a large number of | 32 | 7 | 7 |
| 33 | as one of the | 32 | 7 | 6 |
| 34 | at the same time | 32 | 7 | 5 |
| 35 | in this paper we | 32 | 7 | 6 |
| 36 | it is possible to | 32 | 7 | 7 |
| 37 | metal organic frameworks mofs | 32 | 7 | 6 |
| 38 | the kinetics of the | 32 | 7 | 5 |
| 39 | the surface of the | 32 | 7 | 5 |
| 40 | to the formation of | 32 | 7 | 7 |
| 41 | as a result the | 41 | 6 | 6 |
| 42 | for the synthesis of | 41 | 6 | 5 |

| | | | | |
|---|---|---|---|---|
| 43 | is based on the | 41 | 6 | 6 |
| 44 | on the basis of | 41 | 6 | 6 |
| 45 | the formation of a | 41 | 6 | 6 |
| 46 | to the development of | 41 | 6 | 6 |
| 47 | to the presence of | 41 | 6 | 6 |
| 48 | a large amount of | 48 | 5 | 5 |
| 49 | as a result of | 48 | 5 | 5 |
| 50 | for the development of | 48 | 5 | 5 |
| 51 | functional theory dft calculations | 48 | 5 | 5 |
| 52 | have been used to | 48 | 5 | 5 |
| 53 | in addition to the | 48 | 5 | 5 |
| 54 | in comparison to the | 48 | 5 | 5 |
| 55 | in terms of the | 48 | 5 | 5 |
| 56 | in the form of | 48 | 5 | 5 |
| 57 | in the production of | 48 | 5 | 5 |
| 58 | of the most promising | 48 | 5 | 5 |
| 59 | photoelectron spectroscopy xps and | 48 | 5 | 5 |
| 60 | reported in the literature | 48 | 5 | 5 |
| 61 | the formation of the | 48 | 5 | 5 |
| 62 | the nature of the | 48 | 5 | 5 |
| 63 | the presence of the | 48 | 5 | 5 |
| 64 | the relationship between the | 48 | 5 | 5 |
| 65 | this is the first | 48 | 5 | 5 |
| 66 | to be the most | 48 | 5 | 5 |

The most frequently occurring lexical bundle in this corpus is "in the presence of", which appeared 26 times in 15 different research articles.

## 2. Result of lexical bundles' structural patterns and functional patterns analysis

The exclusion criteria in Table 9 were designed to eliminate those lexical bundles that could not be included due to some of their features, in order to study the structural and functional patterns of each lexical bundle.

**Table 9** Exclusion Criteria

| Criteria | Example of Excluded Lexical Bundle |
|---|---|
| Fragments of other bundles | the other hand the, to the presence of |
| Temperature, volume and length bundles | at c for h, at c for min |
| Random section titles | fig a and b, in fig a and, results and discussion article |
| Meaningless bundles | shown in table the |
| Topic-specific bundles | x ray diffraction xrd, scanning electron microscopy sem |

After applying the exclusion criteria, 24 of the 66 types of four-word lexical bundles were eliminated. As a result, the structural patterns and functional patterns of 42 types of four-word lexical bundles were investigated as shown in Table 10.

**Table 10** The Four-word Lexical Bundles in the CERAI Corpus and their Structural and Functional Patterns

| No. | Type | Structural patterns | Functional patterns | |
|---|---|---|---|---|
| | | | Functional patterns | Sub-types |
| 1 | in the presence of | Prepositional phrase fragments | Text-oriented | Framing signals |
| 2 | on the other hand | Prepositional phrase | Text-oriented | Transition signals |

| | | | | |
|---|---|---|---|---|
| | | fragments | | |
| 3 | one of the most | Noun phrase fragments | Research-oriented | Quantification |
| 4 | is one of the | Verb phrase fragments | Research-oriented | Quantification |
| 5 | for the production of | Prepositional phrase fragments | Research-oriented | Procedure |
| 6 | as well as the | Prepositional phrase fragments | Text-oriented | Transition signals |
| 7 | for the first time | Prepositional phrase fragments | Research-oriented | Location |
| 8 | in the case of | Prepositional phrase fragments | Text-oriented | Framing signals |
| 9 | in the present work | Prepositional phrase fragments | Research-oriented | Location |
| 10 | on the surface of | Prepositional phrase fragments | Research-oriented | Location |
| 11 | a wide range of | Noun phrase fragments | Research-oriented | Quantification |
| 12 | the effect of the | Noun phrase fragments | Text-oriented | Resultative signals |
| 13 | an increase in the | Noun phrase fragments | Research-oriented | Quantification |
| 14 | can be used to | Verb phrase fragments | Participant-oriented | Stance features |
| 15 | in the aqueous phase | Prepositional phrase fragments | Research-oriented | Description |
| 16 | in the field of | Prepositional phrase fragments | Text-oriented | Framing signals |
| 17 | as a function of | Prepositional phrase fragments | Text-oriented | Framing signals |
| 18 | in the range of | Prepositional phrase fragments | Research-oriented | Quantification |
| 19 | it is necessary to | Verb phrase fragments | Participant-oriented | Stance features |
| 20 | the performance of the | Noun phrase fragments | Research-oriented | Description |
| 21 | a large number of | Noun phrase fragments | Research-oriented | Quantification |
| 22 | as one of the | Prepositional phrase fragments | Research-oriented | Quantification |
| 23 | at the same time | Prepositional phrase fragments | Research-oriented | Location |
| 24 | it is possible to | Verb phrase fragments | Participant-oriented | Stance features |
| 25 | the kinetics of the | Noun phrase fragments | Research-oriented | Description |
| 26 | the surface of the | Noun phrase fragments | Research-oriented | Description |
| 27 | for the synthesis of | Prepositional phrase fragments | Research-oriented | Procedure |
| 28 | is based on the | Verb phrase fragments | Text-oriented | Framing signals |
| 29 | on the basis of | Prepositional phrase fragments | Text-oriented | Framing signals |
| 30 | the formation of a | Noun phrase fragments | Research-oriented | Procedure |
| 31 | a large amount of | Noun phrase fragments | Research-oriented | Quantification |
| 32 | as a result of | Prepositional phrase fragments | Text-oriented | Resultative signals |
| 33 | have been used to | Verb phrase fragments | Research-oriented | Procedure |
| 34 | in addition to the | Prepositional phrase fragments | Text-oriented | Transition signals |
| 35 | in comparison to the | Prepositional phrase | Text-oriented | Transition signals |

| | | | | |
|---|---|---|---|---|
| | | fragments | | |
| 36 | in terms of the | Prepositional phrase fragments | Text-oriented | Framing signals |
| 37 | in the form of | Prepositional phrase fragments | Research-oriented | Description |
| 38 | in the production of | Prepositional phrase fragments | Research-oriented | Procedure |
| 39 | the formation of the | Noun phrase fragments | Research-oriented | Procedure |
| 40 | the nature of the | Noun phrase fragments | Research-oriented | Description |
| 41 | the relationship between the | Noun phrase fragments | Text-oriented | Resultative signals |
| 42 | this is the first | Dependent clause fragments | Research-oriented | Location |

Regarding structural patterns analysis, three types of structural patterns, according to Biber et al., (2004)'s structural taxonomy framework, were observed. Prepositional phrase fragments are the most common structural patterns in the CERAI Corpus, with 22 different types of four-word lexical bundles detected in this structural pattern; followed by Noun phrase fragments 13 types, Verb phrase fragments 6 types, and Dependent clause fragments 1 type respectively. The percentage of structural patterns found in CERAIs is shown in Table 11.

**Table 11** Structural Patterns Classification of Four-word Lexical Bundles in CERAI Corpus

| No. | Structural pattern | No. of Types | % |
|---|---|---|---|
| **1** | Prepositional phrase fragments | 22 | 52.38 |
| **2** | Noun phrase fragments | 13 | 30.95 |
| **3** | Verb phrase fragments | 6 | 14.29 |
| **4** | Dependent clause fragments | 1 | 2.38 |
| | Total | 42 | 100.0 |

Noun phrases fragments and prepositional phrases fragments were divided into two patterns because the researcher wanted to confirm which of these two patterns was discovered more frequently than the other. The result revealed that prepositional phrase fragment structure is mostly prevalent in this CERAI corpus. Then noun phrases fragment structure is the second most frequent structural pattern. Thus, it can be assumed that Noun phrase and prepositional phrase fragments are the most frequent structural patterns in CERAIs.

Related to functional patterns analysis, the most frequent lexical bundles found in CERAIs have three functional patterns including research-oriented patterns (59.52%), text-oriented patterns (33.33%), and participant-oriented patterns (7.14%). The findings are consistent with findings in science-related corpora research (Hyland, 2008a) and the medical research article corpus study (Mdodj-Diop, 2016). Table 12 shows the frequency of each sub-type of functional pattern.

**Table 12** Functional Patterns Classification of Four-word Lexical Bundles in CERAI Corpus

| Functional patterns | Number of Bundles | % |
|---|---|---|
| **Research-oriented** | | |
| Location | 5 | 11.90 |
| Procedure | 6 | 14.29 |
| Quantification | 8 | 19.05 |
| Description | 6 | 14.29 |
| Topic | 0 | 0 |
| Sum | **25** | **59.52** |
| **Text-oriented** | | |
| Transition signals | 4 | 9.52 |
| Resultative signals | 3 | 7.14 |
| Structuring signals | 0 | 0 |

| | | |
|---|---|---|
| Framing signals | 7 | 16.67 |
| Sum | **14** | **33.33** |
| **Participant-oriented** | | |
| Stance features | 3 | 7.14 |
| Engagement features | 0 | 0 |
| Sum | **3** | **7.14** |

### C. Lexical bundles in each move in CERAIs

Table 13 presents the findings of lexical bundles in each move to show the connection between lexical bundles and move.

**Table 13** List of Lexical Bundles in each Move in CERAIs

| Move | Lexical Bundles | Key Word in Context (KWIC) |
|---|---|---|
| **Move 1: Establishing a territory** | one of the most | **One of the most** extensively investigated catalysts is… |
| | in the presence of | **In the presence of** moisture, the adsorbent exhibited … |
| | is one of the | Polyurethane **is one of the most** significant materials in our life. |
| | have been used to | … **have been used to** overcome these problems. |
| | in the case of | A similar picture was retrieved **in the case of** CdSe NCs synthesized… |
| | a wide range of | For this reason, it involves **a wide range of** reactions. |
| | as well as the | …, **as well as the** reduction temperature… |
| | for the production of | A new alternative **for the production of** menthol is… |
| | on the other hand | **On the other hand,** inexpensive metals can offer… |
| | on the surface of | Tetraethoxysilane (TEOS) exists only **on the surface of** HZSM-5… |
| | an increase in the | This has led to **an increase in the** popularity of… |
| **Move 2: Establishing a niche** | it is necessary to | Therefore, **it is necessary to** investigate the high-temperature… |
| | as well as the | … their cost, **as well as the** development of the… |
| | in the field of | …has been utilized **in the field of** kinetic studies. |
| | the relationship between the | …to reveal **the relationship between the** Nusselt number… |
| **Move 3: Occupying the niche** | in the present work | **In the present work**, we propose the development of ionomer… |
| | on the other hand | **On the other hand**, our experimental work shows that… |
| | the effect of the | Particularly, we select to study **the effect of the** addition of a random copolymer… |
| | the kinetics of the | **The kinetics of the** degradation reaction is thoroughly investigated… |
| | an increase in the | **An increase in the** average pore size of the ULPCs… |
| | as a result of | **As a result of** this thorough characterization, it is realized… |
| | at the same time | **At the same time**, photoluminescence measurements can be performed in… |
| | for the first time | In our study, here, we demonstrated **for the first time** that… |
| | is based on the | … a regression equation which **is based on the** experimental data… |

These specific lexical bundles identified in each move were one of the total bundles found in CERAIs in Table 8. Depending on their features in each move, they have varied functional patterns. Lexical bundles discovered in Move 1 are more likely to serve as Quantification such as "one of the most", since Move 1 is the initial step in emphasizing the significance of the study and demonstrating interest in the research field. "It is necessary to" is the most frequent lexical bundles

identified in Move 2, and is classified as the Stance features to reflect the writer's opinions. It was used to emphasize the needs following the previous indicated gap. As a result, the sentence connector "Therefore" is frequently used to connect the gap with this lexical bundle. However, the functional patterns of lexical bundles in move 3 were varied. The common functional pattern found in Move 3 was Location function such as “in the present work”. It is used to lead the reader about what the researcher has done in their study.

## 5. Conclusion

Move analysis and lexical bundles analysis of CERAIs has been done in this study. The results show that the refined move structure of CERAIs includes Move 1: Establishing a territory; Move 2: Establishing a niche; Move 3: Occupying the niche. Claim centrality, Making topic generalizations, and Review items of previous research are all conventional steps in Move 1. Move 2 was refined by grouping all of the steps into a move to focus on indicating a research gap. Step 1A: Outline purposes and Step 1B: Announcing present research are conventional steps in Move 3, but Step 2: Announcing principal findings is optional. Moreover, 66 most frequent lexical bundles were found in CERAIs; however, only 42 bundles were conducted the structural and functional pattern analysis because 24 lexical bundles have been excluded after applying the exclusion criteria. Noun phrase and prepositional phrase fragments are the most lexical bundles’ structure found in CERAIs, and research-oriented function is the most common functional pattern found in CERAIs. Lexical bundles in each move were investigated as well. The result revealed that lexical bundles found in each move can show the significant relationship between move and lexical bundle. As a result of the acquisition of lexical bundles, the reader can better comprehend each move's feature.

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