**T.C.**

**YEDİTEPE UNIVERSITY**

**INSTITUTE OF EDUCATIONAL SCIENCES**

**MASTER OF ARTS PROGRAM IN ENGLISH LANGUAGE TEACHING**

# TEXTUAL ORGANIZATION OF ARTICLES:

# A MOVE ANALYSIS OF RESEARCH ARTICLES IN AEROSPACE ENGINEERING

**by**

**İrfan Sarı**

**Submitted to the Institute of Educational Sciences**

**In partial fulfillment of the requirements for the degree of**

**Master of Arts in English Language Education**

**İSTANBUL, 2014**

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**YEDİTEPE ÜNİVERSİTESİ**

**EĞİTİM BİLİMLERİ ENSTİTÜSÜ MÜDÜRLÜĞÜ**

**TEZ TESLİM ve ONAY TUTANAĞI**

KONU: Textual Organization of Articles: A Move Analysis of Research Articles in Aerospace Engineering.

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TEZ ONAY TARİHİ : 13./05./2014

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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## ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my supervisor Asst. Prof. Dr. Erkan KARABACAK for his invaluable guidance, support, encouragement and insight throughout the research.

Besides, I would like to thank to my committee members, Assoc. Prof. Dr. Col. Ali IŞIK, and Asst. Prof. Dr. Jingjing QIN KARABACAK for the time they have dedicated to the reading of my thesis and all the constructive feedback they have made. I also would like to thank Mrs. Evrim EVEYİK AYDIN for coding such complex texts while writing her own Ph.D. thesis.

My special thanks go to Asst. Prof. Dr. Maj. Numan ÜNALDI, Asst. Prof. Dr. Col. Mustafa ER, and Assoc. Prof. Dr. Col. O. Ergüven VATANDAŞ who have always supported me in my academic studies and also guided me throughout my military career.

Ali, Ersin, Raşit, Mustafa, Süleyman, Şaban; we shared the same car, metrobüs and 19F to get to the Yeditepe University located on a different continent after working hours, without your dedication we couldn't have completed this MA experience. And of course, my best companion Serkan ÜLGÜ, who triggered the academician soul of the lieutenants; without his eagerness and motivation we wouldn't have started MA education.

Moreover, my heartfelt thanks go to my parents Ayşe SARI and Ömer SARI who not only raised me, taught me, and loved me, but also believed in me and supported every step I took in my life. I would also like to thank my sisters, brother, and my wife's parents for their encouragement and moral support throughout this study.

Last but not least at all, I am forever grateful to my significant other, Sema, for her care, encouragement, understanding, endless patience, and unconditional love when it was most required. I would like to thank my lovely daughter, Sena, for the times she slept and let me study.

**TABLE OF CONTENTS**

## LIST OF TABLES

**LIST OF FIGURES**

**LIST OF ABBREVIATIONS**

AERAs .....Aerospace Engineering Research Articles

TurAFA ..... Turkish Air Force Academy

IMRD/C.....Introduction-Methods-Results-Discussion/Conclusion

EAP .....English for Academic Purposes

ESP .....English for Specific Purposes

GE..... General English

CARS .....Create a Research Space

ELT..... English Language Teaching

EOP .....English for Occupational Purposes

EVP ..... English for Vocational Purposes

EPP ..... English for Professional Purposes

ESAP .....English for Specific Academic Purposes

EGAP ..... English for General Academic Purposes

CASM.....Composites Applied Science and Manufacturing

CS ..... Composites Structures

MSE..... Materials Science and Engineering

AST ..... Aerospace Science and Technology

# ÖZET

Swales'in (1990) çığır açan, araştırma makalelerinin giriş bölümlerini incelediği, adım yapısı çalışmasından bu güne kadar pek çokları CARS modelini çok farklı alanlarda yazılmış olan makalelerin farklı bölümlerine uygulamışlardır (Örnek olarak doğal bilimler, sosyal bilimler, yardım mektupları ve daha pek çok alan). Bu çalışma tam boyutlu Havacılık ve Uzay mühendisliği araştırma makalelerinde baskın olan adım yapısını incelemiştir. Çalışmanın nihai amacı doğrultusunda, 25 dergi içerisinden seçilen 4 ana dergiden 8 makalelik bir bütünce oluşturulmuştur. Tüm cümleler Kanoksilapatham'ın (2005) bio-kimya araştırma makaleleri için oluşturduğu adım yapılarının uyarlanmış hali kullanılarak kodlanmıştır. Çalışmanın sonuçları göstermiştir ki Havacılık ve Uzay mühendisliği araştırma makalelerinden oluşan bütünce tutarlı bir adım yapısı göstermiştir. Çalışmanın çıktıları, kurumların havacılık ve uzay mühendisliği bölümlerinde okutulan derslere uygulanabilir ayrıca özel/akademik amaçlı İngilizce öğretenler tarafından da kullanılabilir. Çalışma, aynı zamanda, ileride yapılacak olan farklı alanlardaki adım yapısı çalışmalarına ışık tutmaktadır.

**Anahtar Kelimeler:** Akademik yazım, tür, adım yapısı analizi, havacılık ve uzay mühendisliği araştırma makaleleri

## ABSTRACT

Since Swales' (1990) pioneer move analysis study, which analyzed the research article introductions, many have applied CARS model to different sections of articles from varying fields (i.e. natural sciences, social sciences, fundraising letters, and several other fields). The present study investigated the dominant move structures in full-length Aerospace Engineering Research Articles. For the ultimate aim of the study, a corpus of 8 articles from 4 core journals is collected. All the sentences are coded by using an adapted version of Kanoksilapatham's (2005) move structures for biochemistry research articles. The results of the present study showed that Aerospace Engineering research articles have a consistent move structure. The outcomes of this study can be implemented in the writing courses taught in aerospace engineering departments likewise by those who teach EAP/ESP. The findings also supply insights for future move analysis studies in different disciplines.



**Keywords:** Academic writing, genre, move analysis, aerospace engineering, research articles

# CHAPTER I

# INTRODUCTION

The worldwide popularity of English language has also dominated the field of academics and when we talk about the academics, writing comes at the first place. For an academician to make his/her paper published or to make his/her study heard by the international community, an English medium international journal is almost the only option. Additionally, for academicians, especially those live in non-English speaking countries, it is vital to comprehend articles published in English. Thus, functional organization of these articles become relevant both for readers and especially writers. Therefore, this study coded and analyzed the move structures of research articles in Aerospace Engineering (hereafter AERAs).

## 1.1. Organization of the Study

The present thesis is composed of four chapters:

Chapter I introduces the study and states its purpose, related literature, research question, significance, organization, and overview of methodology.

Chapter II provides broad information on the methodology of the present study such as the compilation of the corpus, the basic framework of the study, the coding process of the articles, and the proposed move structure for the field.

Chapter III includes the results of the coding and the discussion of the moves/steps. The observed moves/steps were illustrated by variety of examples.

Chapter IV concludes the study and presents the limitations and the implications of the study for both the EAP instructors and the academicians.

The present thesis ends with references and appendices that are mentioned in the text. The following chapter deals with methodology in detail.

### 1.2. Purpose of the Study

Working in a tertiary level institution “Turkish Air Force Academy (TurAFA)” as an English teacher, the present researcher has been teaching a variety of English courses, namely: General English, CBI and EAP to young adults some of whom continue to graduate education in Aeronautics and Space Technologies Institute, within the campus of TurAFA. So those MA and PhD students who are eager to write papers for journals constitute the target group. In a nutshell, this study investigates if there is a dominant move structure in AERAs and if so how can academicians and material developers make use of it?

### 1.3. Review of the Literature

When we consider any language from the viewpoint of pedagogy, i.e. 'teachability' and 'learnability' of any language, language it can be divided into two broad categories: systems and skills. Pronunciation and grammar make up the former division while reading, writing, listening, and speaking constitute the latter. Another issue to consider is that the more the number of people using English increased the more diversified its sub-divisions (i.e. English for Specific Purposes, English for Academic Purposes, English for General Purposes, English for Science and Technology) would get. Stemming from the increasing number of non-native speakers of English, a new area in language teaching emerged in time: ESP and EAP (Belcher, 2006; Bloor, 1998). Of the skills mentioned above, rather than listening and speaking, reading and writing take over the largest proportion in EAP settings. In EAP, academicians make use of writing as a productive skill considerably. Thus, the scope of the present paper is to identify the functional units by conducting 'move analysis' through AERAs giving opportunity to better read and write academic papers for those teaching and learning in an EAP context.

### 1.3.1. Academic English

Due to the fact that it has been used primarily as the language of the internet, science, and aviation (Krashen, 2006), English language has become the 'leading language' (Hyland and Hamp-Lyons, 2002) in the world recently. In addition to being 'the world's second language' (Krashen, 2006), English language has also been considered as the language of the academic world. Therefore, qualifying proficiency in English language has become a crucial part of the professional life for academicians who would like to follow the recent developments in their respective disciplines. They have to gain proficiency in English especially in terms of academic discourse. The discipline of English Language Teaching replied to this demand with English for Academic Purposes (EAP) since it appeared around 35 years ago (Hyland and Hamp-Lyons, 2002).

English for Academic Purposes (EAP) can briefly be defined as 'teaching English with the aim of facilitating learners' study or research in that language (Jordan, 1997, p.1). We need to consider the fact that 'EAP has emerged out of the broader field of ESP, a theoretically and pedagogically eclectic parent, but one committed to tailoring instruction to specific rather than general purposes' (Hyland and Hamp-Lyons, 2002). Richards and Schmidt also see EAP within the framework of ESP (Richards and Schmidt, 2002, p. 181).

The immersion of this sub-field (EAP) has reformed how English had been taught and perceived and reformed the English Language Teaching programs at especially tertiary level in English as a Foreign/Second Language settings. When we think of the number of users of English (including non-native speakers of English), English medium academic settings have grown enormously. Even in many non-English speaking countries such as Nigeria, Philippines, Tanzania (Kachru, 1992), medium of instruction is English.

EAP takes its ground from the fact that English has been the world language in general and the language of science as was statistically depicted by Benfield and Howard (2000). In

1996, 88.6% of medical citations were in English in Medline whereas German citations covered only 2.2%, Japanese 1.8%, and Spanish 1.2% which also shows the extent to which English language has reached (ibid., 2000, p. 643). Additionally, the number of EAP specialists and/or EAP teachers increased in accordance with the fact that learners of EAP suddenly increased. Still, EAP is a growing need for both native and nonnative contexts as was proposed by Johnson and Parrish (2010).

In order to assist EAP practitioners, Schleppegrell (2002) studied the linguistic challenges of academic language and tried to illustrate the way knowledge is displayed, information is organized, and an authoritative voice is constructed. According to that study it can be derived that academic language is information-packed, has dense clauses with technical and abstract language. And the organization of information is "multi-semiotic" in all disciplines, and in writing, students are expected to take up particular ways of identifying the different kinds of texts they are asked to respond to.

Below is a comparison chart between EAP and General English (GE) in order to explore what EAP is or what it is not. The Differences between GE and EAP is clearly put forward by Alexander, Argent, and Spencer (2008, pp. 3-5).

Table 1.

*Comparisons of GE and EAP (*Alexander, Argent, and Spencer, 2008, pp. 3-5*)*

| **CONTEXT** | **GENERAL ENGLISH LANGUAGE TECHING** | **ENGLISH FOR ACADEMIC PURPOSES** |
|---|---|---|
| **1. What drives the syllabus?** | Level driven: the main focus is what a student can and cannot do now. | Goal driven: the main focus is where a student has to get, often in relation to specific academic course. |
| **2. Time available** | Relatively flexible: a student may opt in and out of ELT at various points in adult life with different motivations. | Not flexible: time is strictly limited and an EAP course is probably a 'one-off' endeavor for a student. |

| | | |
|---|---|---|
| **3. What is at stake for the student?** | For most students, the outcome is a sense of personal achievement or certification of the language level attained, not necessarily involving high stakes. | For almost all students, the only relevant outcome is entry to or successful completion of university study. Failure is costly in time, money and career prospects. |
| **PEOPLE** | | |
| **4. Student motivation** | Motives are varied and general. Students often learn General English out of interest in the language and associated cultures or a wish to become part of a global community. | Motives are specific. A high proportion of EAP students learn English as a means to entering a course at an English-medium university or in order to access a particular academic community. |
| **5. Teachers** | Attracts predominantly graduates in the humanities, e.g., English (usually literature), linguistics or European languages. | Attracts a significant number of graduates in evidence-based academic disciplines, such as science, social science, business studies. |
| **6. Teacher-student roles** | Unequal: teachers are seen as language experts and students as language novices. | Teachers and students are more equal: both are learning about the academic community. |
| **TEACHING AND LEARNING CONTENT** | | |
| **7. Language Content (grammar and vocabulary)** | Potentially, the totality of the English language is possible content. Usually, students need to be equipped for a wide range of communicative situations. | Content is limited to academic discourse, e.g., emphasis on academic style: academic vocabulary and associated grammar and discourse features. |
| **8. Language-skills balance** | Speaking and listening are usually given more importance than reading and writing. Exams or students may determine the weighting given. | The main emphasis is on reading and writing. Some EAP students have a specific need, such as academic reading or writing for publication. |
| **9. Materials** | Texts and tasks are often chosen for self-expression and are usually short and quickly covered; personal response and creativity are valued. | Texts and tasks are drawn from degree study. They are for communicating information and are inherently long and dense. Clarity and objectivity are valued in student |

| | | |
|---|---|---|
| | | writing. |
| **10. Text choice** | Texts are often chosen from entertaining, easily accessible genres. Traditionally, there has been an emphasis on sentence grammar, with topic driving text choice. | Text choice is based on academic genres: students learns about audience, purpose and organization as well as rhetorical functions and inform structure. |
| **11. Text exploitation** | Variety and pace of activities are important in delivery, leading to a tendency to move quickly from text to text to maintain interest, each text having a different topic and learning focus. | Texts require more time for full exploration. Each text may have a range of learning focuses. Texts may be linked thematically. |
| **12. Other skills content** | There is little emphasis on study skills, or these focus on language learning only. Cognitive skills are not explicitly included. | Study skills are emphasized and made explicit, particularly learner independence and cognitive skills, especially critical thinking. |

Pennycook (1997) viewed EAP from the point of pragmatism in that narrowing down general English (GE) into achievable parts is much more cost-effective as follows;

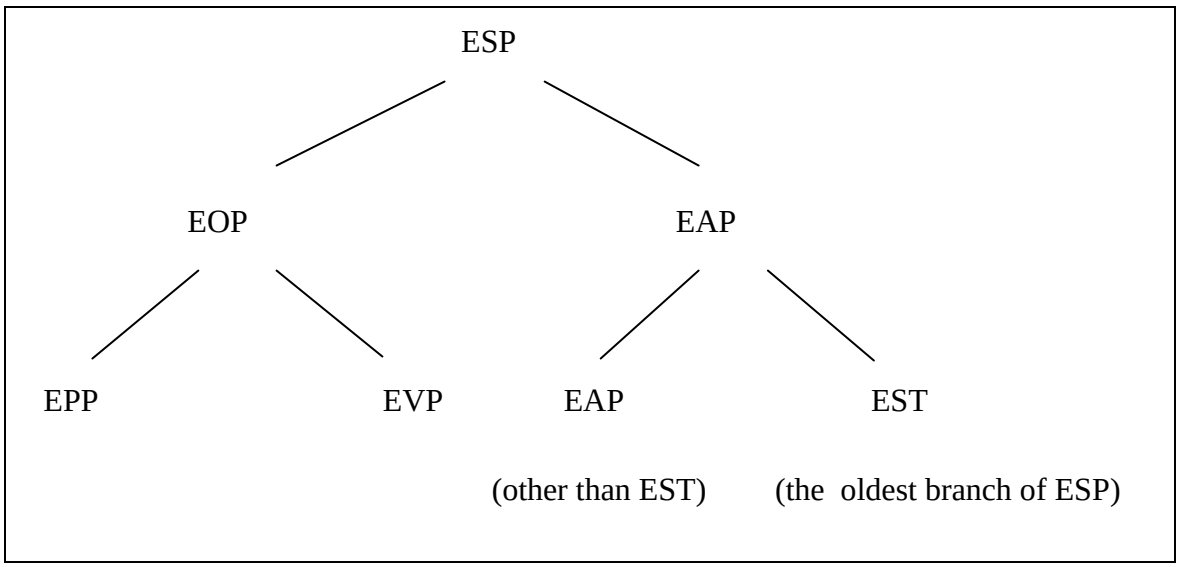
> "... if we are to encourage research that is pragmatic in the sense of looking at the everyday contexts of teaching, I would argue that this should be a critical, rather than a vulgar, pragmatism, a position that is deeply concerned about efforts to maintain the status quo, and insists that while we do have to get on with our teaching, we also have to think very seriously about the broader implications of everything we do." (p. 226)

It can be easily understood from Table 1 that, there are certain differences between GE and EAP in terms of three main domains: general perspective, people, and content. These three domains are divided into 12 different contexts showing that there is a difference between what we call GE and EAP.

Going back to GE and ESP issue within which EAP has emerged, Jordan (2002) mentions the development of EAP in the world and in the UK revealing the reasons behind. Moreover, he gives the following model to show the categorization of ESP:

Figure 1.

*Divisions of ESP (Jordan, 1997, p. 3)*




Regarding the recent definition of the concept of EAP, McDonough (2005) received the answer from Hyland at an interview on EAP as follows. The answer indicates the sudden growth and diversion/immersion of EAP out of ESP showing the extent to which the definition of the concept of EAP has reached since its emergence:

> EAP and ESP were both fledgling fields only 20 years ago… When the English for Specific Purposes journal was begun by Grace Stovall Mancill of the American University in Washington in 1980, it was a gamble to start even one journal concerned with ESP, EAP, and related areas. For some years, it was a struggle to fill the pages of two issues a year. …we seek to show that the breadth and depth of work done and to be done in EAP is more than sufficient to fill the pages of a quarterly journal, as JEAP will be by 2003. (p. 57)

### 1.3.2. Genre Analysis

When considered in terms of terminology, there are two frequently cited terms: genre and register. Register is mainly referred as "the style of language used in a particular context such as formal and informal" (Alexander et al., 2008, p. 37)

Identifying the register of a text is an important part of corpus linguistics. When reading a news report on the Internet, one can easily realize that it is different from the text written in a novel. In the same way, the language used in the academic text is distinctly different from the language used in other texts. The content and the topics are usually different and the depth will also be different in both cases. At this point register analysis comes as a way to study academic texts.

On the other hand, genre is referred as "the types of texts used by groups who share communicative purposes, e.g., cause and effect" (ibid. p. 37). For Hyland (2004, p.4), "Genre is a term for grouping texts together, representing how writers typically use language to respond to recurring situations". Swales (1990, p.58) defines "a genre comprises a set of communicative events, the members of which share some set of communicative purposes".

Swales asserts that the term genre is a "fuzzy" concept (1990, p. 33). He categorizes and explains the term genre in four main divisions and asserts a working definition. Genre in folklore studies gained attention during 1970s and has been referred as forms. Genre in literary texts is shaped by the evolution and development of creative arts like film, music and art taking part in literature. Genre provided an interpretive and evaluative frame for a piece of art then. Genre in linguistics was considered as a part of speech activities. What we call genre was associated with type of communicative event offering some examples. Genre in rhetoric provided applicable contribution to the purpose of genre trying to offer illuminating analysis rather than classifying. Coming to the working definition, Swales (1990, pp. 33-58) lists the following features of genre:

1. A genre is a class of communicative events.

2. The principal criterial feature that turns a collection of communicative events into a genre is some shared set of communicative purposes.

3. Exemplars or instances of genres vary in their prototypicality.

4. The rationale behind a genre establishes constraints on allowable contributions in terms of their content, positioning, and form.

5. A discourse community's nomenclature for genres is an important source of insight.

Considering the above definition of genre, what constitute academic community may be summarized as researchers, academicians, undergraduates, and graduates. They have their own genre comprising articles, essays, and reports. This communication among those academicians and their followers comprise the academic genre peculiar to themselves. Genre can both be spoken or written. The scope of the present paper is limited to written academic texts by a specific academic community (genre).

Defining the type of a text and assisting for professional needs are significant as was asserted by Kutsal and Karahan (2008). They studied medical academicians and categorized their preferences about academic text organization. The results showed that the subjects wanted to see an outline of academic text both in their language and in target language in international publications.

If it is of key importance to conduct needs analysis in ESP and EAP in order to design a syllabus or curriculum (Dudley-Evans, 1991), it entails to carry out genre analysis, which will make it easier and more possible to realize the aimed syllabus along with its components.

Genre was also studied by scholars in non-English context. For instance, Aarts et. al. (2011, p. 1212) studied the issue in Turkish context by developing a coding scheme which investigated the characteristics of academic language and concluded that “the coding scheme can be used to analyze the degree of academicness of language samples in an equivalent way

in different languages." Similarly, Asencion-Delaney and Collentine (2011) also conducted a study in Spanish context.

Genre analysis reveals more than academic assets. For example, while Hyland (2003; 2008) views genre analysis as a social process, Berkenkotter and Huckin (1995) studied genre from socio-cognitive perspective and asserted that genres reveal much about a community's norms, epistemology, ideology, as well as its social ontology. In the same vein, Bhatia (1993; 1997a; 1997b) studied genre from various perspectives focusing specifically on world Englishes and concluded that English has become the language the majority of the world uses as a lingua franca; therefore, this language should be focused on various perspectives, such as acquisition, methodology, and paradigm. Similarly, linguists should focus on these perspectives for the sake of understanding the genre.

The relationship between genre analysis and ESP is argued by some writers. For instance, Dudley-Evans (1997) views genre analysis as a key to ESP. Accordingly, Hüttner et. al. (2009) asserted the necessity to train ESP teachers in order to respond to the growing demand of learners, too. Flowerdew (1998; 2005) focused on corpus-based and genre-based approaches to ESP and EAP in order to get benefit of the field and in order to systematically deal with the field.

To sum up, genre analysis studies have arose due to a need for better understanding organizations of texts in a specific field in terms of communicative purposes. With the growth of academic studies especially the international ones genre analysis has gained much more attention as it helped the writers and the readers to internalize the texts with its communicative functions. Following part explains how these communicative functions operate.

### 1.3.3. Move Analysis

Kanoksilapatham, (2007) described the move as "a section of a text that performs a specific communicative function". Narrowing down the issue of EAP, the basic purpose of move analysis seems to analyze especially academic texts in order for the academicians to assist in their article writing or text construction dealing with the steps taken into account while writing those texts (Biber et al. 2007). There are certain functions assigned to moves as shown in Table 2 below.

Table 2

*Functions of Moves for Introduction Sections (Hyland, 2000)*

| N | Move | Function |
|---|---|---|
| **1** | Introduction | Establishes the context of the paper and motivates the research. |
| **2** | Purpose | Indicates the purpose, and outlines the intention, behind the paper. |
| **3** | Method | Provides the information on design, procedures, assumptions, data, etc. |
| **4** | Results | States the main findings, the argument or what was accomplished. |
| **5** | Conclusion | Interprets or extends the results, draws inferences, points to implications. |

The moves in this table are designed only for the introduction part of research papers. Although there are various moves coined by many scholars, this is one of the widely used move coding tables; although a different move coding scheme was adopted for the present paper as described in the methodology section in detail.

Moves can be defined as "the stages through which genres proceed" (Alexander et al., 2008, p. 45). Each of these stages has an objective of its own. In an academic text moves indicate a variety of communicative functions, such as:

- ✓ Comparing the present findings with those of others.
- ✓ Discussing the limitations of the present paper.
- ✓ Giving suggestions to researchers who may study the same topic.

There are various move analyses focusing on separate parts of texts like abstract (Hyland, 2004), introduction (Loi, 2010; Monreal et. al., 2011; Ozturk, 2007; Ruiying and Allison, 2003; Samraj, 2002), literature review (LR) (Kwan, 2006), method (Martinez, 2003), results/conclusion (Bunton, 2005; Holmes, 1997; and Miin & Lim, 2010), and discussion (Bitchener and Basturkmen, 2006; Martinez, 2003; and Peacock, 2002). There are fewer studies focusing on the whole article (Kanoksilapatham, 2005; Li and Ge, 2009; Moshtagi, 2010; and Nwogu, 1997; Posteguillo, 1999; Stoller and Robinson, 2013; and Zhang, 2011).

It can clearly be stated that Swale's (1990) CARS model is really effective and found place in almost all research articles. Accordingly, the researchers applied this model to their own context and there arose the need for different moves and steps to fulfill the communicative function of their own fields. For instance, Bunton (2002) found many moves which were pretty higher when compared to CARS. Moreover, Bunton (2005) examined the conclusion chapters of the PhD theses or dissertations and identified varying moves apart from CARS, too. In an early study held by Crookes (1986), cyclicity of the moves was analyzed and what can be inferred from that is the length of the introduction section is directly related to cyclicity of the moves. Kwan (2006) worked on literature review sections of the applied linguistics doctoral theses and concluded that literature reviews are observed not only in one specific section but also in every section of the thesis.

### 1.3.4. Pulling it together

It has been clarified in the above discussion that EAP emerged out of ESP which has often been contrasted with GE. For student academicians and professional academicians, text analysis, register analysis, and genre analysis are of key issues bearing in mind the fact that

the number of people using English language for academic purposes is considerably high and it is the lingua franca of the academic language.

Of the four skills (reading, writing, listening, and speaking), writing is a key skill for those who are dealing with academic issues since a great proportion of academic studies are conducted through written English which seems to be the medium of communication among scholars with different language backgrounds. In order to assist the academicians write more effective articles and read the articles more effectively, the field of genre analysis or text analysis has a lot to contribute. Additionally, corpus linguistics also can considerably contribute to the issue through a relatively recent interest area called move analysis details of which will be discussed below. Of the field of corpus linguistics, move analysis is a key technique to achieve this purpose.

### 1.4. Research Question

The present study aims to answer the following question: What are the move structures in full-length (IMRD/C style) Aerospace Engineering research articles?

### 1.5. Significance of the Study

As discussed above, move analysis has gained much attention and many researchers applied the Swales' CARS model to different individual sections (abstracts, introduction, methods, results, discussion) of the articles that are written in various disciplines such as natural sciences, social sciences, applied sciences and several other fields. Few studies investigated research articles in applied sciences--most typically engineering--. Posteguillo (1999) studied articles from computer science. Aerospace Engineering research articles were not studied from a move-analysis perspective; thus, the present study is filling this gap and proposing a model of structure for the Aerospace Engineering field (AERAs), which is the primary branch of the engineering that deals with aircrafts and spacecrafts.

Furthermore, proposed model is intended to guide the novice research writers in terms of contextualizing their studies and ease the publishing procedures of their papers. Additionally, given the fact that all universities and post-graduate schools with engineering majors include EAP courses to familiarize their students to the academic community, EAP instructors may find it helpful to put the outcomes of the current study in use in their classroom practices.

# CHAPTER II

# METHODOLOGY

The present study was designed to explore the move structures of full-length AERAs. The sections below present the selection procedure of the journals and journal articles; framework of the analysis; training of the coders and the coding process.

## 2.1. Compilation of the Corpus

To make sure that the proposed move structure to be generalizable to the target discourse (Aerospace Engineering), journal and journal article selection process conducted through close cooperation with an Associate Professor from the Aerospace Engineering Department, TurAFA. The selected four journals among 27 different journals were: *Composites Part A Applied Science and Manufacturing (CASM), Composite Structures (CS), Materials Science and Engineering B (MSE), Aerospace Science and Technology (AST).* The first criterion that affected the selection process was the impact factor of them that three of them have an impact factor ranging from 2.744 to 1.846 according to the Journal Citation Reports (2012). Although AST has an impact factor of 0.873, it is included to the list due to the evaluation of the field expert. The second criterion taken into consideration was the publication year, which was supposed to be recent--between 2005 and 2013. The quick change in the engineering and the aerospace field is the underlying reason for limiting the publication year. Considering the practical reasons, the last criterion was the accessibility of the journals within the data-base of the TurAFA.

After the journals were chosen, articles needed to be selected. As the aim of the study was to discover the patterns of meaning (moves) in AERAs, the field expert and the researcher made his choice basically depending on Stoller and Robinson's (2013) criteria

which were applied in their study of chemistry articles and verified to be applicable: Topic, currency, length, and author.

Upon deciding on the criteria 8 articles were selected for the coding and analyzing. As aerospace has a wide range of sub-branches, the selected articles represented the foundations of the field and were familiar to the novice researchers. All the articles have the publication year of 2005 to 2013; and they had an average length of varying 82 to 184 sentences and a corpus of 29451 words in total. To prevent the native/non-native discussions; to insure and minimize grammatical and semantic errors, special care is given to the article choice that all of them have at least one native writer who is identified as natives by their demographic information (name-surname).

Although the number of articles seems to be very few, move analysis requires hand-coding of every single sentence and including more articles would have been beyond the capability of the present researcher.

The list of the articles is presented in Appendix A, and the detailed bibliographical information about the journals and the articles are given in Appendix B.

### 2.2. Kanoksilapatham's Framework

As is discussed in the literature review section, there are some studies whose foci are different fields. As the genre and communicative functions of the articles, furthermore the cultural motives of the writers and the publishers show great differences which resulted in different move categories and numbers.

Developed and revised by Swales (1990), move analysis in the field of English for Specific Purposes (ESP) has gained much attention. Although Swales' study "Create a Research Space (CARS)" (see Table 3) included the introduction sections of the articles,

inspired researchers and scholars extended move analyses to different fields and different sections of the articles in numerous studies. Move analysis was also done in texts other than research papers, such as prefaces, job application letters, fundraising letters, and so on.

Table 3

*Swales' CARS model for Research Article Introductions, (1990, p.141)*

| | | |
|---|---|---|
| **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 |

For example, Kwan (2006) proposed a model (see Fig.2) for thematic units in literature review chapters by doing little modifications on Swales (1990) CARS model. This also indicates that the CARS model has a great influence, naturally, on the research articles.

Figure 2.

*A move structure for thematic units in literature review chapters (Kwan, 2006, p. 51)*

| | |
|---|---|
| **Move 1** | **Establishing one part of the territory of one's own research by** |
| Strategy A# | surveying the non-research-related phenomena or knowledge claims |
| Strategy B# | claiming centrality |
| Strategy C | surveying the research-related phenomena |
| **Move 2** | **Creating a research niche (in response to Move 1) by:** |
| Strategy A | counter-claiming |
| Strategy B | gap-indicating |
| Strategy C | asserting confirmative claims about knowledge or research practices surveyed |
| Strategy D | asserting the relevancy of the surveyed claims to one's own research |
| Strategy E | abstracting or synthesizing knowledge claims to establish a theoretical position or a theoretical framework |
| **Move 3(optional)** | **Occupying the research niche by announcing:** |
| Strategy A | research aims, focuses, research questions or hypotheses * |
| Strategy B | theoretical positions/theoretical frameworks * |
| Strategy C | research design/processes * |
| Strategy D | interpretations of terminology used in the thesis * |

*Sub-strategy: justifying or claiming contributions
# Strategy 1B tends to precede Strategy 1A when the two co-occur.

On the other hand, Nwogu (1997) completely changed the moves and increased the numbers of moves (see Fig.3) as response to the needs of the medical research papers.

Figure 3.

*Outline of moves and their constituent elements (Nwogu, 1997, p. 35)*

| | |
|---|---|
| *Introduction* | |
| Move 1: | Presenting Background Information: |
| by | (1) Reference to established knowledge in the field. |
| | (2) Reference to main research problems. |
| Move 2: | Reviewing Related Research: |
| by | (1) Reference to previous research. |
| | (2) Reference to limitations of previous research. |
| Move 3: | Presenting New Research: |
| by | (1) Reference to research purpose. |
| | (2) Reference to main research procedure. |
| *Methods* | |
| Move 4: | Describing Data-Collection Procedure: |
| by | (1) Indicating source of data. |
| | (2) Indicating data size. |
| | (3) Indicating criteria for data collection. |
| Move 5: | Describing Experimental Procedures: |
| by | (1) Identification of main research apparatus. |
| | (2) Recounting experimental process. |
| | (3) Indicating criteria for success. |
| Move 6: | Describing Data-Analysis Procedures: |
| by | (1) Defining terminologies. |
| | (2) Indicating process of data classification. |
| | (3) Identifying analytical instrument/procedure. |
| | (4) Indicating modification to instrument/procedure. |
| *Results* | |
| Move 7: | Indicating Consistent Observation: |
| by | (1) Highlighting overall observation. |
| | (2) Indicating specific observations. |
| | (3) Accounting for observations made. |
| Move 8: | Indicating Non-Consistent Observations: |
| *Discussion* | |
| Move 9: | Highlighting Overall Research Outcome: |
| Move 10: | Explaining Specific Research Outcomes: |
| by | (1) Stating a specific outcome. |
| | (2) Interpreting the outcome. |
| | (3) Indicating significance of the outcome. |
| | (4) Contrasting present and previous outcomes. |
| | (5) Indicating limitations of outcomes. |
| Move 11: | Stating Research Conclusions: |
| by | (1) Indicating research implications. |
| | (2) Promoting further research. |

Including the above rhetorical moves the number of studies on full-length articles is limited (Skelton, 1994; Nwogu, 1997; Kanoksilapatham, 2005). That is why, for the current

study, an adapted version of Kanoksilapatham's (2005) proposed moves which are shown in Table 4 (for the descriptions, see Appendix C) were taken as the theoretical framework as it was the most current study covering full-length articles in natural science (biochemistry). Besides, when needed, Swales' (2004) and Eveyik-Aydın's (2014) move structures were also benefitted from.

The current study didn't include the abstract sections of the research articles just like Kanoksilapatham's (2005), yet this study differed from Kanoksilapatham's study in some aspects. First, the number o the journals and the articles differs, Kanoksilapatham has worked on 60 articles chosen from 5 journals and comprising of 3488 sentences; however this study has a corpus of 1102 sentences picked from 8 articles. As can be seen, although the number of the articles studied seems to be low, the amount of coded units is enough to conduct the present research

The move coding scheme used in the present paper is given below in section 2.5. "*Proposed Model of Move for Aerospace Engineering Research Articles*"

Table 4

*Budsaba Kanoksilapatham's Model of Move Structure for Biochemistry Research Articles (2007, p.76)*

| | | | |
|---|---|---|---|
| **INTRODUCTION** | | **Move 10:** | Announcing results |
| **Move 1:** | Establishing a topic | Step 1 | Reporting results |
| **Move 2:** | Preparing for the present study: Indicating a gap/raising a question | Step 2 | Substantiating results |
| **Move 3:** | Introducing the present study | Step 3 | Invalidating results |
| Step 1 | Stating purpose(s) | **Move 11:** | Commenting results |
| Step 2 | Describing procedures | Step 1 | Explaining results |
| Step 3 | Presenting findings | Step 2 | Generalizing/interpreting results |
| **METHODS** | | Step 3 | Evaluating results |
| **Move 4:** | Describing materials | Step 4 | Stating limitations |
| Step 1 | Listing materials | Step 5 | Summarizing |
| Step 2 | Detailing the source of the materials | **DISCUSSION** | |
| Step 3 | Providing the background of the materials | **Move 12:** | Contextualizing the study |
| **Move 5:** | Describing experimental procedures | Step 1 | Describing established knowledge |
| Step 1 | Documenting established procedures | Step 2 | Generalizing, claiming, deducing |

| | | | |
|---|---|---|---|
| | | | previous knowledge |
| Step 2 | Detailing procedures | **Move 13:** | Consolidating results |
| Step 3 | Providing the background of the procedures | Step 1 | Restating methodology (purposes, research questions, hypotheses) |
| **Move 6:** | Detailing equipment | Step 2 | Stating selected findings |
| **Move 7:** | Describing statistical procedures | Step 3 | Referring to previous literature |
| **RESULTS** | | Step 4 | Explaining differences in findings |
| **Move 8:** | Restating methodological issues | Step 5 | Making overt claims/generalizations |
| Step 1 | Describing aims and purposes | Step 6 | Exemplifying |
| Step 2 | Stating research questions | **Move 14:** | Stating limitations of the study |
| Step 3 | Making hypotheses | **Move 15:** | Suggesting further research |
| Step 4 | Listing procedures or methodological techniques | | |
| **Move 9:** | Justifying methodological issues | | |

### 2.3. Training of the Coders and the Reliability of Moves

For the current study, the researcher trained by his supervisor who coded thousands of sentences from a wide variety of articles for three weeks on independent articles for familiarization. Following these three-week guided coding sessions, two more articles were coded by the researcher and by another expert independently and re-checked. During this training period, disagreement between coders was discussed and moves were clarified until an agreement is ensured to understand the communicative functions of the sentences.

It is undeniable that deciding on each move type depends on subjective evaluation and the judgment of the coder; so it was hard to achieve high inter-coder agreement. To improve consistency, reliability of the coding of the researcher was verified with a professional coder, who had coded a large number of sentences and was already working on her own doctoral dissertation on move analysis (Eveyik-Aydın, 2014), from Yeditepe University. And all the coding was done independently not to harm the objectivity of the results. Moreover, when bottlenecks occurred due to not being able to understand the content of the sentence, assistance was granted from a field expert; Associate Professor Major Zafer Kazancı in the Aerospace Engineering Department, TurAFA.

Percentage agreement of the coders were calculated, additionally, as Brown (1996) mentioned in his testing book, Cohen's $\mathcal{K}$ is used to evaluate the inter-coder reliability. Moreover, inter-coder reliability of a third coder was calculated to get more objective results. According to Fleiss $\mathcal{K}$ values (as cited in Kanoksilapatham (2005)) are; less than .40 poor, .40 to .59 fair, .60 to .74 good and more than 75 excellent. The researcher investigated the coding in two levels: Move and Move/Step. For the Move Level inter-coder reliability only move matching is taken into consideration; however Move/Step Level inter-coder reliability looked for both move and step agreement.

The present coding got the value of .78 in Move Level which showed an excellent agreement. On the other hand, Move/Step Level agreement got the value of .45 which meant fair agreement. The reason for the low Move/Step level agreement is the very close relationship between the steps within the moves. When a different code was given by the other rater, the code was not totally an irrelevant move; it was a move that was closer to the move code assigned by the researcher. Additionally, steps are so detailed and there are only little nuances between each step, which makes the coding harder. Therefore; the results of both calculations which are shown below indicate that the table is adequate and the coding is consistent.

Table 5

*Inter-coder Reliability Analysis*

| **Moves/Steps** | **Cohen's $\mathcal{K}$** |
|---|---|
| Move Level | .78 |
| Move and Step Level | .45 |

## 2.4. Coding Moves in the Corpus of Eight-Aerospace Engineering Research Articles

During the coding sessions some sentences were not clearly associated with a specific move. In such cases the researcher applied to the field expert to get a clear explanation of the related sentence.

After carrying out a labor intensive work, each sentence (1102 sentences in total) was coded by the researcher in line with adapted version of Kanoksilapatham's framework for biochemistry articles. All the data (sentence-move matching) was entered into an Excel Spreadsheet to visualize the move pattern (See Appendix D). Additionally, occurrence rates both in each article and in the corpus of the eight articles as a whole were calculated. In the literature, deciding on a move whether it was a conventional or an optional move depends on its occurrence rate.

To clarify, if 60% and more of the articles contain the move, it is considered as conventional and below 60% is considered as optional move (Kanoksilapatham, 2005). However, in this study the moves were observed in entire eight articles so the occurrence rates of the each move were calculated within each article and in total on the basis of sentence

## 2.5. Proposed Model of Move for Aerospace Engineering Research Articles

At the very beginning of the coding, the researcher decided to use the moves of Kanoksilapatham (2005), however after coding the AERAs for the first time it was discovered that some moves of Kanoksilapatham were not used even for once such as "Move 13 Consolidating Results". Moreover, some moves were in close relation with another move as a move-step relation. Therefore, the researcher excluded some moves while locating some under another move. Then, coding processes led the present researcher to design a move coding scheme that fits the current corpus. The newly made moves and steps were given to other coders, who were also involved in coding so that familiar to the topic, with randomly

selected articles to see whether they work or not. After this piloting process the agreements and disagreements were checked to see the reliability of the updated "moves".

As is shown in Table 6, for the corpus of AERAs, 6 different "moves" and 21 "steps/submoves" are realized. Examples for each category were given later in Results section.

Table 6

*Model of Move Structure for AERAs used in the present study*

| |
|---|
| Move 1: Establishing a topic |
| Step 1: Claiming centrality/importance of the topic |
| Step 2a: Reviewing items of previous research |
| Step 2b: Making claims based on the finding of the previous research |
| Step 2c: Limitations (in other studies' methodology/of the area) |
| Step 3: Background information about the topic |
| Move 2: Preparing for the present study |
| Step 1: Indicating a gap/raising a question |
| Step 2: Suggesting a different solution/study |
| Step 3: Stating the value of the present research |
| Step 4: Making assumptions about the study |
| Move 3: Describing procedures of the study |
| Step 1: Listing procedures |
| Step 2: Detailing procedures (by graphs/figures and equations) |
| Step 3: Describing procedures through other studies |
| Step 4: Justifying methodological issues (Suggesting a different procedure, Underlying reasons of a procedure) |
| Move 4: Describing materials |
| Step 1: Listing materials by detailing (the amount/features of the materials) |
| Step 2: Providing the background of the materials |
| Step 3: Justifying materials |
| Move 5: Announcing results |
| Step 1: Reporting results |

Step 2: Detailing results by graphs/figures and equations

Step 3: Validating/invalidating results

Move 6: Evaluating results

Step 1: Explaining results

Step 2: Generalizing/interpreting results

Step 3: Stating limitations

Step 4: Suggesting further research

***Move 1: Establishing a topic.*** This move is adapted from Swales' (2004) revised CARS model due to appropriateness, as Kanoksilapatham's "Move 1: Announcing the importance of the field" was not general enough to cover AERAs. This move, also, is the gate of the research article and it provides a general view about the study. Move 1 is composed of three steps: *Move 1 Step 1 "claiming centrality/importance of the topic", Move 1 Step 2a "reviewing items of previous research", Move 1 Step 2b "making claims based on the finding of the previous research", Move 1 Step 2c "limitations"* (in other studies' methodology/of the area) and *Move 1 Step 3 "background information about the topic".*

Move 1 Step 1 aims at attracting the attention of both the reader and the publishers. This Step shows that the study is worth investigating for the researcher and worth reading and publishing by the third parties (publishers and academicians). Move 1 Step 2 is the same as Swales' (1990) Move 1 Step 3 "reviewing items of previous research", yet with a slight difference. The current study needed to divide this move to 3 "sub-steps" as is named above. All the sub-steps are about reviewing the literature but they all have different communicative functions. While these sub-steps review the literature, they make deductions and demonstrate the restrictions which may be helpful to the current study. And Move 1 Step 3 is the backbone of this move as it informs about the established knowledge on the topic. Questions such as

how this topic has emerged, who has studied on this topic, what kind of changes has happened from the beginning of this study, are the key points of this step.

***Move 2: Preparing for the present study.*** Move 2 plays the role of bridge between the topic and the study. While Swales (1990) suggest only one step and that emphasize the need to the current study, Kanoksilapatham (2005) doesn't need any step. In this study the researcher and the coder agreed upon 4 different steps which facilitate the bridging process: *Move 2 Step 1 "indicating a gap/raising a question", Move 2 Step 2 "suggesting a different solution/study", Move 2 Step 3 "stating the value of the present research",* and *Move 2 Step 4 "making assumptions about the study".*

Move 2 Step 1, after reviewing the related literature in Move 1 , makes deductions and indicates a gap in the field or raises a question that have never studied by the other academicians. Move 2 Step 2 realizes itself on a topic by offering a new solution. These solutions are done for the purpose of finding better results or improvements in the current situation. Move 2 Step 3 indicates the contribution and the value of the present study. For the last part, Move 2 Step 4 informs the readers of the study that what the possible results and implications would be. Overall, the focus of this move is not the details of the study but the general boundaries of it.

***Move 3: Describing procedures of the study.*** This move goes deep into the research by listing and explaining the phases of the experiment or processes. Swales' (2004) revised model briefly mentions about such sentences; however, Kanoksilapatham (2005) gives room to these procedures as a separate move. In the present study, Move 3 is identified in 4 steps: *Move 3 Step 1 "listing procedures", Move 3 Step 2 "detailing procedures", Move 3 Step 3 "describing procedures through other studies",* and *Move 3 Step 4 "justifying methodological issues".*

Move 3 Step 1, without any detail or comment, states the ongoing procedures and draws a clear picture of the study. However, Move 3 Step 2, as its name suggests, gives details and due to the nature of the field details are observed in the form of graphs, figures and/or equations. Move 3 Step 3 is used to keep the procedures short by just referring to the other studies. Move 3 Step 4 helps the article writer evaluate himself such as suggesting different procedure or underlying reasons of employing particular method.

Working on full-length articles necessitates this move as it eases the replication of the study.

***Move 4: Describing materials.*** Move 4 is employed due to the aforementioned reasons. Additionally, the foci of some journals (i.e. *Composite Materials*) are directly related to type of materials used in the research studies. This move occurs in 3 Steps: *Move 4 Step 1 "listing materials by detailing"*, *Move 4 Step 2 "providing the background of the materials",* and *Move 4 Step 3 "justifying materials"*.

Move 4 Step 1 briefs the reader about the amount, the shape, the color, and the special features of the materials used in the study. Investigation of the corpus showed that some articles have mentioned about how the researcher obtained the materials. Move 4 Step 2 fulfills this aim and enlightens the reader about the source or supplier of the material. Move 4 Step 3 argues whether the materials or amount of the materials are appropriate or not for the study. This step may include suggestions to use different materials, too.

***Move 5: Announcing the results.*** This part includes the results obtained through the study without any comments or interpretations. Move 5 has great importance that whether the results are worth spreading to the field depends on this part. Move 5 observed in 3 Steps: *Move 5 Step 1 "reporting results", Move 5 Step 2 "detailing results",* and *Move 5 Step 3 "validating/invalidating results"*.

Aerospace Engineering field has both experiments and production (i.e. analysis and production of durable wings for the high pressures) so; Move 5 Step 1 includes the outcomes of these calculations or the production process. Whereas Move 5 Step 2 goes one step forward and expands the outcomes with more visuals such as graphs, figures and equations. This helps the article writers to clearly explain what has happened. Move 5 Step 3 states whether the results meet the expected outcomes or not. Both, meeting the expectation or not, may have a contribution to the field.

***Move 6: Evaluating result.*** The last move, Move 6, is interwoven with the previous move besides it is the last touch to the study by the elaborations and the crucial comments of the researcher. It is composed of 4 Steps: *Move 6 Step 1 "explaining results"*, *Move 6 Step 2 "generalizing/interpreting result*s*"*, *Move 6 Step 3 "stating limitations"*, and *Move 6 Step 4 "suggesting further research"*.

As results alone may not be meaningful to the reader, Move 6 Step 1 uses what has found in the study and makes clarifications to the readers of the article. Move 6 Step 2 is of great importance as the value of a study is mostly determined with its generalizability. The writer makes generalizations and interpretations with this move and step. Move 6 Step 3 includes all kinds of limitations from materials to time, from experiments to lack of support. This step also helps the researcher to move softly to the next step. Move 6 Step 4 urges the researcher or other researchers to study another topic or the same topic but with different materials, formulas, or procedures. Kanoksilapatham (2005) labeled this step as a "separate move" in her article and according to that study it is considered to be optional. However, low occurrence rate of this step should not mislead us that it should be optional since it is the nature of this step. It means, such suggestions are done through only one sentence in AERAs. So, bearing these in mind, the present study put "suggesting further study" as a step under Move 6 and it is admitted to be a conventional step.

The following chapter, Chapter IV reports the findings of the present study. Basically, occurrence rates of the each move and step in each article and in the whole data are presented and a discussion part follows the findings for each move.

# CHAPTER III

## RESULTS AND DISCUSSION

The AERAs were coded in terms of their structures and it has been clearly observed that articles in the corpus is systematic in terms of their sections, such as introduction, literature review, experimental procedures, methods, conclusion, results, and discussion.

The moves realized in this study match up with Kanoksilapatham's (2005) to some extent, yet, the number of occurrence of the moves led the researcher to convert some of the moves into steps and put them under some "quasi-obligatory" moves (Swales, 1990).

Contrary to biochemistry articles, in aerospace article, writers don't intend to "restate" methodological issues which show that they are refraining from too much wording. This feature is also observed for the rest of the study; especially Move 13 of Kanoksilapatham (2005) called "consolidating results" couldn't find space for itself in the current corpus.

It seemed that the eight articles, which were published in high quality core journals, follow a standard pattern; however, this study didn't explore the moves in a certain section. Thus, in Appendix D the borders of these IMRD parts were demonstrated. As each sentence was coded independently, it was possible to report the number and percentages of the sentences per move in the AERAs, which are visualized in Table 7.

Additionally, Appendix E presents a detailed table showing the number of sentences along with their percentage in the data for each move and step in each article and the whole corpus. The results with sample sentences from the corpus are examined below.

Table 7

*Number of Sentences per Move in the whole Corpus of Sentences*

| **Moves** | **Number of Sentences per Move** | **Percentages (%)** |
|---|---|---|
| Move 1: Establishing a topic | 132 | 11.98 |
| Move 2: Preparing for the present study | 52 | 4.72 |
| Move 3: Describing procedures of the study | 328 | 29.76 |
| Move 4: Describing materials | 94 | 8.53 |
| Move 5: Announcing results | 256 | 23.23 |
| Move 6: Evaluating results | 240 | 21.78 |
| **Total Sentences** | 1102 | 100 |

### 3.1. Move 1 Establishing the Topic

*Move 1: Establishing the topic* is observed in all articles, additionally it is occurred in 132 sentences and it constituted 11.98% of the whole corpus. Move 1 obtained the forth place in terms of occurrence rate. Move 1 is congruent with the findings in both Kanoksilapatham's (2005) and Swales' (1990) studies.

Being observed in all articles indicates that AERAs give importance to contextualizing the study and Move 1 has a role of convincing the readers that the study is worth reading and publishing.

Move 1 fulfilled its function of informing the reader and providing a general view about the topic of the study under 3 different steps.

*Move 1 Step 1: Claiming centrality/importance of the topic* basically indicated the value of the study. This step is observed in 7 out of 8 articles and in 11 sentences corresponding 1% of the corpus of sentences. Being identified almost in all articles makes it a

conventional step. Only the second article did not include this step, and when examined, it was understood that the second article directly started to mention about the related literature.

**Ex.1** *The wide range of applications of CNT based composites includes aerospace structures, sporting goods, automotive components, optical barriers, conducting plastics, electro-magnetic interference shielding, composite mirrors, plastics with high thermal dissipation, biomaterial devices, and nanosensors.* **(Composite Structures 3-Sentence 3)**

*Move 1 Step 2:* Only in one article in the corpus Move 1 Step 2 is not observed; however, the other articles had one of 3 different variations of Move 1 Step 2 and they are listed below.

*Move 1 Step 2a: Reviewing items of previous research* simply mentioned about the previous studies of which interests were the same with the current study. Move 1 Step 2a is observed in 6 articles corresponding 75% of the corpus included this step and it makes above the cut-off point of 60%. On the hand when we consider the sentence numbers, it was observed only in 22 sentences with 2% occurrence rate in the whole corpus. Reviewing the related literature in AERAs may have two reasons: First, the article writer tries to explain the rationale of his/her own study. Second, the reviewing committee of the journals may have such expectations that novice academicians are at the beginning of their academic career and they had better to mention about the more experienced academicians

**Ex.2** *Olsson attributes the initial matrix cracking due to high local contact stresses, which initiate at relatively low - loads.* **(CS1-S24)**

*Move 1 Step 2b: Making claims based on the finding of the previous research* is observed in 6 articles and in 17 sentences equal to 1.54% of the whole corpus. This step directly asserted a benefit of the previous study; this is to say that the present article will go

one step further from what has been obtained and it gives the message that it has a value in the field.

**Ex.3** *Compared to PECVD the latter, being an emerging technology in silicon photovoltaics [8, 9], comprises two main advantages, i.e. high deposition rates and the absence of toxic process gases.* **(MSE3-S11)**

*Move 1 Step 2c: Limitations (in other studies' methodology/of the area)* are argued while reviewing the literature and it is seen in the area of the research and in the methodology parts of the researches. Move 1 Step 2c is observed only in 4 out of 8 articles or 50% of the articles and in 9 sentences out of 1102 or 0.82%. This sub-step is labeled as an optional sub-step due to 60% cut-off rate. The scant observance might have resulted from its closeness to Move 2 Step 1 "indicating a gap". As can be concluded, AERAs do not have a tendency to mention the limitations of other researchers; instead AERA writers focus on their own studies.

**Ex.4** *One of the most restrictive assumptions in Pode's analysis is that of a uniform velocity field.* **(AST-S39)**

*Move 1 Step 3: Background information about the topic* is used to construct a basis for the study and to make way to the current study.

Move 1 Step 3 is observed in all articles without any exception also its occurrence rate is 6.62% in the whole corpus of sentences; therefore, it is a conventional move

This step was also presented in Eveyik-Aydın's (2014) study and she found that applied linguistic research articles used this step very frequently. Move 1 Step 3 had dominance on the other steps in the present study, too. Being the most frequently occurred step in Move 1 suggests that in this area, understanding the current study depends on readers' knowledge on the subject. Background information as a part of literature review helps the

reader to get the picture just before the study and raise the awareness of the readers; and thus, it is used so much.

**Ex.5** *There has also been significant research into the use of such systems in fiber reinforced polymers (FRP) [8–15]*. **(CASM-S12)**

### 3.2. Move 2: Preparing for the Present Study

*Move 2: Preparing for the present study* aimed at familiarizing the reader or the publisher to the study by making assumptions about the study or indicating weaknesses in the field. Move 2 was the least frequently occurring move in terms of number of sentences (in 52 sentences out of 1102 with an occurrence rate of 4.72% in the whole corpus of sentences) in the corpus. The overall number of the Move 2 identified led us to interpret that; Aerospace Engineering academicians have a tendency to pass this "warming" stage swiftly so do the publishers. Additionally, it is an indicator that the Aerospace Engineering field in favor of narrate the study directly. Furthermore, the domination of the "result" and the "procedure" section resulted in the scarcity of this move.

Move 2, as can be seen in Appendix D, lied in between Move 1 and 3 and gave the researcher a glimpse of transition move. It was realized under four categories:

*Move 2 Step 1: Indicating a gap/raising a question* is identified in 4 articles and had an occurrence rate of 0.64% or 7 sentences out of 1102 in the whole corpus of sentences. This step fell below the 60% occurrence rate so that it is labeled as optional step.

This step is congruent with Kanoksilapatham's (2005). This move has a role to divert the readers from a general topic to a more specific (here the current study) point by means of raising a question, making assumptions, or specifying the importance of the topic.

What can be interpreted from the occurrence rate that some writers are trying to contribute to the field while some mention about the gaps, and some do not.

**Ex.6** *There is a limited number of studies available in the literature that investigate the combined effect of all these experimentally observed factors on the elastic properties of CNT composites mainly using stochastic approaches [27].* **(CS3-S19)**

*Move 2 Step 2: Suggesting a different solution/study* is observed in 5 articles and considered to be a conventional step; and in 8 sentences out of 1102 or 0.73% of the corpus, which is very close to the previous step.

AERAs writers have a tendency to keep the articles short and to the point so in the first move they've already established the topic and they don't need such transition phases. They are directly starting experiments or calculations.

**Ex.7** *Short of employing an extensive computational fluid dynamic analysis, the incorporation of the effect of a steady two-dimensional flow field which may vary with vertical position may be accomplished with a step-wise change of velocity magnitude with height (discussed below).* **(AST-S12)**

*Move 2 Step 3: Stating the value of the present research*, contrary to other steps of this move, is mostly realized. In the whole corpus of sentences, it was observed in 23 sentences and 6 articles with an occurrence rate of 75%.

As one of the aims of an article writer is to show the difference of his/her paper so that it is more likely to be published or read by many, this step is preferred more than the other steps in this move

**Ex.8** *…the use of a premixed healing resin and elevated temperature after a damage event was an attempt to make the Cycom 823 more suitable as a healing resin and attempt to demonstrate the highest level of healing efficiency possible with this system.* **(CASM-S61)**

*Move 2 Step 4: Making assumptions about the study,* is identified in 5 articles or 62.5% and had an occurrence rate of 1.27% in the whole corpus of sentences. So, this step is also considered to be conventional.

AERAs showed a distinct feature that, as is seen in this step, the writers of this field has a judgment about what they are doing and their assumptions will be validated or not at the end of their work.

**Ex.9** *The honeycomb cell can, in this sense, amplify the local strain experienced by an insert.* **(CS2-S30)**

### 3.3. Move 3 Describing Procedures of the Study

*Move 3: Describing procedures of the study* is realized in all articles without any exception. With the sentence number of 328 it took the highest rating in the corpus. In an 1102 sentence corpus of sentences, it occurred 29.76% of the time, which makes nearly one third of the corpus. It is also labeled as conventional move.

Kanoksilapatham's (2005) argued that the methods section of the biochemistry research articles contrary to other disciplines, are well established. Similarly, Move 3, in the present study is the equivalent of the Kanoksilapatham's (2005) Move 5 (describing experimental procedures).

To better understand, the dominance of this move is demonstrated with blue color in Appendix D. In an applied field, such as AERAs, article writers are cautious about being clear enough to make their procedures seem reasonable. For instance, if the writer is working on a composite material to be used in an aircraft, he/she needs to visualize each step of the experiment carefully to prevent any change in the results when it is replicated by others. Another reason should be the effect of reviewers and publishers; field experts expect detailed

description of the procedures in order to be satisfied by the results (in a personal interview with a field expert).

Move 3 is realized in 4 different steps;

*Move 3 Step 1: Listing procedures* figured out the phases that how the results obtained. This step is observed in all articles. Moreover, it is the most widely used step by 15.25%, which constituted 168 sentences, in the whole corpus of sentences. Its occurrence rate is 100% of the corpus.

It can be interpreted from this picture that AERAs give high importance to the procedures due to the complexity of the experiments. And, any fuzzy point can convert the direction of the outputs for the reproduction of the similar studies. Furthermore, another reason may be, as is discussed above, the field is well established and the scientists are acquainted with the procedures.

**Ex.10** *Finally, the samples were cut into pieces with sizes from of 2.5 cm × 2.5 cm to 5 cm × 5 cm.* **(MSE3-S24)**

*Move 3 Step 2: Detailing procedures (by graphs/figures and equations)* is realized in all articles and considered to be conventional. The number of the sentences employing this step is 119 with 10.80% percent occurrence rate.

This step also is a consequence of the field itself, which means sometimes graphs/figures and equations may be better in conveying the meaning. Moreover, without such instruments writers would be lost in the explanations.

**Ex.11** *However, it must be noted that the bending-only deformation of the ribs described in [2] can be considered a valid assumption for slender cell walls and for internal angles h not approaching 0 at which point beam stretching dominates behavior [24].* **(CS2-S34)**

*Move 3 Step 3: Describing procedures through other studies* is only observed in 16 sentences out of 1102. Three of the eight articles did not give room to this step at all and with an occurrence rate of 62.5% it is considered to be a conventional step.

Directing the readers to the procedures of another study is not common in AERAs; the one who employed such strategies did this just for some parts of the whole procedure. When investigated, it is due to practical reasons that the writers referenced to others' methodology.

**Ex.12** *The detailed synthesis of the fluorinated polybenzoxazoles has been described elsewhere [6]*. **(MSE1-S20)**

*Move 3 Step 4: Justifying methodological issues (Suggesting a different procedure, underlying reasons of a procedure)* is observed in 7 articles or 87.5% of the corpus and in 25 sentences in the whole corpus of sentences.

This step is handled as a separate Move in Kanoksilapatham's (2005) study. However, due to its low frequency in the present corpus of AERAs and its being a part of procedures justification of the methodology is considered to be a step instead of a move in this study. In her article Kanoksilapatham (2005) argued the uniqueness of the justification of methodology and she added that biochemistry articles differ from other disciplines. Then, it can be argued that similar to the biochemistry corpus AERAs also differ from other disciplines. For instance, this field conducts experiments ant they are all concrete however, social sciences relies on human factor that manipulate the result of a study.

**Ex.13** *However, for the purposes of this study, the energy lost due to projectile deformation and thermal effects were neglected due to the small values associated with such energy losses as compared to the initial kinetic energy of the projectile.* **(CS1-S52)**

### 3.4. Move 4 Describing Materials

*Move 4: Describing materials* is realized in all articles and that makes it a conventional move. Additionally, it is observed in 94 sentences occupying a small portion of the whole corpus of sentences. Therefore; it takes the second place in terms of scarcity after Move 2 yet it is coded in the 8.53% percent of the corpus. It, still, considered as a conventional move.

Contrary to biochemistry articles (Kanoksilapatham, 2005) AERAs allocate less space for the description of materials and it should be due to types of experiments whose materials are already familiar to the researchers. As discussed above, some of the articles included only numerical analyses. Still, all the articles included this move so we need another explanation that why the occurrence numbers are low. That is: AERAs do not have very long sections for materials probably because writers are keeping their description of materials short and clear.

Emerging steps are shown below:

*Move 4 Step 1: Listing materials by detailing the amount/features of the materials* is identified in all articles thus labeled as conventional. It is realized in 50 sentences or 4.54% of the corpus in total. Very similar to what is discussed in the procedure part, providing the amount and features strengthens the article and its reliability.

**Ex.14** *The specifications of the CNTs as provided by the supplier are: outer diameter (OD) 20–30 nm, inner diameter (ID) 5–10 nm, length 10–30 lm, purity >95 wt.%, and ash <1.5 wt.%.* **(CS3-S25)**

*Move 4 Step 2: Providing the background of the materials* is not observed in all articles. Only 5 of the articles give room to this move and it is just above the cut-off point by 62.5%. The sentences that include Move 4 Step 2 is limited to 22 out of 1102 which means it is not a frequent.

The Move 4 Step 2 in the present study is slightly different from the one used in Kanoksilapatham (2005). While she meant *descriptions* by the word "background," in this study it referred to the "source" of the material. The background of a material seems not to be necessary information in some articles.

**Ex.15** *The epoxy used for this study was purchased from Eastpointe Fiberglass Sales, Inc., with the resin part number F - 82 and the hardener TP - 41.* **(CS1-S41)**

*Move 4 Step 3: Justifying materials* is seen in only 5 articles or 62.5% of the corpus and 22 sentences corresponding 2% of the corpus are coded as Move 4 Step 3.

Justification of materials as is seen in procedures is favorable in the field. It can be interpreted that the writers do not want to mention any justification parts in their study and this may explain the scant use of this step. As a result of coding process, "justifying materials" is considered to be a step instead of a move (Kanoksilapatham, 2005).

**Ex.16** *As readily be noticed, samples with thicker foam-filled cores and face-sheets on multiple sides provide the best resistance to impact.* **(CS1-S69)**

As is seen above and in the literature, if there is an experiment, it is unavoidable not to mention about the materials.

### 3.5. Move 5 Announcing Results

*Move 5: Announcing results* is a conventional step that it is identified in 8 articles out of 8 and occupied 256 sentences in the corpus equal to 23.23% of the whole corpus of sentences. With these numbers it took the second place in terms of occurrence. This move mainly reports the results, sometimes by giving details and sometimes by comparing with other studies but in each case without commenting on them.

The function of Move 5 is to harvest the bounty of experiments, procedures and labor intensive studies.

This move came into existence in 3 steps:

*Move 5 Step 1: Reporting results* is identified in all articles and labeled as conventional step. Move 5 Step 1 is realized in 99 sentences or 8.9% of the corpus. This step is the natural outcome of the research process.

By nature, in a research report, AERA writers report what they found at the end of their experiments, production phases, calculations, and other analyses.

**Ex.17** *Laminates with resin filled HGF at two different fibre spacings (70 lm and 200 lm) were shown to provide recovery in flexural strength due to self-healing.* **(CASM-S121)**

*Move 5 Step 2: Detailing results by graphs/figures and equations*, as in the previous step, are realized in all articles. It is observed in 138 sentences out of 1102 or 12.52% of the corpus. This step includes explanations through figures and graphs which are considered to be conventional. While Kanoksilapatham (2005) mentioned two different steps; substantiating results and invalidating results, he did not refer anything about graphs or figures.

AERAs (present corpus) are dealing with the production and experimentation stage and these steps are visualized to affect and ease the perception of the readers. In addition to this, the instruments such as graphs, formulas, and tables presented in this step are the sine qua non of engineering field.

**Ex.18** *As can be seen in Fig.8 the honeycombs with internal angles close to 0 achieve the highest maximum ligament strains, with a discontinuity around h = 0 because the deformation of the oblique ribs (l) becomes predominantly axial rather than flexural.* **(CS2-S103)**

*Move 5 Step 3: Validating/invalidating results* are the least occurred step within Move 5 but still named as conventional as it is observed in 6 articles or 75% of the corpus. Being identified in 19 sentences out of 1102 made it the least occurred step in this study.

The writers had a tendency to talk of assumptions that they mentioned in the previous parts of their studies. According to the investigation, this step is identified in the form of validating which is an indicator of writers' crosschecking whether the results meet the expectations or not.

**Ex.19** *As would be expected, the energy absorption capabilities of the laminate alone do not approach that of the sandwich as a whole.* **(CS1-S96)**

### 3.6. Move 6 Evaluating Results

*Move 6: Evaluating results is also observed in all articles and labeled as conventional.* Move 6 got the third place in terms of frequency of occurrence. Move 6 is coded in 240 sentences out of 1102 or 21.78% of the corpus. Expanding study's result and establishing the meaning is realized through this move.

In the present study Move 6 included explanations, evaluations, generalizations, limitations, and suggestions for further studies. However, Kanoksilapatham (2005) handled similar points in 5 different moves and 12 steps. Such a difference can directly be related to the different expectations in different fields.

*Move 6 Step 1: Explaining results* is realized in all articles, and it occurred in 88 sentences or 7.9% of the corpus. Although the writer presented the results in the previous move and steps, he/she needs to clarify and evaluate them for the readers. Leaving the results without any comment prevents the writers building bridges between the wider communities.

**Ex.20** *The spikes in the current, seen in some of the I–V traces, are due to 'clearing' or 'self healing' events occurring in the M–I–M (Metal–Insulator–Metal) device prior to complete electrical breakdown.* **(MS1-S97)**

*Move 6 Step 2: Generalizing/interpreting results* is also observed in all articles thus named as conventional. It occurred in 106 sentences out of 1102 sentences.

By this step, one can understand that the article is in its peak and coming closer to the end. The writers are trying to generalize their findings so that it affects the uniqueness of the article.

**Ex.21** *Incorporating cable dynamics into such a simulation opens the door for various types of high-interest analyses such as rotorcraft fast-rope and air refueling drogue models.* **(AST-S82)**

*Move 6 Step 3: Stating limitations* is realized in all articles and in 40 sentences out of 1102. Occurrence rate of 3.63% is realized by this step. As its name expresses, the shortcomings of the study are the focus of this move.

It is very interesting that no writer avoided expressing limitations. The writers seem to extensively share the obstacles and restrictions in their studies so that the readers and evaluators can judge the article confidently. It may also reflect the honesty of the writers (Kanoksilapatham, 2005)

**Ex.22** *While there was excellent agreement in tension between the proposed method, Pode's solution, and the polygonal method, it can be seen that the polygonal method (which begins at the balloon and proceeds downward) tends to "overshoot" unless a very large number of elements is employed.* **(AST-S64)**

*Move 6 Step 4: Suggesting further research* is occurred only in 5 articles out of 8 or 62.5% of the corpus, just above the cut-off point. In other words, this step is identified in only 6 sentences out of 1102.

One reason that may explain the fewness of this step is; writers have a tendency to keep the ongoing questions about the study themselves so that they can carry out follow on researches (Berkentokker and Huckin, 1995).

**Ex.23** *Capacitance measured over a complete heating (RU) and cooling cycle (RD) at the frequency of interest for power conditioning capacitor applications (10 kHz) shows a slight hysteresis effect (Fig.4(a))and it will be of interest, in the future, to further examine the film dielectric properties as a function of repeated thermal cycling.* **(MS1-S70)**

When it comes to the cyclicity of the moves, as is seen in Appendix D, it doesn't necessarily follow a regular and strict pattern as discussed in the literature (Kanoksilapatham, 2005; Swales, 2004; Postguillo, 1999). Nevertheless, entire corpus especially "announcing results" and "evaluating results" demonstrate a very clear cyclical pattern and cooperation within themselves. Overall occurrence order of the moves is realized as M1-M2-M3-M4-M5-M6 in general yet (as is seen in Appendix D) not linear and all the moves are interwoven through the articles.

In general, Move 1 and Move 2 were realized in the *Introduction* part of the articles, however, there are some exemptions such as examples 24 and 25. They are expected to be realized in the Introduction section but as is seen they are observed in the discussion section. The basic purpose of the writers is to remind the readers, the value and the procedures of the study.

**EX.24** *The proposed model … can be used to guide the manufacturing of composites with engineered properties for targeted applications.* **(Move 2 Step 3) (Discussion Section) (CS3-S167)**

**EX.25** *Rapid thermal processing was done using a conventional RTA oven, a dual wavelength laser setup and a movable two sided halogen lamp oven commonly used for ZMR experiments.* **(Move 3 Step 1) (Discussion Section) (MSE3-S162)**

Example 26 shows another distinct feature that although it is supposed to be seen in the discussion section it is observed in the introduction part.

**EX.26** *However, adding foam into honeycomb structures significantly increases the density of the sandwich panel, even if foams themselves exhibit relatively good density specific properties*. **(Move 6 Step 6) (Introduction Section) (CS2-S10)**

All in all, Move 3 is emerged all over the sections (see Appendix D).

# CHAPTER IV

# CONCLUSION

The aim of the present study was to determine the textual organization of Aerospace Engineering Research Articles, in order to assist the academicians write and read articles more effectively; and assist material developers who are designing materials for ESP/EAP writing.

This paper shows distinctive feature as its focuses on both moves and steps within each move. The study clearly showed that AERAs have many common features in terms of moves and steps that were observed in earlier move studies. Still, field specific genre affected the move structures in AERAs; therefore, a new coding schema was designed and the sentences were coded accordingly.

Aerospace Engineering research articles have a consistent move structure and in order to visualize this consistent move pattern each sentence was colored in accordance with their moves and presented in Appendix D. Overall occurrence order of the moves is realized as M1-M2-M3-M4-M5-M6 in general yet not linear and all the moves are interwoven through the articles and these exemptions that break the consistency of the move pattern were negligible.

The present study proposed six different move and twenty-one steps within those moves. All the moves were considered to be conventional and only two of the steps fell below the 60% cut-off point and labeled as optional. The moves did not follow a regular and strict cycling pattern as discussed in the literature (Kanoksilapatham, 2005; Swales, 2004; Postguillo, 1999). Nevertheless, entire corpus especially “announcing results” and “evaluating results” demonstrate a very clear cyclical pattern and cooperation within themselves.

The study contributed to both Aerospace Engineering and EAP by proposing a model and deeply investigating the textual organization of the AERAs. The proposed schema also meets the expectations of the writers and readers of research articles

### 4.1. Implications

Basic implications that can be derived from the study are the teaching of EAP/ESP for the candidate academicians not only to have a better understanding of their field but also to be confident enough to send their papers to distinguished international journals written in English.

To emphasize once more, EAP/ESP instructors, who especially work at the Turkish Air Force Academy, Aeronautical and Space Technologies Institute in Turkey, and other instructors who work in aerospace/aeronautics engineering departments of their universities, can get benefit from the outcomes of this study. First, they can guide the novice move-researchers to understand the rhetorical structures of the articles. Second, they can help native/non-native EAP/ESP students better understand the texts in terms of organizational structures of the articles as the schematic structure proposed by this study will ease the writing process. Moreover, academicians can feel more comfortable when they send their papers to an international journal to be published.

### 4.2. Limitations and Directions for Future Research

The rhetorical structure scheme, that is proposed after analyzing the corpus, can be applied to the full-length articles written in IMRD/C but this study is still pretty limited for such a huge field so further research should be carried through a wide variety of the articles covering the field. When compared with the social sciences (Eveyik-Aydın, 2014), linguist

who are willing to work on different fields, should consider the assistance of the field experts due to the unfamiliarity of the terminology.

The findings also may guide both material developers and future move analysis studies in different disciplines.

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# APPENDICES

## Appendix A

## The Corpus

**(Article 1) (CS1)** Christopherson J., Mahinfalah M., Jazar G. N., Rastgaar Aagaah M., "An Investigation on the Effect of a Small Mass Impact on Sandwich Composite Plates", Composite Structures, 67(3), 299 – 306, 2005.

**(Article 2) (CS2)** Boucher M-A, Smith CW, Scarpa F, Rajasekaran R, Evans KE. (2013) Effective topologies for vibration damping inserts in honeycomb structures, Composite Structures, volume 106, pages 1-14.

**(Article 3) (CS3)** Md A Bhuiyan, Raghuram V Pucha, Johnny Worthy; Mehdi Karevan, Kyriaki Kalaitzidou, "Defining the lower and upper limit of the effective modulus of CNT/polypropylene composites through integration of modeling and experiments", Composite Structures, vol 95, pp 80-87, 2013.

**(Article 4) (MSE1)** Narayanan Venkat, Thuy D. Dang, Zongwu Bai, Victor K. McNier, Jennifer N. DeCerbo, Bang-Hung Tsao, Jeffery T. Stricker, "High temperature polymer film dielectrics for aerospace power conditioning capacitor applications" Materials Science and Engineering: B, Volume 168, Issues 1–3, 15 April 2010, Pages 16-21.

**(Article 5) (MSE2)** Steve Reynolds, Rudi Brüggemann, Björn Grootoonk, Vlad Smirnov, Transient photocurrents as a spatially resolved probe of carrier transport and defect distributions in silicon thin films, Materials Science and Engineering: B, Volume 178, Issue 9, 15 May 2013, Pages 568-573.

**(Article 6) (MSE3)** S. Steffens, C. Becker, J.H. Zollondz, A. Chowdhury, A. Slaoui, S. Lindekugel, U. Schubert, R. Evans, B. Rech. Defect annealing processes for polycrystalline silicon thin-film solar cells. Material Science and Engineering B 178, 670 (2013).

**(Article 7) (CASM)** G. Williams, R. Trask, I. Bond, A self-healing carbon fibre reinforced polymer for aerospace applications, Composites Part A: Applied Science and Manufacturing, Volume 38, Issue 6, June 2007, Pages 1525-1532.

**(Article 8) (AST)** Michael R. Maixner, David R. McDaniel, Preliminary calculations for a flexible cable in steady, non-uniform flow, Aerospace Science and Technology, Volume 18, Issue 1, April–May 2012, Pages 1-7.

## Appendix B

## The Detailed Bibliographical Data of the Journals and the Articles

| No | Article | Journal | Impact Factor (2012) | Publication Year | Number of Sentences | Number of Words |
|---|---|---|---|---|---|---|
| **1** | An investigation on the effect of a small mass impact on sandwich composite plates | Composite Structures | 2.231 | 2005 | 133 | 3736 |
| **2** | Effective topologies for vibration damping inserts in honeycomb structures | Composite Structures | 2.231 | 2013 | 184 | 5233 |
| **3** | Defining the lower and upper limit of the effective modulus of CNT polypropylene composites through integration of modeling and experiments | Composite Structures | 2.231 | 2013 | 172 | 4504 |
| **4** | High temperature polymer film dielectrics for aerospace power conditioning capacitor applications | Materials Science and Engineering B | 1.846 | 2010 | 104 | 2722 |
| **5** | Transient photocurrents as a spatially resolved probe of carrier transport and defect distributions in silicon thin films | Materials Science and Engineering B | 1.846 | 2013 | 129 | 3487 |
| **6** | Defect annealing processes for polycrystalline silicon thin-film solar cells | Materials Science and Engineering B | 1.846 | 2013 | 168 | 4116 |
| **7** | A self-healing carbon fiber reinforced polymer for aerospace applications | Composites Part A Applied Science and Manufacturing | 2.744 | 2007 | 130 | 3196 |
| **8** | Preliminary calculations for a flexible cable in steady, non-uniform flow | Aerospace Science and Technology | 0.873 | 2012 | 82 | 2457 |

## Appendix C

## The Descriptions of the Proposed Moves of Budsaba Kanoksilapatham

**Move 1: Announcing the importance of the field** asserts the importance of the topic of study.

Step 1: Claiming the centrality of the topic assures that the article developed on the topic is worth investigating and the field is well established.

Step 2: Making topic generalizations gives overviews about the subject of the study.

Step 3: Reviewing previous research reports previous research deemed to be relevant to the topic being discussed.

**Move 2: Preparing for the present study** draws scientist's attention to weakness in the existing literature and asserts that a particular research question requires an answer.

**Move 3: Introducing the present study** consists of three steps in biochemistry corpus.

Step 1: Stating purpose(s) is characterized by a statement of purpose(s) of the study or by an explicitly stated research question.

Step 2: Describing procedures focuses on the main features of the study being reported.

Step 3: Presenting findings announces the principal findings of the study.

**Move 4: Describing materials** covers a wide variety of materials used in biochemistry ranging from natural substances, human/animal organs or tissues, to chemicals (e.g., cell lines, antibodies, plasmids, enzymes, nucleotides, microsomes, membranes, serum, proteins, medium, strains, genes, transporons, DNAs).

Step 1: Listing materials explicitly itemizing materials or substances used in the study.

Step 2: Detailing the source of the materials identifying how these items are obtained, such as, by purchase, as a gift, etc.

Step 3: Providing the background of the materials including the description, properties, or characteristics of the materials.

**Move 5: Describing experimental procedures** indicates that biochemistry as a discipline is well established and its procedures, methods, and techniques are usually protocolized.

Step 1: Documenting established procedures recounts an experimental process that is already established by previous researchers. As a result of the standardization of experimental procedure, simple reference to the specific name of the method or procedure used to conduct research is adequate.

Step 2: Detailing procedures is used to provide detailed description of the procedures to enable future research replication.

Step 3: Providing the background of the procedures, providing justification for the choice of technique or procedure, and comments or observations made during the experiment.

**Move 6: Detailing equipment** provides detailed information regarding the setting of the apparatus used for a particular task in an experiment, the information crucial for future research replication.

**Move 7: Describing statistical procedures**

**Move 8: Stating procedures** explains why and how the data of the study have been produced.

Step 1: Describing aims and purposes states aim(s) or purpose(s) of the study.

Step 2: Stating research questions explicitly states research questions.

Step 3: Making hypotheses presents hypothetical statements.

Step 4: Listing procedures or methodological techniques details the procedures or methodological techniques employed in the data production.

**Move 9: Justifying procedures** or methodology provides the rationale for the scientist's decision to use particular experimental methods, procedures, or techniques.

**Move 10: Announcing results**

Step 1: Reporting results highlights the results obtained from the study.

Step 2: Substantiating results indicate the validity of the finding; the scientists are making an appeal to the scientific community that their results should be a part of the consensual knowledge of the field.

Step 3: Invalidating results highlight a difference between the result of the current study and that of previous studies, suggesting to the scientific community that the scientists are contributing something novel that might be worth further investigation.

**Move 11: Stating comments on the results** present the scientist's subjective comments, which are not absolutely established by the data; it occurs in 91% of the articles.

Step 1: Explaining the results.

Step 2: Making generalizations or interpretations of the results.

Step 3: Evaluating the current findings with those from previous studies or with regard to the hypotheses.

Step 4: Stating limitations.

Step 5: Summarizing.

**Move 12: Contextualizing the study**

Step 1: Describing established knowledge situates the study being reported in the interest of the discourse community.

Step 2: Presenting generalizations, claims, deductions, or research gaps allows the scientists to go beyond the results and place their work under the scrutiny of the discourse community.

**Move 13: Consolidating results** conventionally highlights the strengths of the study and defends their research successes.

Step 1: Restating methodology.

Step 2: Stating selected findings.

Step 3: Referring to previous literature.

Step 4: Explaining differences in findings.

Step 5: Making overt claims or generalizations.

Step 6: Exemplifying.

**Move 14: Stating limitations of the present study** makes explicit the scientist's views of the limitations of the study about the findings (Step 1), the methodology (Step 2), or the claims made (Step 3).

**Move 15: Suggesting further research** allows the scientists to advocate the need to offer recommendations for the course of future research by pinpointing particular research questions to be addressed or improvements in their research methodology.

## Appendix D

## Move Patterns based on each sentence in the Whole Corpus

| S/N | Article 1 | | Article 2 | | Article 3 | | Article 4 | | Article 5 | | Article 6 | | Article 7 | | Article 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M1S1 | Introduction | M1S3 | Introduction | M1S2B | Introduction | M2S1 | Introduction | M1S3 | Introduction | M1S1 | Introduction | M1S1 | Introduction | M1S1 | Introduction |
| 2 | M1S3 | | M1S3 | | M1S1 | | M1S3 | | M1S3 | | M1S3 | | M1S3 | | M1S2A | |
| 3 | M1S3 | | M1S3 | | M1S1 | | M1S1 | | M1S2A | | M1S3 | | M1S3 | | M1S2A | |
| 4 | M1S3 | | M1S3 | | M1S2C | | M1S3 | | M1S3 | | M1S3 | | M1S2B | | M1S2A | |
| 5 | M3S1 | | M1S3 | | M1S2C | | M1S3 | | M1S3 | | M1S3 | | M1S3 | | M2S1 | |
| 6 | M3S4 | | M2S3 | | M1S2C | | M1S3 | | M1S2B | | M5S1 | | M1S3 | | M1S3 | |
| 7 | M3S4 | | M2S3 | | M1S2C | | M1S3 | | M1S2A | | M1S3 | | M1S2B | | M1S3 | |
| 8 | M3S4 | | M3S1 | | M1S2C | | M1S3 | | M4S1 | | M1S3 | | M1S2A | | M1S3 | |
| 9 | M1S3 | | M3S1 | | M6S4 | | M1S3 | | M6S1 | | M2S3 | | M1S3 | | M1S3 | |
| 10 | M1S3 | | M6S3 | | M1S1 | | M1S3 | | M5S1 | | M1S2B | | M1S3 | | M1S3 | |
| 11 | M1S3 | | M3S4 | | M1S2A | | M6S4 | | M4S1 | | M1S2B | | M1S3 | | M1S2A | |
| 12 | M1S3 | | M1S2A | | M2S1 | | M1S3 | | M6S1 | | M1S3 | | M1S3 | | M2S2 | |
| 13 | M1S3 | | M1S3 | | M2S2 | | M1S1 | | M4S3 | | M4S1 | Methods | M1S2B | | M1S3 | |
| 14 | M5S1 | | M1S3 | | M2S1 | | M2S2 | | M1S1 | | M4S1 | | M1S2B | | M3S1 | |
| 15 | M5S1 | | M1S3 | | M2S2 | | M4S1 | | M3S1 | | M4S3 | | M1S2A | | M1S3 | |
| 16 | M5S1 | | M1S3 | | M1S3 | | M4S1 | | M2S4 | | M3S1 | | M1S4 | | M1S2B | |
| 17 | M5S1 | | M1S2A | | M1S3 | | M4S1 | | M2S4 | | M3S1 | | M1S2B | Methods | M2S3 | |
| 18 | M1S2A | | M1S3 | | M2S3 | | M4S1 | | M3S1 | | M3S1 | | M2S1 | | M3S3 | Methods |
| 19 | M1S2A | | M1S3 | | M2S1 | | M1S3 | | M3S4 | | M3S1 | | M2S2 | | M3S2 | |
| 20 | M1S2A | | M1S3 | | M2S1 | | M3S3 | Methods | M3S2 | Methods | M3S1 | | M1S3 | | M1S3 | |
| 21 | M1S2A | | M1S3 | | M3S1 | | M3S3 | | M4S1 | | M1S2C | | M1S3 | | M3S2 | |
| 22 | M1S2B | | M1S3 | | M2S3 | | M3S3 | | M4S1 | | M1S2C | | M2S2 | | M3S2 | |
| 23 | M1S2A | | M2S2 | | M4S1 | Methods | M3S3 | | M3S2 | | M3S1 | | M4S1 | | M3S2 | |
| 24 | M1S2A | | M2S3 | | M4S1 | | M3S3 | | M3S2 | | M3S1 | | M4S2 | | M3S2 | |

| S/N | Article 1 | | Article 2 | | Article 3 | | Article 4 | | Article 5 | | Article 6 | | Article 7 | | Article 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | M1S2C | Introduction | M3S1 | Methods | M4S1 | Methods | M3S1 | Methods | M3S2 | Methods | M3S1 | Methods | M4S2 | Methods | M3S2 | Methods |
| 26 | M1S2A | | M3S1 | | M4S2 | | M3S1 | | M3S2 | | M3S1 | | M3S1 | | M3S2 | |
| 27 | M1S2A | | M3S1 | | M4S2 | | M3S1 | | M3S2 | | M3S1 | | M5S1 | | M1S2B | |
| 28 | M1S1 | | M3S2 | | M4S2 | | M3S1 | | M3S2 | | M3S1 | | M3S1 | | M3S3 | |
| 29 | M1S3 | | M2S4 | | M4S2 | | M3S1 | | M3S2 | | M3S1 | | M3S1 | | M3S3 | |
| 30 | M1S3 | | M2S4 | | M4S2 | | M3S1 | | M3S2 | | M3S1 | | M3S1 | | M1S2A | |
| 31 | M1S3 | | M3S3 | | M4S2 | | M3S1 | | M3S2 | | M3S1 | | M3S1 | | M3S2 | |
| 32 | M3S1 | Methods | M3S3 | | M4S2 | | M3S1 | | M5S1 | | M3S1 | | M3S1 | | M3S2 | |
| 33 | M3S4 | | M3S3 | | M4S2 | | M3S2 | | M3S2 | | M4S1 | | M1S2A | | M3S2 | |
| 34 | M3S4 | | M3S2 | | M4S1 | | M3S2 | | M3S1 | | M3S1 | | M3S1 | | M3S2 | |
| 35 | M3S2 | | M3S2 | | M4S1 | | M3S2 | | M3S2 | | M3S1 | | M4S3 | | M3S2 | |
| 36 | M4S1 | | M3S2 | | M4S1 | | M3S2 | | M3S1 | | M3S1 | | M4S3 | | M3S2 | |
| 37 | M4S1 | | M3S2 | | M3S2 | | M3S2 | | M3S2 | | M3S1 | | M4S3 | | M3S3 | |
| 38 | M4S1 | | M3S2 | | M4S1 | | M3S2 | | M3S2 | | M3S1 | | M4S3 | | M1S2B | |
| 39 | M4S1 | | M3S2 | | M4S2 | | M5S1 | | M5S1 | | M3S1 | | M3S2 | | M1S2C | |
| 40 | M4S1 | | M3S2 | | M4S2 | | M3S1 | | M3S1 | | M3S1 | | M6S1 | | M1S2B | |
| 41 | M4S2 | | M3S2 | | M4S2 | | M3S1 | | M3S1 | | M3S1 | | M6S1 | | M3S2 | |
| 42 | M4S1 | | M3S2 | | M4S1 | | M3S1 | | M3S1 | | M5S1 | | M5S2 | | M3S2 | |
| 43 | M4S1 | | M3S1 | | M4S2 | | M3S1 | | M3S1 | | M1S3 | | M3S1 | | M3S2 | |
| 44 | M4S2 | | M3S1 | | M3S1 | | M3S1 | | M3S4 | | M1S2B | | M6S1 | | M3S2 | |
| 45 | M4S1 | | M3S2 | | M3S1 | | M6S1 | Results and Discussion | M3S4 | | M3S2 | | M6S1 | | M3S2 | |
| 46 | M3S1 | | M5S3 | | M3S1 | | M6S2 | | M3S4 | | M3S1 | | M3S4 | | M3S2 | |
| 47 | M3S2 | | M3S2 | | M3S1 | | M6S2 | | M3S4 | | M4S1 | | M6S1 | | M2S4 | |
| 48 | M3S1 | | M3S1 | | M3S1 | | M6S2 | | M3S1 | | M3S2 | | M6S1 | | M4S1 | |
| 49 | M3S1 | | M3S1 | | M2S4 | | M5S2 | | M5S1 | | M1S3 | | M3S1 | | M1S2B | |
| 50 | M3S1 | | M3S1 | | M3S2 | | M5S2 | | M3S2 | | M3S1 | | M3S4 | | M3S2 | |

| S/N | Article 1 | | Article 2 | | Article 3 | | Article 4 | | Article 5 | | Article 6 | | Article 7 | | Article 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | M2S4 | Methods | M3S1 | Methods | M1S2A | Methods | M5S3 | Results and Discussion | M4S1 | Methods | M3S1 | Methods | M3S1 | Methods | M3S1 | Methods |
| 52 | M3S4 | | M3S2 | | M3S1 | | M5S1 | | M4S1 | | M3S1 | | M3S1 | | M3S2 | |
| 53 | M4S1 | | M3S1 | | M3S1 | | M5S1 | | M4S1 | | M3S1 | | M3S1 | | M3S1 | Results and Discussion |
| 54 | M3S2 | | M3S1 | | M3S1 | | M6S2 | | M6S1 | | M5S1 | | M3S1 | | M3S1 | |
| 55 | M4S1 | | M3S1 | | M3S1 | | M6S2 | | M3S4 | | M3S1 | | M5S1 | | M3S1 | |
| 56 | M3S1 | | M3S1 | | M3S1 | | M6S2 | | M3S1 | | M3S1 | | M5S2 | | M3S1 | |
| 57 | M3S1 | | M2S4 | | M3S1 | | M5S1 | | M5S1 | Results and Discussion | M3S1 | | M6S1 | | M3S4 | |
| 58 | M3S2 | | M2S4 | | M3S1 | | M3S2 | | M5S1 | | M4S3 | | M6S1 | | M3S1 | |
| 59 | M3S2 | Results and Discussion | M6S1 | | M4S2 | | M3S2 | | M5S2 | | M4S3 | | M3S1 | | M5S1 | |
| 60 | M3S2 | | M3S1 | | M4S1 | | M6S1 | | M5S2 | | M4S3 | | M3S1 | | M6S3 | |
| 61 | M3S2 | | M3S1 | | M3S1 | | M2S2 | | M6S1 | | M3S1 | | M2S3 | | M3S2 | |
| 62 | M3S2 | | M3S1 | | M3S1 | | M3S4 | | M6S1 | | M3S1 | | M4S1 | | M6S1 | |
| 63 | M4S1 | | M3S2 | | M3S2 | | M4S2 | | M5S1 | | M3S1 | | M4S1 | | M5S1 | |
| 64 | M4S1 | | M3S2 | | M3S1 | | M4S2 | | M5S1 | | M4S3 | | M4S1 | | M6S3 | |
| 65 | M4S1 | | M3S2 | | M3S4 | | M6S1 | | M5S1 | | M4S3 | | M4S1 | | M6S3 | |
| 66 | M3S2 | | M3S2 | | M3S4 | | M5S2 | | M5S2 | | M4S3 | | M3S1 | | M6S3 | |
| 67 | M3S2 | | M3S3 | | M3S1 | | M5S2 | | M6S2 | | M4S3 | | M3S1 | | M6S3 | |
| 68 | M3S2 | | M3S2 | | M5S1 | Results and Discussion | M6S1 | | M5S2 | | M4S3 | | M3S1 | | M6S2 | |
| 69 | M4S3 | | M3S2 | | M4S1 | | M6S2 | | M5S1 | | M4S3 | | M3S1 | | M6S3 | |
| 70 | M4S3 | | M2S4 | | M4S1 | | M6S4 | | M5S1 | | M3S1 | | M5S1 | | M6S3 | |
| 71 | M4S3 | | M3S2 | | M6S2 | | M3S4 | | M2S4 | | M3S1 | | M5S1 | | M6S2 | |
| 72 | M5S2 | | M3S2 | | M6S2 | | M3S4 | | M5S1 | | M3S1 | | M5S1 | | M3S2 | |
| 73 | M5S2 | | M3S2 | | M3S1 | | M5S2 | | M6S2 | | M3S1 | | M6S1 | | M3S2 | |
| 74 | M5S2 | | M3S2 | | M3S2 | | M5S2 | | M6S3 | | M3S1 | | M6S2 | | M3S2 | |

| S/N | Article 1 | | Article 2 | | Article 3 | | Article 4 | | Article 5 | | Article 6 | | Article 7 | | Article 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 75 | M5S1 | Results and Discussion | M3S2 | Methods | M5S2 | Results and Discussion | M5S2 | Results and Discussion | M6S2 | Results and Discussion | M1S3 | Methods | M5S2 | Methods | M3S2 | Results and Discussion |
| 76 | M5S2 | | M3S1 | | M5S1 | | M6S1 | | M6S2 | | M1S3 | | M5S2 | | M3S4 | |
| 77 | M5S2 | | M3S2 | | M6S2 | | M5S2 | | M5S2 | | M5S1 | | M5S2 | | M2S3 | |
| 78 | M5S3 | | M3S2 | | M5S1 | | M6S1 | | M6S2 | | M5S1 | | M5S1 | | M3S4 | |
| 79 | M6S1 | | M3S4 | | M6S3 | | M6S3 | | M5S1 | | M3S1 | | M6S1 | | M5S2 | |
| 80 | M5S2 | | M3S4 | | M3S2 | | M6S2 | | M6S2 | | M4S1 | | M5S2 | | M2S3 | |
| 81 | M5S2 | | M4S3 | | M3S2 | | M5S2 | | M5S2 | | M3S1 | | M6S2 | | M6S2 | |
| 82 | M5S2 | | M4S3 | | M3S2 | | M6S3 | | M5S2 | | M3S1 | | M5S1 | | M6S2 | |
| 83 | M5S2 | | M3S1 | | M1S3 | | M5S2 | | M3S1 | | M3S1 | | M5S1 | | | |
| 84 | M5S2 | | M3S2 | | M1S3 | | M5S2 | | M5S1 | | M3S1 | | M5S2 | | | |
| 85 | M6S1 | | M3S1 | | M5S1 | | M6S1 | | M6S2 | | M3S1 | | M5S1 | | | |
| 86 | M6S1 | | M4S1 | | M5S1 | | M5S2 | | M5S1 | | M4S3 | | M5S2 | | | |
| 87 | M6S1 | | M3S1 | | M5S2 | | M5S2 | | M6S2 | | M6S2 | | M6S3 | | | |
| 88 | M5S2 | | M3S1 | | M3S2 | | M5S2 | | M5S2 | | M3S1 | | M6S3 | | | |
| 89 | M5S2 | | M3S2 | | M3S2 | | M5S2 | | M6S2 | | M3S1 | | M4S2 | | | |
| 90 | M5S2 | | M3S2 | | M3S2 | | M6S2 | | M6S2 | | M3S1 | | M4S2 | | | |
| 91 | M5S2 | | M3S1 | | M3S2 | | M6S2 | | M5S2 | | M3S1 | | M5S2 | | | |
| 92 | M5S2 | | M3S1 | | M3S2 | | M6S1 | | M5S2 | | M3S1 | | M6S2 | | | |
| 93 | M3S1 | | M3S1 | | M3S2 | | M6S2 | | M6S1 | | M3S1 | | M5S2 | Results and Discussion | | |
| 94 | M5S2 | | M3S1 | | M4S1 | | M6S1 | | M6S2 | | M4S2 | | M5S2 | | | |
| 95 | M5S1 | | M3S2 | | M4S1 | | M6S2 | | M6S3 | | M4S1 | | M5S2 | | | |
| 96 | M5S3 | | M3S2 | | M3S1 | | M6S1 | | M5S1 | | M3S1 | | M5S1 | | | |
| 97 | M6S2 | | M3S2 | | M5S3 | | M6S1 | | M6S3 | | M3S1 | | M5S2 | | | |
| 98 | M5S3 | | M3S2 | | M5S2 | | M6S1 | | M6S2 | | M5S2 | Results and Discussion | M5S2 | | | |
| 99 | M5S2 | | M2S4 | | M6S1 | | M6S2 | | M5S1 | | M5S2 | | M5S1 | | | |
| 100 | M6S1 | | M3S3 | | M6S2 | | M6S1 | | M5S1 | | M5S2 | | M6S2 | | | |

| S/N | Article 1 | | Article 2 | | Article 3 | | Article 4 | | Article 5 | | Article 6 | | Article 7 | | Article 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | M5S2 | Results and Discussion | M5S2 | Results | M3S1 | Results and Discussion | M6S2 | Results and Discussion | M5S2 | Results and Discussion | M5S2 | Results and Discussion | M6S1 | Results and Discussion | |
| 102 | M6S2 | | M5S1 | | M1S2B | | M6S2 | | M5S1 | | M5S2 | | M6S2 | | |
| 103 | M6S1 | | M5S2 | | M6S1 | | M6S2 | | M5S3 | | M5S2 | | M5S2 | | |
| 104 | M6S3 | | M5S2 | | M3S1 | | M6S2 | | M6S1 | | M5S3 | | M6S2 | | |
| 105 | M6S3 | | M5S1 | | M5S2 | | | | M6S3 | | M6S1 | | M6S1 | | |
| 106 | M6S3 | | M5S2 | | M6S2 | | | | M6S3 | | M6S1 | | M5S2 | | |
| 107 | M6S3 | | M5S3 | | M5S1 | | | | M6S3 | | M6S1 | | M5S2 | | |
| 108 | M6S3 | | M5S1 | | M5S2 | | | | M5S2 | | M6S2 | | M3S3 | | |
| 109 | M6S1 | | M3S1 | | M6S1 | | | | M5S3 | | M6S2 | | M5S1 | | |
| 110 | M5S2 | | M3S1 | | M6S1 | | | | M5S1 | | M6S1 | | M5S1 | | |
| 111 | M5S1 | | M5S2 | | M3S2 | | | | M5S1 | | M5S2 | | M6S2 | | |
| 112 | M5S2 | | M5S2 | | M3S2 | | | | M5S2 | | M5S1 | | M6S2 | | |
| 113 | M5S2 | | M5S2 | | M3S3 | | | | M5S2 | | M5S2 | | M6S2 | | |
| 114 | M5S2 | | M5S1 | | M3S2 | | | | M5S2 | | M5S1 | | M6S1 | | |
| 115 | M5S2 | | M5S2 | | M3S2 | | | | M5S1 | | M5S1 | | M6S2 | | |
| 116 | M5S2 | | M5S2 | | M2S4 | | | | M5S3 | | M6S2 | | M6S1 | | |
| 117 | M5S2 | | M5S2 | | M3S2 | | | | M5S3 | | M6S1 | | M6S2 | | |
| 118 | M5S1 | | M5S2 | | M5S3 | | | | M6S1 | | M6S1 | | M6S2 | | |
| 119 | M5S1 | | M5S2 | | M6S1 | | | | M6S3 | | M6S3 | | M6S1 | | |
| 120 | M6S3 | | M5S2 | | M3S1 | | | | M5S2 | | M6S1 | | M5S1 | | |
| 121 | M5S2 | | M3S2 | | M6S1 | | | | M6S2 | | M5S1 | | M5S1 | | |
| 122 | M5S1 | | M5S2 | | M6S1 | | | | M6S2 | | M3S1 | | M6S2 | | |
| 123 | M5S1 | | M6S2 | | M6S1 | | | | M6S2 | | M6S1 | | M6S1 | | |
| 124 | M5S1 | | M5S1 | | M5S1 | | | | M6S1 | | M6S1 | | M6S2 | | |
| 125 | M6S2 | | M6S1 | | M2S3 | | | | M6S1 | | M6S1 | | M5S1 | | |
| 126 | M6S2 | | M5S2 | | M6S2 | | | | M6S2 | | M5S3 | | M5S1 | | |

| S/N | Article 1 | | Article 2 | | Article 3 | | Article 4 | Article 5 | | Article 6 | | Article 7 | | Article 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 127 | M6S2 | Results and Discussion | M5S2 | Results | M6S1 | Results and Discussion | | M2S3 | Results and Discussion | M5S2 | Results and Discussion | M6S2 | Results and Discussion | |
| 128 | M6S2 | | M5S1 | | M6S1 | | | M6S4 | | M6S3 | | M6S2 | | |
| 129 | M6S2 | | M5S1 | | M6S1 | | | M2S3 | | M6S1 | | M6S2 | | |
| 130 | M6S1 | | M3S2 | | M6S1 | | | | | M6S1 | | M6S4 | | |
| 131 | M6S2 | | M3S2 | | M6S3 | | | | | M6S2 | | | | |
| 132 | M6S1 | | M3S2 | | M5S2 | | | | | M5S1 | | | | |
| 133 | M6S1 | | M3S2 | | M5S3 | | | | | M5S1 | | | | |
| 134 | | | M5S1 | | M6S1 | | | | | M6S1 | | | | |
| 135 | | | M5S1 | | M6S1 | | | | | M5S2 | | | | |
| 136 | | | M5S2 | | M5S2 | | | | | M3S1 | | | | |
| 137 | | | M5S2 | | M2S4 | | | | | M5S2 | | | | |
| 138 | | | M5S1 | | M5S2 | | | | | M5S2 | | | | |
| 139 | | | M5S2 | | M5S2 | | | | | M5S2 | | | | |
| 140 | | | M5S2 | | M6S1 | | | | | M5S1 | | | | |
| 141 | | | M5S2 | | M6S1 | | | | | M5S1 | | | | |
| 142 | | | M5S2 | | M6S3 | | | | | M6S1 | | | | |
| 143 | | | M5S2 | | M6S3 | | | | | M4S3 | | | | |
| 144 | | | M5S2 | | M6S1 | | | | | M6S2 | | | | |
| 145 | | | M5S1 | | M5S1 | | | | | M6S3 | | | | |
| 146 | | | M5S1 | | M3S4 | | | | | M2S3 | | | | |
| 147 | | | M5S2 | | M5S2 | | | | | M6S3 | | | | |
| 148 | | | M5S2 | | M6S1 | | | | | M6S2 | | | | |
| 149 | | | M5S2 | | M6S2 | | | | | M5S2 | | | | |
| 150 | | | M5S2 | | M5S2 | | | | | M6S3 | | | | |
| 151 | | | M5S1 | | M5S2 | | | | | M6S4 | | | | |
| 152 | | | M6S2 | | M6S2 | | | | | M5S1 | | | | |
| 153 | | | M6S2 | | M6S2 | | | | | M6S2 | | | | |

| S/N | Article 1 | Article 2 | | Article 3 | | Article 4 | Article 5 | Article 6 | | Article 7 | Article 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 154 | | M6S2 | Discussion | M5S2 | Results and Discussion | | | M6S3 | Results and Discussion | | |
| 155 | | M6S2 | | M5S2 | | | | M6S3 | | | |
| 156 | | M5S2 | | M5S2 | | | | M6S3 | | | |
| 157 | | M5S2 | | M5S2 | | | | M6S2 | | | |
| 158 | | M6S1 | | M2S3 | | | | M6S2 | | | |
| 159 | | M6S2 | | M6S2 | | | | M6S2 | | | |
| 160 | | M5S1 | | M6S2 | | | | M6S1 | | | |
| 161 | | M6S2 | | M2S3 | | | | M6S2 | | | |
| 162 | | M5S2 | | M6S1 | | | | M3S1 | | | |
| 163 | | M5S3 | | M2S3 | | | | M3S1 | | | |
| 164 | | M5S3 | | M5S3 | | | | M6S2 | | | |
| 165 | | M5S2 | | M6S1 | | | | M6S3 | | | |
| 166 | | M2S3 | | M6S2 | | | | M6S2 | | | |
| 167 | | M6S3 | | M2S3 | | | | M6S2 | | | |
| 168 | | M1S3 | | M6S2 | | | | M5S1 | | | |
| 169 | | M5S2 | | M6S2 | | | | | | | |
| 170 | | M6S2 | | M6S2 | | | | | | | |
| 171 | | M5S2 | | M5S3 | | | | | | | |
| 172 | | M6S2 | | M2S3 | | | | | | | |
| 173 | | M5S1 | | | | | | | | | |
| 174 | | M5S1 | | | | | | | | | |
| 175 | | M5S1 | | | | | | | | | |
| 176 | | M5S1 | | | | | | | | | |
| 177 | | M5S1 | | | | | | | | | |
| 178 | | M6S3 | | | | | | | | | |
| 179 | | M2S3 | | | | | | | | | |
| 180 | | M6S2 | | | | | | | | | |

| S/N | Article 1 | Article 2 | | Article 3 | Article 4 | Article 5 | Article 6 | Article 7 | Article 8 |
|---|---|---|---|---|---|---|---|---|---|
| 181 | | M6S2 | Discussion | | | | | | |
| 182 | | M2S3 | | | | | | | |
| 183 | | M6S2 | | | | | | | |
| 184 | | M6S2 | | | | | | | |

## Appendix E

## Numbers and Percentages of Each Move in each Article and in Total

| Moves and Steps / Articles | Article 1 | | Article 2 | | Article 3 | | Article 4 | | Article 5 | | Article 6 | | Article 7 | | Article 8 | | Occurrence Rates of Moves/ Steps (%) | Number of Moves and Steps in the Corpus | Percentages of Moves and Steps in the Corpus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sentences | % | Sentences | % | Sentences | % | Sentences | % | Sentences | % | Sentences | % | Sentences | % | Sentences | % | | | |
| **Move 1: Establishing a topic** | 23 | 17,3 | 17 | 9,2 | 16 | 9,3 | 12 | 11,5 | 8 | 6,2 | 17 | 10,1 | 19 | 14,6 | 20 | 24,4 | **100** | **132** | **11,98** |
| Step 1: Claiming centrality/importance of the topic | 2 | 1,5 | 0 | 0,0 | 3 | 1,7 | 2 | 1,9 | 1 | 0,8 | 1 | 0,6 | 1 | 0,8 | 1 | 1,2 | **87.5** | **11** | **1,00** |
| Step 2a: Reviewing items of previous research | 8 | 6,0 | 2 | 1,1 | 2 | 1,2 | 0 | 0,0 | 2 | 1,6 | 0 | 0,0 | 3 | 2,3 | 5 | 6,1 | **75** | **22** | **2,00** |
| Step 2b: Making claims based on the finding of the previous research | 1 | 0,8 | 0 | 0,0 | 2 | 1,2 | 0 | 0,0 | 1 | 0,8 | 3 | 1,8 | 5 | 3,8 | 5 | 6,1 | **75** | **17** | **1,54** |
| Step 2c: Limitations (in other studies' methodology/of the area) | 1 | 0,8 | 0 | 0,0 | 5 | 2,9 | 0 | 0,0 | 0 | 0,0 | 2 | 1,2 | 0 | 0,0 | 1 | 1,2 | **50** | **9** | **0,82** |
| Step 3: Background information about the topic | 11 | 8,3 | 15 | 8,2 | 4 | 2,3 | 10 | 9,6 | 4 | 3,1 | 11 | 6,5 | 10 | 7,7 | 8 | 9,8 | **100** | **73** | **6,62** |
| **Move 2: Preparing for the present study** | 1 | 0,8 | 13 | 7,1 | 17 | 9,9 | 3 | 2,9 | 5 | 3,9 | 2 | 1,2 | 5 | 3,8 | 6 | 7,3 | **100** | **52** | **4,72** |
| Step 1: Indicating a gap/raising a question | 0 | 0,0 | 0 | 0,0 | 4 | 2,3 | 1 | 1,0 | 0 | 0,0 | 0 | 0,0 | 1 | 0,8 | 1 | 1,2 | **50** | **7** | **0,64** |
| Step 2: Suggesting a different solution/study | 0 | 0,0 | 1 | 0,5 | 2 | 1,2 | 2 | 1,9 | 0 | 0,0 | 0 | 0,0 | 2 | 1,5 | 1 | 1,2 | **62.5** | **8** | **0,73** |
| Step 3: Stating the value of the present research | 0 | 0,0 | 6 | 3,3 | 8 | 4,7 | 0 | 0,0 | 2 | 1,6 | 2 | 1,2 | 2 | 1,5 | 3 | 3,7 | **75** | **23** | **2,09** |
| Step 4: Making assumptions about the study | 1 | 0,8 | 6 | 3,3 | 3 | 1,7 | 0 | 0,0 | 3 | 2,3 | 0 | 0,0 | 0 | 0,0 | 1 | 1,2 | **62.5** | **14** | **1,27** |
| **Move 3: Describing procedures of the study** | 26 | 19,5 | 75 | 40,8 | 44 | 25,6 | 29 | 27,9 | 32 | 24,8 | 59 | 35,1 | 23 | 17,7 | 40 | 48,8 | **100** | **328** | **29,76** |
| Step 1: Listing procedures | 9 | 6,8 | 29 | 15,8 | 22 | 12,8 | 13 | 12,5 | 12 | 9,3 | 57 | 33,9 | 19 | 14,6 | 7 | 8,5 | **100** | **168** | **15,25** |
| Step 2: Detailing procedures (by graphs/figures and equations) | 11 | 8,3 | 38 | 20,7 | 18 | 10,5 | 8 | 7,7 | 15 | 11,6 | 2 | 1,2 | 1 | 0,8 | 26 | 31,7 | **100** | **119** | **10,80** |
| Step 3: Describing procedures through other studies | 0 | 0,0 | 5 | 2,7 | 1 | 0,6 | 5 | 4,8 | 0 | 0,0 | 0 | 0,0 | 1 | 0,8 | 4 | 4,9 | **62.5** | **16** | **1,45** |
| Step 4: Justifying methodological issues (Suggesting a different procedure) | 6 | 4,5 | 3 | 1,6 | 3 | 1,7 | 3 | 2,9 | 5 | 3,9 | 0 | 0,0 | 2 | 1,5 | 3 | 3,7 | **87.5** | **25** | **2,27** |
| **Move 4: Describing materials** | 18 | 13,5 | 3 | 1,6 | 26 | 15,1 | 6 | 5,8 | 8 | 6,2 | 19 | 11,3 | 13 | 10,0 | 1 | 1,2 | **100** | **94** | **8,53** |
| Step 1: Listing materials by detailing the amount/features of the materials | 13 | 9,8 | 1 | 0,5 | 13 | 7,6 | 4 | 3,8 | 7 | 5,4 | 6 | 3,6 | 5 | 3,8 | 1 | 1,2 | **100** | **50** | **4,54** |
| Step 2: Providing the background of the materials | 2 | 1,5 | 0 | 0,0 | 13 | 7,6 | 2 | 1,9 | 0 | 0,0 | 1 | 0,6 | 4 | 3,1 | 0 | 0,0 | **62.5** | **22** | **2,00** |
| Step 3: Justifying materials | 3 | 2,3 | 2 | 1,1 | 0 | 0,0 | 0 | 0,0 | 1 | 0,8 | 12 | 7,1 | 4 | 3,1 | 0 | 0,0 | **62.5** | **22** | **2,00** |
| **Move 5: Announcing results** | 41 | 30,8 | 56 | 30,4 | 29 | 16,9 | 20 | 19,2 | 42 | 32,6 | 31 | 18,5 | 34 | 26,2 | 3 | 3,7 | **100** | **256** | **23,23** |
| Step 1: Reporting results | 12 | 9,0 | 19 | 10,3 | 8 | 4,7 | 4 | 3,8 | 22 | 17,1 | 15 | 8,9 | 17 | 13,1 | 2 | 2,4 | **100** | **99** | **8,98** |
| Step 2: Detailing results by graphs/figures and equations | 26 | 19,5 | 33 | 17,9 | 16 | 9,3 | 15 | 14,4 | 16 | 12,4 | 14 | 8,3 | 17 | 13,1 | 1 | 1,2 | **100** | **138** | **12,52** |
| Step 3: Validating/invalidating results | 3 | 2,3 | 4 | 2,2 | 5 | 2,9 | 1 | 1,0 | 4 | 3,1 | 2 | 1,2 | 0 | 0,0 | 0 | 0,0 | **75** | **19** | **1,72** |
| **Move 6: Evaluating results** | 24 | 18,0 | 20 | 10,9 | 40 | 23,3 | 34 | 32,7 | 34 | 26,4 | 40 | 23,8 | 36 | 27,7 | 12 | 14,6 | **100** | **240** | **21,78** |
| Step 1: Explaining results | 10 | 7,5 | 3 | 1,6 | 20 | 11,6 | 13 | 12,5 | 10 | 7,8 | 15 | 8,9 | 16 | 12,3 | 1 | 1,2 | **100** | **88** | **7,99** |
| Step 2: Generalizing/interpreting results | 8 | 6,0 | 14 | 7,6 | 15 | 8,7 | 17 | 16,3 | 16 | 12,4 | 15 | 8,9 | 17 | 13,1 | 4 | 4,9 | **100** | **106** | **9,62** |
| Step 3: Stating limitations | 6 | 4,5 | 3 | 1,6 | 4 | 2,3 | 2 | 1,9 | 7 | 5,4 | 9 | 5,4 | 2 | 1,5 | 7 | 8,5 | **100** | **40** | **3,63** |
| Step 4: Suggesting further research | 0 | 0,0 | 0 | 0,0 | 1 | 0,6 | 2 | 1,9 | 1 | 0,8 | 1 | 0,6 | 1 | 0,8 | 0 | 0,0 | **62.5** | **6** | **0,54** |
| **Number of Sentences per Article** | **133** | | **184** | | **172** | | **104** | | **129** | | **168** | | **130** | | **82** | | | | |