อัตถภาคและกลุ่มคำศัพท์: การศึกษาเปรียบเทียบบทความวิจัยภาษาอังกฤษ ทางวิทยาศาสตร์การเกษตรที่ตีพิมพ์ในวารสารจีน และวารสารระดับนานาชาติ

นางสาวฮุยมิน ซือ

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาปรัชญาดุษฎีบัณฑิต

สาขาวิชาภาษาอังกฤษศึกษา

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MOVES AND LEXICAL BUNDLES: A CONTRASTIVE STUDY OF ENGLISH AGRICULTURAL SCIENCE RESEARCH ARTICLES BETWEEN CHINESE JOURNALS AND INTERNATIONALLY PUBLISHED JOURNALS

Huimin Shi

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in English Language Studies

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MOVES AND LEXICAL BUNDLES: A CONTRASTIVE STUDY OF ENGLISH AGRICULTURAL SCIENCE RESEARCH ARTICLES BETWEEN CHINESE JOURNALS AND INTERNATIONALLY PUBLISHED JOURNALS

Suranaree University of Technology has approved this thesis submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

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ฮุยมิน ซือ : อัตถภาคและกลุ่มคำศัพท์: การศึกษาเปรียบเทียบบทความวิจัยภาษาอังกฤษทางวิทยาศาสตร์การเกษตรที่ตีพิมพ์ในวารสารจีนและวารสารระดับนานาชาติ (MOVES AND LEXICAL BUNDLES: A CONTRASTIVE STUDY OF ENGLISH AGRICULTURAL SCIENCE RESEARCH ARTICLES BETWEEN CHINESE JOURNALS AND INTERNATIONALLY PUBLISHED JOURNALS) อาจารย์ที่ปรึกษา : รองศาสตราจารย์ ดร.อัญชลี วรรณรักษ์, 343 หน้า

เนื่องจากภาษาอังกฤษเป็นภาษาหลักในการสื่อสารในแวดวงวิชาการ การได้ตีพิมพ์ในวารสารระดับนานาชาติจึงเป็นเป้าหมายและสิ่งที่ท้าทายสำหรับนักวิจัยที่ไม่ใช่เจ้าของภาษา งานวิจัยนี้ได้ศึกษาบทความวิจัยภาษาอังกฤษที่ตีพิมพ์ในวารสารจีนและวารสารระดับนานาชาติ เพื่อเปรียบเทียบความเหมือนและความแตกต่างของโครงสร้างอัตถภาค (move structures) และกลุ่มคำศัพท์ (lexical bundles) โดยในขั้นแรกเป็นการวิเคราะห์อัฒภาคจากสองคลังข้อมูล คือคลังข้อมูลบทความทางวิทยาศาสตร์การเกษตรที่ตีพิมพ์ในวารสารจีนจำนวน 45 บทความ และที่ตีพิมพ์ในวารสารระดับนานาชาติ จำนวน 45 บทความ ตามแนวอัตถภาควิเคราะห์ของกนกศิลปธรรม (2005)

ผลการวิเคราะห์พบว่าบทความที่ตีพิมพ์ในวารสารจีนและวารสารระดับนานาชาติ มีความคล้ายคลึงกันในด้านโครงสร้างอัตถภาค กล่าวคือมีการพบอัตถภาคจำนวน 16 อัตภาค (ส่วนบทนำ 3 อัตถภาค ส่วนวิธีวิจัย 5 อัตถภาค ส่วนผลการวิจัย 4 อัตถภาค และส่วนอภิปรายผล 4 อัตถภาค) อย่างไรก็ตามด้วยปัจจัยหลายประการทำให้เกิดความแตกต่างระหว่างคลังข้อมูลทั้งสองในด้านการปรากฏและความถี่ในการปรากฏของอัตถภาค/อนุวัจน์ (step)ในแต่ละภาค โดยเฉพาะอย่างยิ่งในส่วนบทนำและส่วนอภิปรายผล นอกจากนี้ยังพบว่าเมื่อเปรียบเทียบกับโครงสร้างอัตถภาคที่พบในงานวิจัยก่อนหน้านี้โครงสร้างอัตถภาคของบทความวิจัยทางวิทยาศาสตร์การเกษตรมีรูปแบบเป็นของตนเอง รูปแบบเฉพาะนี้สามารถพบได้โดยเฉพาะอย่างยิ่งในส่วนวิธีวิจัยและส่วนผลการวิจัย ซึ่งแสดงให้เห็นว่าความหลากหลายของสาขาวิชามีบทบาทสำคัญในการกำหนดโครงสร้างอัตถภาคของบทความวิจัย

ขั้นการวิเคราะห์ต่อมาคือการหากลุ่มคำศัพท์ (lexical bundles) ของ 16 อัตถภาค จากทั้งสองคลังข้อมูลบทความ ผลการวิเคราะห์พบว่ากลุ่มคำศัพท์ที่พบในคลังข้อมูลวารสารระดับนานาชาติมีจำนวนมากกว่ากลุ่มคำศัพท์ที่พบในคลังข้อมูลวารสารจีน ซึ่งแสดงให้เห็นว่าควรมีการสอนกลุ่มคำศัพท์ที่นักวิจัยชาวจีนใช้น้อย ผลของงานวิจัยนี้นอกจากจะช่วยเพิ่มพูนความรู้และความ

เข้าใจเกี่ยวกับโครงสร้างอัตถภาคของบทความทางวิทยาศาสตร์การเกษตรแล้ว ยังเป็นประโยชน์ต่อนักวิจัยที่ไม่ใช่เจ้าของภาษาหรือนักศึกษาที่ต้องแข่งขันในการตีพิมพ์ระดับนานาชาติอีกด้วย

สาขาวิชาภาษาต่างประเทศ	ลายมือชื่อนักศึกษา____________________
ปีการศึกษา 2557	ลายมือชื่ออาจารย์ที่ปรึกษา______________

HUIMIN SHI : MOVES AND LEXICAL BUNDLES: A CONTRASTIVE STUDY OF ENGLISH AGRICULTURAL SCIENCE RESEARCH ARTICLES BETWEEN CHINESE JOURNALS AND INTERNATIONALLY PUBLISHED JOURNALS. THESIS ADVISOR : ASSOC. PROF. ANCHALEE WANNARUK, Ph.D., 343 PP.

MOVE ANALYSIS / LEXICAL BUNDLES / RESESARCH ARTICLES

As English is the leading medium of communication in academia, publishing in international journals presents a goal and a challenge for many non-native English speaking (NNES) researchers. In this study, English research articles (RAs) published in China and internationally have been examined in order to discover whether the move structures and lexical bundles in each context are similar or different. For the first step, two corpora comprised of forty-five local and forty-five international RAs in agricultural science were analyzed using Kanoksilapatham's (2005) model as an analytical tool.

The analysis revealed that both local and international RAs were similar in their move structures, namely sixteen moves for each (three for the Introduction section, five for the Methods section, four for the Results section and four for the Discussion section). However, due to a number of factors, discrepancies between the two corpora led to a rise in the choices of steps or move/step frequency in each

section, particularly in the Introduction and Discussion sections. Also, the move structure of agricultural science RAs appeared to have its own distinct format, compared with those from previous studies. The diversity can be particularly learned in the Methods and Results sections, suggesting that disciplinary variations play a key role to determine move structure of RAs.

A further step in the analysis was to identify lexical bundles from the sixteen move sub-corpora for each group of RAs. The results showed that the number of lexical bundles used in the international corpus was greater than those used in the local corpus, indicating that lexical bundles under-used by Chinese researchers should be explicitly taught. The findings of the present study may provide insight into the move structure of agricultural science RAs and help NNES researchers or learners compete for international publication.

School of Foreign Languages Student's Signature_________________

Academic Year 2014 Advisor's Signature_________________

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Last but not least, I would like to dedicate this dissertation to my family who were always there when I was in need of help and support. They have been a source of comfort and happiness, enabling me to overcome any difficulties both in study and life.

Huimin Shi

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

LIST OF TABLES

Table **Page**

LIST OF TABLES (Continued)

Table **Page**

LIST OF FIGURES

LIST OF ABBREVIATIONS

BNC	British National Corpus
CARS	Create a Research Spaces
CLAWS	Constituent-Likelihood Automatic Word Tagging System
CNKI	China National Knowledge Infrastructure
CR	Contrastive Rhetoric
EFL	English as a Foreign Language
ESP	English for Specific Purposes
FEI	Fixed Expressions and Idioms
IMRD	Introduction Methods Results Discussion
M	Move
NES	Native English Speaking
NNES	Non-native English Speaking
RA	Research Article
S	Step
SCI	Science Citation Index
SFL	Systemic Functional Linguistics
SLA	Second Language Acquisitions
SLW	Second Language Writing

CHAPTER 1

INTRODUCTION

This introductory chapter describes an overview of the proposed research to compare the move structures and lexical bundles used in agricultural science research articles published in China and internationally. First, the background of the research and research problem are introduced in the first two sections. Then, the rationale of the study is presented, followed by a section that presents the research objectives. Next, the significance, scope and limitations of the study are outlined. Finally, the chapter is concluded with a list of key terms.

1.1 The Background of the Research

Agriculture in China has played a very important role in Chinese economy. It has succeeded in sustaining 22% of the world's population with only 7% of the world's farmland (Ryan & Flavin, 1995). However, with nearly all land potentially suitable for cultivation already in use and current cultivated land shrinking (Zhong, 1999), the question of whether China will be able to keep its food production in pace with the country's population growth in the future still remains a subject of world-wide concern. Therefore, the development of agriculture and the balance between food and population are the foundation of the economy in China.

Due to the important role of agriculture in China, agricultural science research also appears to have a steady growth over the last few decades. This can be reflected in four aspects (Dolla, 2011). First, the institutions at the national level grew from 39 in 1995 to 42 in 2008. Second, the number of provincial level institutions went up to 470 in 2005 from 403 in 1995. Third, the number of agricultural scientists has increased from 31,000 in 1980 to 42,687 in 2005. Fourth, the number of scientific papers published in Science Citation Index (SCI) journals has grown from forty-three in 1995 to 678 in 2005. To some extent, the progress of agriculture is likely dependent on the scientists who contribute through their research and innovation. The success of their agricultural research, in turn, is measured on the ground when the farmers use their results, thereby improving agricultural productivity. Taken together, the field of agriculture science being investigated in the present was motivated by its critical role in the Chinese economy and the rapid growth of agricultural science research.

1.2 The Research Problem

Concerning the dominant use of English in academic communication, Swales (1990) claims "…there is no doubt that English has become the world's predominant language of research and publication" (p.99). According to Gibbs (1995), most journals included in international databases such as Science Citations Index (SCI) are published in English. In fact, over eighty percent of journal articles published internationally are written in English (Hamel, 2007). This suggests that RAs (research articles) in English play a key role in the spread of academic knowledge. As a result, the ability to publish RAs internationally is crucial for academic and professional success in science and technology. However, writing RAs in English is one of the most daunting tasks for researchers. Besides presenting the disciplinary content in RAs, researchers also need to meet the often stringent language requirements of the international journals concerned (Belcher, 2007; Flowerdew, 2001), whereby non-native English speaking researchers (NNES) are put at a disadvantage in competing with their native English speaking (NES) peers (Cho, 2009; Cho, 2004; Huang, 2010; Marusˇic´ & Marusˇic´, 2001). This difficulty could be critical for NNES scientists, who might not succeed in being published if their work is presented in the wrong rhetorical style. For instance, after investigating the difficulty scientists experience, Hanauer and Englander (2011) indicate that the use of English as a second language is the main cause of these difficulties. Similarly, learners of English as a foreign language (EFL), like Chinese researchers, feel extremely challenged to publish internationally. In 1998, Chen-lu Tsou, the President of the Chinese Biochemical Society, who was twice awarded the China National Natural Science Prize, commented on the fact that a large number of Chinese scientists have not published internationally yet. He concludes that their poor English might be the biggest obstacle faced by Chinese scientists attempting to publish their RAs at the international level, apart from other non-language problems.

Due to the fact that language problems might result in the rejection of research, several dimensions concerning international publication were examined, including the attitudes of journal editors (Flowerdew, 2001), the challenges that NNES writers face (Flowerdew, 1999a, 1999b), and the perspectives held by NNES writers (Chiu, 2011). Specifically, two main difficulties faced by NNES writers were identified. One is inadequate knowledge of rhetorical organization. The other is inappropriate language use regarding lexical and grammatical choices in the realization of each identified move. In particular, rhetorical organization was perceived to be the first frequently indicated difficulty for two reasons: First, the discourse organization of a paper plays a more crucial role in delivering content than the linguistic features (Cho, 2006). Second, poor structure restricts a writer's ability to elucidate his or her ideas clearly. Such problems usually manifest themselves in a paper that lacks focus, rambles, or contains much irrelevant information (McKercher, Law, Weber, Song, & Hsu, 2007).

In response to the needs and difficulties of writing for publication, ESP research has produced fruitful results regarding the genre of RAs at two levels: macro structure and linguistic features. The former takes genre-analysis approach to analyze the discourse organization of RAs in terms of moves and steps, originated by John Swales (1981, 1990, 2004). The latter is concerned with the language use in RAs which is analyzed by means of corpus linguistic techniques, such as lexico-grammatical features (Marco, 2000; Tarone, Dwyer, Gillette, & Icke, 1998b). With the help of corpus techniques, the present study aims to identify the move structure of agricultural science RAs and to investigate lexical bundles linked to each identified move. Knowing the language use at the move level could be helpful in shaping the move structure used in a target genre and this will provide a better description of the function of the different moves in the genre. In addition, findings from this investigation might provide NNES writers, particularly Chinese learners, with a list of disciplinary-lexical bundles to help them write RAs in English effectively.

1.3 Rationale of the Study

The motivation to employ genre analysis in writing arises from a need to provide the most effective support to learners. As far back as 1990, Swales proposed that genre analysis is useful for learners to identify the language features and communicative purposes represented by a particular text type. Additionally, learners are able to explore these features themselves (Brett, 1994). Bhatia (1997) further explains that genre analysis can provide useful information for learners who are not familiar with a particular genre, by exposing them to the conventions of a particular genre and explaining to them the reason why these features were chosen to achieve a particular communicative purpose. Being aware of genre practices, learners are then able to transfer previously noticed textual features into their own writing (Yayli, 2011), thus producing more texts independently and creatively. Moreover, explicit knowledge of move structure has the potential to provide a long term impact and facilitate learners in retaining such knowledge over an extended period of time (Hyon, 2001), because it provides learners with a thorough and complete understanding of specific texts (Loi & Evans, 2010).

The choice of RA as a target genre in the present study is motivated partly by its important role and partly by the obstacle NNES learners face in writing in a research genre as argued in Section 1.2. Realizing the difficulties that NNES writers have is important, yet, what is equally important is how they should write their paper. For this reason, the investigation of the discourse organization of RAs has aroused great interest among researchers for many years. After John Swales' introduction of the Create A Research Space (CARS) model in 1990, there have been a great number of studies on the structure of RAs in the past two decades, for example, Nwogu's (1997), Posteguillo's (1999), or Peacock's (2011) studies. These genre-based studies have made a significant contribution to improve NNES learners' writing skills. Yet, a number of move-based studies seem to focus on specific sections of research articles, particularly on the Introduction (Anthony, 1999; Hirano, 2009; Ozturk, 2007; Pho, 2010; Samraj, 2002, 2005) and the Discussions (Amirian, Kassaian, & Tavakoli, 2008; Amnuai & Wannaruk, 2013b; Basturkmen, 2012; Holmes, 1997; Peacock, 2002). Comparatively few studies, however, address the move structure of other sections, for example, the Methods (Lim, 2006) and the Results sections (Brett, 1994) or the overall move structure of RA, namely the complete IMRD (Introduction-Methods-Results-Discussions) sections, as a whole entity (Kanoksilapatham, 2005; Nwogu, 1997; Pho, 2008b; Posteguillo, 1999).

In addition, most of the researchers know the format of IMRD sections, however, they are unaware of the internal linking of the IMRD sections. In fact, each section sets the stage for the following section, and collectively they contribute to form a cohesive piece of research. Consequently, ignorance of the internal ordering of the information presented in various sections unavoidably leads to illogically organized research report (Nwogu, 1997). With this in mind, and considering the research gap, clearly, the investigation of complete IMRD sections as a whole entity appears to be of more significance rather than the investigation of individual section of RAs.

The organizational patterns of RAs not only differ in their sections but also in disciplines. The investigations into specific disciplines (e.g. Nwogu, 1997 on medicine; Kanoksilapatham, 2005 on biochemistry), across disciplines (Peacock, 2011; Samraj, 2008) or even between two sub-disciplines of one field (Ozturk, 2007) show that the move structure of RAs varied across disciplines. This observation is also in line with Zhu's (2004) comments that the discourse organization of RAs should not be taught as a uniform structure to learners with different disciplines backgrounds. As a result, the move structure of RAs needs to be investigated in a specified field, such as agricultural science, in the present study.

Chinese agricultural researchers and Ph.D students need knowledge of agriculture-specific genre conventions to facilitate their writing for publication, particularly for international publication. This is due to the fact that they are under great pressure to publish academic articles in international journals. In many of Chinese leading universities, faculty members need to publish their research papers in journals indexed by SCI which is used as an important index in their research assessment since the early 1990s (Li, 2006). Similarly, doctoral students in science have at least one English paper published in SCI indexed journals as a degree requirement since the mid-1990s (Li, 2002). Therefore, international publication has become a requirement for the hiring, promotion, and tenure of academic staff and also for Ph.D. degrees candidates in China (Li & Flowerdew, 2009). Meanwhile, publishing their research findings will also mean that they have a voice in the international academic community and that they are also able to represent their home country's perspectives.

Considering the great pressure and significance of international publication, there is, as a result, a considerable demand for meeting the requirements of international gatekeepers. Perhaps, this is driven by the two factors. First, the international journals are different from the local Chinese journals, with respect to writing style (direct and linear) and structure (e.g. literature review, report of methods, and discussion of findings) (Shi, Wenyu, & Jingwei, 2005). In other words, international journals have their own writing style and structure. Second, Chinese writers may include discourse features valued in Chinese culture in their English writing, which differ from those used in English prose (Loi & Evans, 2010). This is likely to cause problems for Chinese learners writing English academic papers for international publication. For the reasons above, Chinese academics who wish to obtain international recognition through publication will necessarily have to adopt the genre conventions of prestigious international journals. Unawareness of cross-cultural differences in text structures is believed to be the main cause of NNES writers' lack of success in the international community (Connor, 1996). For this reason, an effective way to help Chinese English language learners to cope with the challenges for international publication might be to make the differences explicit to them, by comparing RAs published in the local Chinese journals with those published in the international journals. More importantly, a comparison of the complete IMRD sections of RAs between two publication cultures seems very limited, while researchers pay more attention to comparing RAs written in English with RAs in other languages, such as Portuguese (Moritz, Meurer, & Dellagnelo, 2008), Thai (Kanoksilapatham, 2007b), Turkish (Çandarlı, 2012), French (Van Bonn & Swales, 2007), and Spanish (Martı´n Martı´n, 2003).

Equally important to the move structure is writing for academic purpose which also involves the particular style of academic language required by these move structures (Hyland & Tse, 2007). To some extent, a good writing performance mean the control of multi-word expressions, referred to as lexical bundles, in the present study. Lexical bundles are extended collocations which appear more frequently than expected by chance and which can be identified as a different register (Hyland, 2008a). For example, the lexical bundles, such as, *the protocol described previously* and *performed as described by*, help identify a text as belonging to an academic register, while *with regard to*, *in pursuance of*, and *in accordance with* are more likely to be found in a legal text. Two aspects need to be emphasized. First, the application of lexical bundles in writing not only identifies different registers but also the structure of articles. According to Swales (1990), lexical bundles indicate realizations of rhetorical moves in different IMRD sections of RAs in various disciplines. For example, lexical bundles, such as, *play an important role* and *the aim of this study was to investigate*, indicate the realization of the Introduction section, while lexical bundles, such as, *the experimental site is located on* and *was determined by measuring*, indicate the realization of the Methods section (Shi, 2010). Second, lexical bundles appeared to be discipline-bound (Cortes, 2013). As far as we know, lexical bundles occurring in agricultural science RAs have not been investigated yet so there is a need to fill in this research gap.

The important role of lexical bundles in academic writing has motivated researchers to further explore lexical bundles used in different disciplinary fields (Hyland, 2008a), registers (Biber & Barbieri, 2007; Biber, Conrad, & Cortes, 2004; Jablonkai, 2009), genres (Hyland, 2008b; Jalali & Ghayoomi, 2010), and different degrees of writing expertise (Chen & Baker, 2010), with the aid of corpus linguistic techniques. This is because corpus tools can save a lot of effort to extract linguistic expressions occurring in a large number of texts. Interestingly, possible variations across different degrees of writing expertise have mainly stressed students' writing (e.g. essays, master theses and doctoral dissertations) and published researchers' writing. Yet, the variations on the lexical bundles in English RAs published locally and those published internationally remain unknown. Since RAs published in prestigious international journals are considered as high-profile RAs, the lexical bundles realizing the communicative function of each move in those RAs would help learners acquire the specific rhetorical practices required by the international community (Amnuai, 2012). The lexical bundles found in the present study are those identified from the move boundaries which perform a particular communicative function in a section of the text. Moreover, a comparison of lexical bundles between RAs published locally and internationally will provide learners with a better understanding of how they should use those lexical bundles in the writing of their own RAs.

The present study was, therefore, motivated partly by the writing difficulites faced by NNES learners, partly by research gaps and partly by a wide range of insights from genre analysis, contrastive rhetoric and corpus linguistics, which form the basis for a comprehensive investigation of the distinctive move structure of RAs between two different groups of writers. With these perspectives in mind, this contrastive study aimed to enhance the Chinese learners' chances of successful international publication, by elucidating to what extent Chinese academics writing in English transfer, underuse, overuse or deviate from the rhetorical features found in the RAs of academic writers published in the international journals.

1.4 Research Objectives

The purpose of this investigation was to compare two move structures and lexical bundles between two sets of RAs. To achieve this, both genre-based and corpus-based approaches were conducted. First, the move structure of RAs was determined by using a genre-based approach. Next, corpus techniques were applied to investigate lexical bundles associated with each identified move in each IMRD sections. Specifically, three objectives were attempted. First, to identify moves and lexical bundles associated with each move occurring in the local Chinese English journals in agricultural science. Second, to identify moves and lexical bundles linked with each move occurring in the international journals in agricultural science. Third, to find out the variations in move structures and lexical bundles between the two corpora. These three objectives were translated into the following research questions:

1) What are the move structures used in English agricultural science research articles published in Chinese and international journals?
2) How is the move structure used in Chinese agricultural science journals similar to or different from that in international agricultural science journals?
3) What lexical bundles are typically found in each move of English agricultural science research articles published in Chinese and international journals?

4) How are the lexical bundles used in agricultural science journals published in China similar to or different from those used in international agricultural science journals?

Questions 1 and 2 were answered by using move analysis and Questions 3 and 4 were answered by using corpus techniques.

1.5 Significance of the Study

The present study is significant in a number of ways: First, previous research has looked at interdisciplinary variations. However, this study further revealed that move structure of RAs varied between different publication contexts, adding that understanding genre is crucial for taking part in the practice of the relevant discourse community.

Second, the investigation of two move structures will provide two useful writing references for the local Chinese and international publications, since the analyzed RAs were accepted by local Chinese and international journals respectively. At the same time, the move analysis of the international corpus yielded a representative structure of agricultural science RAs, showing what communicative purposes writers have while they are writing and how they construct their papers and in what sequence they organize their moves.

Third, the move structure of agricultural science RAs will become more evident to Chinese writers because their awareness of the different rhetorical conventions will be developed by comparing the move structures published in the two different contexts. This could help NNES writers produce texts that appear more native-like (Herriman & Aronsson, 2009). Also, ESP writing instructors can guide NNES writers to produce academic discourse following the norms of the international academic community.

Fourth, the present study is expected to provide a list of lexical bundles for writing RAs in English. It is believed that direct explicit learning of the frequently-used lexical bundles will help learners in the development of their academic reading and writing ability (Cortes, 2006). When learners possess a large stock of these expressions, their task is simplified, because these stored sequences need little encoding work, and thus learners have more time to devote to other more constructive language activities.

Finally, as far as we know, no model of agricultural science RAs exits in China. Hence, most Chinese researchers and novice researchers learn how to write a research paper by reading and imitating other researchers' papers. Given this situation, it would be of great help to use the results of the present study to teach them how to write acceptable papers in English, in terms of moves, steps and the typical lexical bundles linked with each identified move. Furthermore, the model could be easily applied to the teaching of academic writing in the classroom. Through explicit instruction of such a model and certain text features, learners "can better understand how to make a piece of writing more effective and appropriate to their communicative purpose"(Reppen, 2002, p.322); they can therefore "gain confidence in producing a text that serves its intended purposes" (Ling, 2001, p.56).

1.6 Scope of the Study

The present study aimed to explore variations of move structures and lexical bundles between agricultural science RAs published in the two contexts. For this purpose, the scope was confined to the following areas.

1) The field of agricultural science was under investigation, including animal science, food science and plant science.

2) Research articles with complete IMRD sections selected from China National Knowledge Infrastructure (CNKI) and international peer-reviewed journals were investigated. In particular, the journals included in CNKI were selected due to the fact that CNKI is the world's largest database of research content from China and provides comprehensive and current Chinese information on a world-wide scale (Tang, 2007).

3) Only the four sections of RA (Introduction-Methods-Results-Discussion) were analyzed in the present study, while the remaining sections (e.g. abstract, conclusions) were not examined.

4) Move identification was based on the framework developed by Kanoksilapatham (2005). The reasons behind the selection of this model were explained in Chapter 3.

5) Lexical bundles were identified from move sub-corpora. The details of the move sub-corpora will be presented in Chapter 3.

6) In the present study, only the function of lexical bundles was analyzed with respect to move structure of agricultural science RAs due to the fact that the function of lexical bundles can benefit the writers more than the structure of lexical bundles.

1.7 Limitations of the Study

1) Corpus size is an important factor which reflects its representativeness and it influences the final results of the study. However, knowledge of move structure gained from the present study is based on a move analysis of forty-five RAs. For this reason, some lexical bundles other than those identified from forty-five RAs might not be found in the corpus, so they will not be investigated in this study.

2) To a large extent, corpus size strongly influenced the number of retrieved lexical bundles. On the whole, the international corpus, giving a total of 170,857 words, generated more lexical bundles with the same cut-off frequency, when compared with the local corpus with a total of 84,928 words. In fact, it is impossible to compile the two corpora with the same number of words, since the average length of the international and Chinese RAs was quite different (3,967 words to 1,887 words). For this reason, it might over generalize the evidence that international researchers make more use of lexical bundles than their Chinese counterparts, when the two corpora are not identical.

3) Lexical bundles found in the present study must be extended collocations with at least three words, such as *There has been an increasing demand for*, *Little work has been done on*, *The objective of this*, *The reaction was carried out*, *The results revealed that* and *These findings are consistent with*.

1.8 Key Terms

The following terms have specific meanings as explained below:

1) **Move** refers to "a unit that relates to both the writer's purpose and the content that s/he wishes to communicate" (Dudley-Evans & John, 1998).

2) **Step** refers to "a lower level unit than a move that provides a detailed perspective on the options open to the writer in setting out the moves" (Dudley-Evans & John, 1998, p.89).

3) **Lexical Bundles** refer to extended collocations, sequences of three or more words, satisfying the cut-off point of three occurrences in a range of three different texts, such as, *the results of* and *It has been suggested that*. The reasons were explained as follows. First of all, three words were chosen as the lowest cut-off point in identifying lexical bundles for the purpose of getting a wide range of lexical bundles. This was motivated by the fact that many important recurrent words combinations are actually three word lexical bundles (Simpson-Vlach & Ellis, 2010). Second, they should occur at least three times, since DeCock (1998) (Cited in Chen & Baker, 2010) suggested that a cut-off frequency for relatively small corpora is often

ranged from two-ten times. Third, the distribution threshold, which helps avoid the idiosyncrasies of individual writers, was restricted to occurrences across at least three different texts (Biber & Barbieri, 2007).

The distinction between collocation and lexical bundles was described as follows: Collocation is "a succession of two or more words that must be learned as an integral whole and not pieced together from its component parts" (Palmer, 1933, cited in Cortes, 2004, p.398). At the same time, it was used to describe the habitual occurrence of a word with another word or other words (Firth, 1951). On the other hand, lexical bundles are identified empirically, rather than intuitively, as word combinations. In addition, frequency of occurrence is the defining characteristic for lexical bundles (Cortes, 2004).

4) **Chinese Papers/RAs** are agricultural science RAs which are written in English and published in China.

5) **International Papers/RAs** are agricultural science RAs which are written in English and published internationally.

6) **Chinese/Local Corpus** is a corpus of forty-five agricultural science research articles with a total of 84,928 words. In particular, these articles were selected from five English journals published in China in three sub-fields of agricultural science, including animal science, food science and plant science.

7) **International Corpus** refers to a corpus of forty-five RAs with a total of 170, 857 words from twenty-two peer-reviewed international journals in the three sub-fields of agricultural science: animal science, food science and plant science.

1.9 Summary

This chapter presents a pedagogical need to conduct this corpus-based contrastive genre analysis, in order to help learners write scientific RAs effectively, particularly Chinese learners. To clearly describe the goal of the present study, Chapter 1 presents the background of the research, the research problem, the rationale of the study and the significance of the study. Then, the research objectives are identified, and the similarities or differences of move structures and lexical bundles are investigated in agricultural science RAs between the corpora. It is hoped to generate a discipline-specific list of lexical bundles. In addition, the scope and limitations of the study and the key terms used in the study are defined. In the following chapter, a review of the theoretical background and previous studies will be discussed.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter reviews the theoretical framework and previous studies relevant to the proposed research. It begins with the introduction of genre analysis with the purpose of establishing the theoretical framework for the present study, followed by a section which reviews previous studies on move analyses of RAs varied with a variety of IMRD sections for whole articles. However, move analysis alone has its unavoidable disadvantages. Then the third section is concerned with corpus linguistics theory with a focus on the interface between move analysis and a corpus-based approach to academic writing. Subsequently, the fourth section deals with corpus-based research on linguistic features of RAs with a focus on lexical bundles. Finally, this chapter ends with the introduction of the proposed research after a critique on move analysis of previous studies of RAs.

2.1 Genre Analysis

The primary goals of the present research were to examine the move structures of agricultural science RAs between the two corpora and to find out the possible similarities or differences by using Swales' move analysis. In order to facilitate an understanding of genre analysis, Section 2.1.1 introduces the development of genre analysis. Next, Section 2.1.2 specifies three approaches to genre analysis and comments on them. Finally, Section 2.1.3 discusses contrastive rhetoric theory taking into account the role of cultural background in writing.

2.1.1 Development of Genre Analysis

The development of genre analysis has been classified into 4 phases by Bhatia (1993). These include register analysis (surface-level linguistic description), grammatical-rhetorical analysis (functional language description), interactional analysis (language description as discourse), and genre analysis (language description as explanation). First, register analysis, starting in the 1960s, is one of the earliest approaches to describe varieties of language use with a heavy emphasis on the description of vocabulary and grammar, but it fails to probe into the organization of information in certain discourse. Next, grammatical-rhetorical analysis, popular in the 1970s, addresses the relationship between grammatical choice and rhetorical function in written English for science and technology. Again, this approach overemphasizes the study of particular linguistic features and limits itself to a surface-level description of discourse, thus failing to provide an account for why certain discourse displays certain linguistic features. Then, interactional analysis prevailed in the 1970s and 1980s by showing a concern for the interaction between a writer and a reader. However, this ignores the social-cultural, institutional and organizational constraints and expectations that shape the written genre in a particular setting. In contrast with interactional analysis, genre analysis interprets the underlying interactions between a writer and a reader and the structure of discourse, revealing a specific method of accomplishing social purposes and constraints in structure discourses. Surprisingly, the most striking characteristics of genre analysis lie in its explanatory features compared with the descriptive method by means of integrating linguistic with sociological and psychological methods.

In conclusion, Bhatia's view indicates that genre analysis combines the effects of register analysis, grammatical rhetorical analysis and interactional analysis. This might be the reason why numerous researchers prefer this approach. The following section reviews three approaches to genre analysis with a focus on the English for Specific Purposes (ESP) approach which was adopted in the present study.

2.1.2 Three Approaches to Genre Analysis

Hyon (1996) distinguished three "worlds" of genre scholars: English for Specific Purposes, New Rhetoric and Australian theories/the Sydney school, according to the different theoretical and pedagogical orientations of their proponents. These three approaches overlap in their ways of interpreting purpose, form and context and are distinguished by the emphasis given to text or context.

2.1.2.1 English for Specific Purposes

The ESP approach to genre was developed by practitioners, who worked in the field of ESP for the purpose of developing pedagogic materials for NNES speakers. This began with Swales' pioneering works on analysis of the Introductions of RAs (Swales, 1981) and continued with its refinements in 1990 and 2004.

Definitions of genre are provided by the best-known scholars of this group: John Swales and Vijay Bhatia. Specifically, Swales (1990) describes "genre" as a class of communicative events, the members of which share the same set of communicative purposes. This rationale shapes the schematic structure of the discourse and influences choice of content and style. Following Swales' definition, Bhatia (1993) makes a further elaboration and points out that each genre is an instance of a successful achievement of a specific communicative purpose using conventionalized knowledge of linguistic and discoursal resources. Despite the differences in these definitions, both of them defined genre as a certain type of communicative event with a particular purpose.

Central to the notion of genre in the ESP domain is the "move structure" analysis, which classifies segments of text according to their communicative purpose for a particular genre. "Move analysis, as articulated by Swales, represents academic RAs in terms of hierarchically organized text made up of distinct sections; each section can be subdivided into moves, and each move can be broken into steps" (Kanoksilaptham, 2005, p.271). Many researchers give different meanings to the recognition of "move" and "step", such as, "moves are discriminative elements of generic structure" (Bhatia, 1993, p.30). Nwogu (1997, p.122) further specifies the definition of "move" "as a text segment made up of a bundle of linguistic features (lexical meaning, propositional meanings, illocutionary forces, etc.) which give the segment a uniform orientation and signal the content of discourse in it". Yang and Allison (2003) state that a move is a semantic unit of text achieving a unified purpose in ESP genre analysis. This means that, the concept of "move" captures the function and purpose of a segment of text at a more general level, while "step" provides a more detailed rhetorical means of realizing the function of a move. The set of steps for a move is the set of rhetorical choices most commonly available to RA writers to realize a certain purpose. That is, the order of steps presented in each move shows a preferred sequence for the choices to occur when in combination.

Such sequences, sometimes referred to as a genre's schematic structure, are likely to vary between different sections of RA. Some moves may be optional, some may be obligatory, some may occur in a different order, some may be embedded in others, and some may be recycled (Swales, 1990). Knowing how to perform a genre involves knowing both its schematic structure and generic specific language features. However, Swales does not explicitly describe the relation between the specific moves and steps with particular linguistic realizations at the lexicogrammatical level. Following his model, analysts use their intuitive knowledge in identifying the functions of particular elements of text.

Nevertheless, Swales' analysis has been successfully extended to other sections of RAs in various academic disciplines (e.g. Nwogu, 1997 on medicine; Posteguillo, 1999 on computer science, Kanoksilapatham, 2005 on biochemistry). Later, Bhatia (1993) successfully extended Swales' work to include professional settings by examining two types of business letter: the sales promotion letter and the job application letter. Findings reveal that both of them belong to the promotional genre due to the fact that they share the same communicative purpose. By using a similar methodology, other ESP practitioners have applied move structure analysis to explore the generic pattern in academic and professional settings, such as magazines and newspapers (Nwogu, 1997), public reports (Harvey, 1995), letters of application (Henry & Roseberry, 2001), and dissertation acknowledgements (Mingwei & Yajun, 2010).

Despite its positive effects in academic and professional settings, the ESP approach to genre analysis has some drawbacks. First, move structure analysis tends to be subjective because it depends, to a great extent, on the researcher's intuition or global understanding of the text (Paltridge, 1994). Second, Hyon (1996, p. 695) claims that "…many ESP scholars have paid particular attention to detailing the formal characteristics of genres while focusing less on the specialized functions of texts and their surrounding social contexts". This sociocultural context has been addressed in the New Rhetoric approach outlined below.

2.1.2.2 New Rhetoric

New Rhetoric research, adopted particularly in North America, emerges from a variety of disciplines concerning L1 teaching, including rhetoric, composition studies, and professional writing. A rather different way of looking at genre, it focuses more on situational context than linguistic forms with an emphasis on social purposes and actions (Hyon, 1996). Miller (1984), one of the most influential members of the New Rhetoric group, argues that a definition of genre should place stress on the actions used to accomplish their purposes rather than substance or form. Further, Miller (1994) defines genre as a "cultural artifact". She suggests that, to fully understand genres, we should understand the culture of which they are constituents. Genre, in this sense, could be regarded as part of the social processes by which knowledge and facts are made (Freedman & Medway, 1994).

The other way in which the New Rhetoric approach differs from the ESP analyses is that rhetorical scholars have attempted to adopt ethnographic rather than linguistic methods for providing detailed descriptions of the contexts surrounding genres and the actions they perform within these contexts (Hyon, 1996), such as participant observation, interviews, and descriptions of physical settings and analysis of texts (Hyland, 2004). From the New Rhetoric researchers' perspective, the linguistic approach over-emphasises the conventional nature of form-functional relations at the clause level, thereby neglecting the potential for creativity within genres (Flowerdew & Wan, 2010).

2.1.2.3 Australian theories/The Sydney School

Australian genre theory, also known as the Sydney School (Hyon, 1996), is grounded in systemic functional linguistics (SFL) as developed by Michael Halliday. SFL makes four main theoretical claims about language: that language use is functional; its function is to make meanings; meanings are influenced by social and cultural context; the process of using language is a semiotic process in which people make meanings by making linguistic choices (Eggins, 1994). SFL suggests that text structures and language vary from context to context, but, within that variation, there exists comparatively stable patterns shaping the organization of texts in appropriate contexts (Johns, 2011).

The Sydney School employs a methodology derived from Hallidayan systemic-functional linguistics, aiming to identify the close correlations between form and function realizing a characteristic of a specific genre (Flowerdew & Wan, 2010). From its perspective, the forms of language are shaped by key features of the context of situation which can be described in terms of register variables: field, tenor and mode (Halliday, 1994; Halliday & Hassen, 1985). Field refers to what is happening, i.e. the activity that is going on. Tenor refers to who is taking part, i.e. the relationship between participants. Mode refers to what part the language is playing, i.e. the channel of communication. These three elements, then, together determine the register of language (Hyon, 1996).

Register is more central than the notion of genre in SFL, yet, Halliday's followers, most notably Jim Martin, developed the definition of genre in line with Halliday's concern for linking form, function and social context. In this regard, genre has been defined "as staged, goal-oriented social processes, structural forms that cultures use in certain contexts to achieve various purposes" (Hyon, 1996, p.697). In analyzing these social processes, the Sydney School scholars, quite differently from both ESP and New Rhetoric scholars, focused mainly on primary and secondly school genres and nonprofessional workplace texts rather than on university and professional writings.

In conclusion, the three approaches; namely, ESP, New Rhetoric and Sydney School have made a common attempt to describe purpose, form and situated social action. On the other hand, they clearly differ in the emphasis they give to a text or a context, the research methods they employ, and the types of pedagogies they encourage (Hyland, 2002). Specifically, first, the ESP approach gives emphasis to discourse structure; whereas New Rhetoric emphasizes social context and Australian linguistics explicitly and theoretically connects grammar and lexicon as well as discourse structure to social function. Second, ESP analysis employs an analytical approach to text by analyzing the formal characteristics of texts through moves, steps and linguistic signals, rather than through the functions of texts in their social contexts as stressed by Australian genre theories, but the New Rhetoric theorists would prefer an ethnographic methodology. Third, the educational context for ESP is primarily the instruction of NNES speakers in university, while Australian genre studies focus primarily on mother-tongue education in primary and secondary schools; and the New Rhetoric school focuses on mother-tongue education at advanced (post-) graduate levels. Regarding the purpose of this proposed study, an ESP approach was adopted as an analytical framework to analyze the discourse structures of agricultural science RAs in local and international corpora. Likewise, such move structures were compared between the two publication cultures. Thus, the following section reviews contrastive rhetoric theory to see how discourse structure varies along with cultural backgrounds.

2.1.3 Contrastive Rhetoric Theory

Contrastive rhetoric (CR) is defined as "an area of research in second language acquisition that identifies problems in composition encountered by second language writers and, by referring to the rhetorical strategies of the first language, attempts to explain them" (Connor, 1996, p. 5). Clearly, the main concern of CR is to investigate the similarities and differences between writings in the first and second languages in order to understand the interrelationship of L1 and L2 writing patterns and strategies. With this in mind, language and culture are considered as cultural phenomena (Kaplan, 1966; Connor, 1996).

Kaplan's (1966) study provides the initial work of CR in the field of applied linguistics (Connor, 2002), extending the rhetorical analyses to the discourse and textual level. In this study, he observes that certain ESL students from diverse linguistic backgrounds employ recognizable rhetorical movements, when they write an English paragraph. Also, he distinguishes five different movements for five language families: English, Romance, Russian, Oriental, and Semitic. His study marks the beginning of the field of CR.

The Sapir-Whorf hypothesis, as the theoretical framework of CR, had two versions: a strong and a weak one. In particular, the strong version stipulates that language controls thoughts and perceptions of reality. Thus, different languages dictate thoughts in different ways. Despite the fact that a strong version of "Linguistic Determinism" has been proven problematic, a wide range of cross-cultural studies have indicated that language plays a role in formulating people's thinking (Loi & Evans, 2010; Çandarlı, 2012). This was interpreted as a weak version of the Whorfian hypothesis known as "linguistic relativity", suggesting that one's native language influences one's thinking. Being deeply influenced by the Sapir-Whorf hypothesis of linguistic relativity, Kaplan (1966, p.2) claims that not only does cultural variation exist at the level of sentence, grammar, and vocabulary, but "logic *per se* is a cultural phenomenon as well". Rhetoric, having its basis on logic, is not universal either; it varies from culture to culture, and within the same culture it evolves over time. Language not only determines thought, but more importantly, logic and rhetoric are interdependent as well as culture specific (Connor, 1996).

Research into CR is often closely related to genre-specific studies, for example, research articles (Connor, 1996), with the purpose of helping NNES researchers read, write and interact with research that is predominantly written in English (Swales, 1990; Connor, 1996). In particular, Martín Martín (2003) compared English and Spanish RA abstracts in experimental social science RAs. He found that Spanish abstracts in this field almost agree with the international academic conventions, which are established by English native speakers. However, the variations were detected in the occurrence of frequency on the introduction and result moves. Moritz, Meurer and Dellagnelo (2008) compared research article conclusions in three ways: research article conclusions written in Portuguese as L1 (PL1), English as L1 (EL1) and English as L2 (EL2). Thirty-six RAs in applied linguistics, twelve for each group, were analyzed. The results seemed to demonstrate that EL2 writing parallels PL1 and EL1 writings regarding the features of cyclicity of moves/steps and the occurrence of frequency of Move 6 (Making deductions from the research), which is a obligatory in the conclusions of three language versions. Çandarlı (2012) examined variations of move structures between Turkish and English research abstracts by adopting Swales' framework of move analysis (Swales, 2004). The significant difference was found in the frequency of Move 2, where writers justify their work in their research field. Therefore, we can tentatively draw a conclusion from previous studies that move structure of RAs was varied according to different languages.

At the same time, with the rapid development of the genre analysis theory in China, many Chinese researchers come to take the contrastive study. For example, Gao (2007) compared Discussion sections written between English and Chinese linguistic RAs and summarized their differences and similarities in both macro-structure and linguistic features. Li (2010) compared move structures of the Introduction section between English and Chinese social science RAs, based on Swales' (1990) CARS model. The results showed that both English and Chinese RAs were similar in terms of the presence of moves. But they varied in choice of steps and the discrepancies can be found in three moves. Zheng and Zheng (2012) investigated the generic structures of sixty abstracts from English teaching and learning journals written by Chinese and English native writers respectively. The results showed that, first, English natives tended to write longer abstracts than Chinese counterparts; second, the move structure of the abstract written by English natives appeared to be more complete than that written by Chinese writers; third, English natives tended to give more information of the background, whereas Chinese writers focused more on the explanations of the results. The similar studies have been done by many other researchers on different sections, such as, the Review of Literature section (Zhu & Jin, 2010) and the Methods section (Huang & He, 2010). Taken together, the findings of previous studies indicated that, first, the differences between English and Chinese writing in RAs existed; second, Chinese writing was commonly viewed as circular, indirect and reader-responsible. On the contrary, English writing was viewed as linear, direct and writer-responsible; 3) most of them seemed to focus on individual sections of RA, particularly on abstracts. However, contrastive analysis on IMRD sections as a whole entity seems limited. The related previous RA studies are reviewed in a separate section designated specifically for it.

2.2 Previous Studies of Move Analysis of RAs

Since Swales (1981) originally put forward his CARS model, which provides a move analysis of Introductions to RAs, there have been numerous investigations of this type, with perhaps the most studied academic genres being the RA and the thesis. Within the genre of scientific RAs, a number of move-based studies tended to focus on individual sections of research articles, while fewer studies have focused on all four sections (IMRD) of RAs. In order to illustrate how move structure varies across disciplines and cultures/languages, studies of the four conventional sections of experimental RAs are reviewed with respect to specific-discipline features, discipline variations and cultural/linguistic variations.

2.2.1 Move Structure of Research Article Introductions

The Introduction, among other research article sections, has received special attention particularly following Swales' (1990) (CARS) model. These studies have shown that, in general, the CARS model can account for the structural organization (move structure) of RA Introductions with a certain discipline, within disciplines or between different cultures and languages.

The CARS model was first created by Swales in 1981 as an attempt to account for the rhetorical organization of RA Introductions. In this study, forty-eight RAs were selected for rhetorical analysis from three fields: biology, medicine and soft sciences, 16 from each field. A common pattern emerged from all of the articles and across the three different fields. The recurring pattern was then identified as the rhetorical moves of RA Introductions as shown in Table 2.1.

Table 2.1 The CARS Model by Swales 1981 (p.21)

Move 1	**Establishing the field by:** a) showing centrality b) stating current knowledge c) ascribing key characteristics
Move 2	**Summarizing previous research**
Move 3	**Preparing for present research by:** a) indicating a gap b) questioning raising c) extending a finding
Move 4	**Introducing present research by:** a) giving the purpose b) describing present research

Even though Swales' (1981) model attracted immediate attention, problems occurred when Crookes examined the structure of twenty-four Introductions from hard and soft science by using this model (Crookes, 1986). First, Crookes pointed out difficulties in separating Move 1 *Establishing the field* and Move 2 *Literature review.* Besides, Crookes found that soft sciences tended to have longer Introductions, thus potentially leading to cycling of Move 2 *Literature review* and Move 3 *Preparing for present research: niche*. As a result, he concluded that the CARS model should be modified to account for these observations.

In order to correct the problems of his 1981 model, Swales himself refined the CARS model in 1990. The newer version of the CARS model consists of three moves instead of four, by including Move 2 *Literature review* in Move 1 *Establishing the field* as one of the steps. Swales makes room for the cycling of the Step *Literature review* within Move 1 by adding "and/or". That is, Step 3 *Literature review* can come after Step 1 *Claiming centrality* as well as Step 2 *Topic generalization*. Although Swales (1990) admits the possibility of the cycling of Move 1, Step 3 *Literature review* in Move 2 *Establishing a niche*, his 1990 model does not contain the Step *Literature review* in Move 2. However, he seems to be open to the possibility of the recurring appearance of the literature review throughout the Introduction section. Again, two more steps were added to Move 3 as shown in Table 2.2.

Table 2.2 The CARS Model by Swales 1990 (p.141)

Move 1	**Establishing 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 1 A Counter-claiming or Step 1 B Indicating a gap or Step 1 C Question-raising or Step 1 D Continuing a tradition
Move 3	**Occupying the niche** Step 1 A Outlining purposes or Step 1 B Announcing present research Step 2 Announcing principal findings Step 3 Indicating RA structure

In 2004, Swales fine-tuned his 1990 model (Swales, 2004) to accommodate new findings found by himself and other researchers (e.g. Samraj, 2002) as shown in Table 2.3. The most significant modification within Move 1 was the reduction of Step 1 *Claiming centrality* and Step 2 *Making topic generalization* to a single Step of *Topic generalization of increasing specificity*. As for Move 2, the four steps (Step 1 A *Counter-claiming*, Step 1 B *Indicating a gap*, Step 1 C *Question-raising* and Step 1 D *Continuing a tradition*) were reduced to Step 1 A *Indicating a gap* and Step 1 B *Adding to what is known*. A new optional Step 2 *Presenting positive justification* was added. Move 3 *Occupying the niche* is achieved through seven steps in contrast to three steps in the 1990 model. Another significant improvement was considering Move 1 Step 3 *Reviewing items of previous research* as a pervasive rhetorical device, which is no longer restricted to one exclusive move, but one which can occur throughout the whole RAs. However, despite the modifications, subsequent research on the rhetorical move structure of RA introductions has largely adhered to the 1990 model. A major reason why few studies have used the 2004 model as a framework might be that it basically describes the underlying structure of the 1990 model, and outlines possible additional steps within the moves without radically modifying them.

Table 2.3 The CARS Model by Swales 2004 (pp.230-231)

Move 1	**Establishing a territory (citations required)** via Topic generalizations of increasing specificity
Move 2	**Establishing a niche (citations possible)** via Step 1 A Indicating a gap or Step 1 B Adding to what is known Step 2 Presenting positive justification (optional)
Move 3	**Presenting the present work (citations possible)** via Step 1 Announcing present research descriptively and/or purposively (obligatory) Step 2* Presenting RQs or hypotheses (optional) Step 3 Definitional clarifications (optional) (optional) Step 4 Summarizing methods (optional) Step 5 Announcing principle outcomes (PISF**) Step 6 Stating the value of present research (PISF) Step 7 Outlining the structure of the paper (PISF)

* Steps 2-4 are not only optional but less fixed in their order of occurrence than the other

** PISF: Probable in some fields, but unlikely in others

The later studies, which were based on the newer version of CARS, acknowledged two facts: the validity of the CARS model as a holistic tool for analyzing RA Introductions and the specific disciplinary variations. Anthony (1999) evaluated Swales' (1990) model for describing the structure of RA Introductions in software engineering. In total, twelve RAs, which received "Best Paper" awards in the field of software engineering, were analyzed. To ensure the validity of the interpretations, after the initial analysis was completed, the results were discussed with four specialist informants in software engineering. The analysis revealed that the CARS model is very successful in terms of describing the overall structure. However, a few aspects do not fit the model, including the classification of definitions and examples, an extensive review of background literature and an evaluation of research.

The CARS model could not be applied completely to all disciplines because disciplines have their own conventions and their rhetorical devices to express their specific rhetorical functions (Bazerman, 1999). Following the same line of Anthony's (1999) research, Samraj (2002) examined the disciplinary variations between two related fields: Wildlife Behavior and Conservation Biology. Twelve RAs from the two fields, all published in 1995, were randomly selected from two journals which were central to these fields. Three moves were identified in her corpus, revealing disciplinary variations in the structure of this genre. For example, the review of literature can be found in all three moves both in Wildlife Behavior and Conservation Biology, and it is not only limited to Move 1 as proposed in the CARS model. But it served different rhetorical functions in each move: presenting background information in Move 1, Step 2, elaborating on the gap in research in Move 2, Step 1 and specification of the goal of the study in Move 3, Step 1. These results suggested that a deeper exploration is needed in Swales' (1990) model to explain the structures found in the Introductions analyzed.

Apart from the interdisciplinary variations mentioned above, intradisciplinary variations were also found by using the CARS model. Ozturk (2007) compared the move structure of research article Introductions between two sub-disciplines of applied linguistics: second language acquisition (SLA) and second language writing research (SLW). Twenty RAs were analyzed, ten from each sub-field. The findings suggested that the predominant structure in SLA was M1-M2-M3. This seems to support Crookes' (1986) observation that the pattern proposed by Swales (1981) occurs in shorter RA Introductions, but that in longer ones "a variety of alternatives is possible" (p.65). That is, the M1-M2-M3 structure is expected to occur in shorter Introductions. In this sense, SLA is considered an "established" area of study that occupies a relatively discrete and clearly defined area of study within applied linguistics. As a result, most RAs in SLA followed this move sequence. Moreover, two different move structures were almost equally predominant in the organization of RA Introductions in SLW (M1-M2-M1-M3, 40%; M1-M3, 30%). This could be explained by the fact that SLW was an emerging field of inquiry.

Another area of study, which is growing in importance, is to test the CARS model for cultural variations. Attention has been given to exploring the extent to which native languages resemble or differ from English RA move structures. Probably, Taylor and Tingguang's (1991) investigation was the first published study to explore language variations between Chinese and English. They tended to examine the rhetorical organization of English research article Introductions written in three ways (in Chinese, in English by Chinese writers and in English by English L1 writers) with the focus on investigating the social-cultural differences. In this study, thirty-one articles selected from hard science (mineral processing, geophysics, and materials engineering) were analyzed, showing that twenty RA Introductions written by Chinese writers both in English and Chinese differed from their English counterparts in three aspects. First, the twenty articles written by Chinese writers were shorter than those of their English counterparts. Second, Chinese writers seemed to cite fewer citations; meanwhile they decline to expose the names of other researchers they disagreed. Thus, creating a niche is not as straightforward in Chinese as it is in English. Third, the manner in which they realize their moves were different. For example, the Chinese writers prefer non-threatening and face keeping techniques in their writing more than their English counterparts do.

Rather than seeking socio-cultural differences, two studies conducted by Loi (2010) and Zhang and Hu (2010) demonstrated the fit between the CARS model and the move structure of RA Introductions in Chinese and English. Specifically, Loi (2010) examined forty articles in educational psychology (twenty English and twenty Chinese) by using the CARS (1990, 2004) model, showing that Chinese Introductions share three similar moves and eleven similar steps to those found in English Introductions. Concerning the cyclical pattern, only five out of the twenty Chinese Introductions exhibit a cyclical order of moves. On the other hand, all twenty English Introductions have a cyclical structure, revealing that Move 1 *Establishing a territory* contributes to the extra length of the English Introductions. Similarly, Zhang and Hu (2010) focused on the move structures of RAs between Chinese and English, but in the field of medical science. The results showed that Chinese and English writing have a great resemblance at the macro-structural level, which to some extent indicates the universal characteristics shared in the genre of academic writing.

In addition to language variation between English and Chinese RA Introductions, researchers have also become increasingly interested in comparing RA Introductions written in English with RA Introductions in other languages, such as Korean (Lee, 2001), Persian (Mahzari & Maftoon, 2007), Spanish (Soler-Monreal, Carbonell-Olivares, & Gil-Salom, 2011), Brazilian Portuguese (Hirano, 2009), and Thai (Jogthong, 2001). While most cross-linguistic variation studies have compared two different languages, Sheldon (2011) conducts an interesting three-way comparison. She investigates 54 applied linguistics RA Introductions in English and Spanish as well as RA Introductions written in English by Spanish-background speakers. The English L1 texts are found to conform to the CARS schema, but the Spanish L1 texts exhibit some considerable culture-specific features. The English L2 introductions, however, have a greater affinity with the CARS model as they are intended for an international readership.

More recently, Amnuai and Wannaruk (2013a) compared move structure of RA Introductions in English published in Thai journals with those published in international journals. In this study, twenty applied linguistics English RAs were purposively selected from seven local Thai and seven international journals. The two corpora were analyzed based on Swales' (2004) model, showing that both local Thai and international RAs were similar in move structure concerning the presence of moves. However, they differed in frequency of moves and steps. At the same time, M1-M2-M3 was favored in the two corpora and Move 1 was the most frequent cyclical move.

In sum, a number of studies have been carried out using the Swales' CARS model as an analytical tool to investigate the characteristics of RA Introductions from different academic fields to different languages/cultures. Apart from the move analysis of the whole Introduction section in different disciplines, some researchers just analyzed one particular move in this section; for example, Shehzad (2008) (Move 2 in computer science RA Introductions). Much of the attention given to this section of RAs can be explained for three reasons. First, the Introductions play a crucial role in attending to "the need to re-establish in the eyes of the discourse community the significance of the research field itself; the need to 'situate' the actual research in terms of that significance; and the need to show how this niche in the wide ecosystem will be occupied and defended" (Swales, 1990, p.142). Second, this section is particularly difficult for researchers to write, thus attracting increasing attention in the exploration of the move structure of the Introduction (Flowerdew, 1999a). Third, Swales (1981, 1990, 2004) provides a very detailed model for facilitating the writing of the Introduction.

2.2.2 Move Structure of Research Article Methods

After the Introduction, the second major section, often labeled the Methods, describes the materials and experimental procedure employed in the study with the function of showing the readers how the experiment was carried out. Swales (1990) advises that it is useful for readers who are interested in replicating or extending the study. However, very little previous research has apparently examined the individual section of Methods, and there appears to be no model of its move structure in contrast to models of the Introduction. This might be due to the fact that the Methods are highly specialized and heavily content-oriented.

Wood (1982) might be the first researcher to determine the move structure of the Methods by adapting Swales' model of Introductions. In this study, ten chemistry RAs were analyzed and three moves were found, including 1) describing the sample, 2) describing an apparatus, and 3) describing experimental procedures. As noted by Wood, Moves *Describing an apparatus* and *Describing experimental procedures* were optional because it was unnecessary to present information about the apparatus and the experimental procedure if they were commonly used in their discipline.

Unlike Wood's (1982) study, Lim (2006) provided a very detailed move-and-step analysis linked to linguistic features. He analyzed twenty methods texts from two business management journals and found three moves with twelve steps. The three moves included *describing the data collection procedures*, *delineating procedure/s for measuring variables* and *elucidating data analysis procedure/s*. Move boundaries were identified based on the linguistic features and obvious markers. Also, Lim (2006) described the close relations between a writer's communicative purposes and the linguistics features used, revealing the pedagogical significance of the relation between linguistics features and language content. Certainly, writing courses should meet the needs of students who have difficulties in linking linguistic features with communicative functions in their writing.

Both Wood (1982) and Lim (2006) looked at a fairly small number of RAs from just one discipline. However, a more recent study carried out by Peacock (2011) reports a communicative move structure of 288 research article Methods across eight disciplines: physics, biology, chemistry, environmental science, business, language and linguistics, law, and public and social administration. Analysis of this large corpus found seven different moves, though not in all RAs and not necessarily in this order: *Overview, Location, Research aims/questions/hypotheses, Subjects/materials, Procedure*, *Limitations* and *Data analysis*. Clearly, striking differences were found across three sub-corpora, including the science sub-corpus (biology, chemistry and physics), the non-science sub-corpus and the environmental science sub-corpus. At the same time, environmental science differed in several ways from all the other disciplines, and thus those results were presented independently. In particular, the science sub-corpus shows that the three most frequent moves included *Procedure*, *Materials* and *Data analysis*, with the most typical move structure being 1) *Materials*, 2)*Procedure*, 3)*Materials,* 4)*Procedure,* 5)*Procedure* and 6)*Data analysis*. Conversely, the non-science sub-corpus had a greater variety of moves showing that the three most frequent moves contained *Procedure*, *Subjects* and *Data analysis.* The most typical move structure was 1)*Subjects*, 2)*Procedure*, 3)*Location*, 4)*Procedure* and 5)*Data analysis*. In addition, environmental science RAs have a longer and more complex Methods sections than RAs in any other fields, thus leading to a different move structure as follows: 1)*Location*, 2)*Overview*, 3)*Procedure*, *4)Limitations*, 5)*Procedure, 6)Data analysis*, 7)*Procedure* and 8)*Data analysis*. Again, these findings added to the knowledge of genre conventions in academic writing, therefore improving the understanding of the schematic structure of Methods and helping teachers or course designers prepare discipline-specific courses for students.

Contrastive studies, previously conducted on research abstracts and introductions, have been successfully extended to the section of Methods, such as Huang and He's (2010) work. In particular, taking Swales' (1990) model as a framework, they explored the differences in Methods written in English and Chinese in two disciplines: applied linguistics and medical science. Their corpus consisted of sixty experimental RAs, including fifteen RAs respectively from four aspects: international medical and applied linguistic journals and local medical and applied linguistic journals. The results showed that the field and language community the research article belongs to would affect the writing of Methods.

In sum, the move structure of Methods has been investigated from a single discipline to across disciplines to across languages, revealing that the discipline-specific organization of Methods can be very distinct. Uniform structure for this section seems unlikely; therefore, discipline-specific teaching of the Methods structure is appropriate and sensitivity to interdisciplinary variation is required for teachers of research writing.

2.2.3 Move Structure of Research Article Results

The third major section, called the Results, plays a primary role in a research report, in which researchers present the findings of the study and briefly comment on them. Move-based studies focusing exclusively on the Results include Brett (1994) in sociology and Williams (1999) in medicine. Some researchers study the language differences of move structure in the Results and Discussion, such as Atai and Falah (2005), or focus on combinations of the Results and the Discussion, such as Yang and Allison (2003).

Of these previous work, Brett's (1994) study is probably the most influential model so that recent researchers can adopt his framework as a reference to identify the move boundaries of the Results. Using Swales' (1990) model, he examined the Results of twenty sociology RAs and identified three major moves: *metatextual*, *presentation* and *comment* moves. Under each major move, sub-moves were covered as follows: First, a metatextual move consisted of *a pointer* and *the structure of section*. Second, the presentation move included *procedure*, *hypothesis restated* and *statement of data*.

Third, comment moves covered *comparison of finding with the literature*, *evaluation*, *further research suggested*, *implications* and *summarizing*. Additionally, he described each of the three major moves in terms of function, lexis, and grammatical form.

Later, Williams (1999) tested Brett's (1994) model by analyzing the move structure of eight medical RAs. In Williams' study, ten moves were found with some modifications (two metatext moves, four presentation moves and four comment moves). Specifically, they include: 1) *Pointer*, 2) *Structure of section*, 3) *Procedurel*, 4) *Statement of findings/result*, 5) *Substantiation of findings*, 6) *Non-validation of findings*, 7) *Explanation of findings*, 8) *Comparison of findings with literature*, 9) *Evaluation of findings re hypotheses*, and 10) *Interpretation of findings*. Further, research article results in medical science were divided into 5 or 6 subsections. In each subsection, cyclical patterning was commonly found to cope with the complex results of the study.

A further modification of Brett's (1994) model in William's study showed a tendency towards disciplinary variation, but the results remain to be substantiated. This might be due to the relatively small number of texts in William's corpus. More importantly, although eight articles belonged to the same discipline of medical science, they were mixed by different genres, such as a clinical report and an experimental study. For this reason, potential variations among the genre structure should not be ignored (Kanoksilapatham, 2007a).

In view of the limitations of William's (1999) investigation, Atai and Falah's (2005) study included eighty articles written in English by English L1 and Persian L1 with the same genre structure in applied linguistics. These texts were analyzed on the basis of Brett's (1994) model. Again, move identified in applied linguistics RAs do not completely correspond to Brett's (1994) model. These six moves found in eighty RAs included: 1.1-*pointer*, 2.1-*procedure*, 2.2-*hypothesis restated*, 2.3-*statement of data*, 3.1-*comparison with literature* and 3.2-*evaluation*. Specifically, both of the moves, *Pointer* and *Statement of data*, were found to be obligatory. At the same time, four of the moves found by Brett (1944) were absent, including 1.2- *structure of section*, 3.3-*further research suggested*, 3.4-*implications* and 3.5-*summarizing*. Their study shows a distinct possibility of disciplinary variation of the Results structure, although no significant differences were observed between English L1 and Persian L1 writers.

Another study, conducted by Yang and Allison (2003), was more concerned with the possible relationships between neighboring sections, such as the Results and Discussion or Conclusions. Their corpus consisted of twenty applied linguistic RAs and six moves were identified in the Results as follows: Move 1 *Preparatory information*, Move 2 *Reporting results*, Move 3 *Commenting on results* (*interpreting results*, *comparing with the literature*, *evaluating results*, *accounting for results*), Move 4 *Summarizing results*, Move 5 *Evaluating results* (*indicating limitations*, *indicating significance*), and Move 6 *Deductions from the research* (*recommending further research*). In addition to moves and steps, they observe that Results sections in applied linguistics generally have a highly cyclical structure, and they not only report results but also briefly comment on them, largely supporting previous findings on the same sections.

Since commenting on results is a key move in discussion of results section, Basturkmen (2009) particularly investigates the ways writers present their claims based on the results of their research. This researcher found that, first, the writers of the articles and dissertations discussed their results primarily through a series of Result-Comments Sequences; second, although the writers had options to select steps of “explaining”, “comparing the results with a result in the literature” and “evaluating a result”, most of them had a strong focus on “explaining”.

In sum, the Results section appears to have a uniform move structure in contrast to that of the Methods section. This is because two elements found in the Results (reporting results and commenting on them) appear to be shared by RAs Results sections in different disciplines, no matter whether we are dealing with “hard” sciences (e.g. medical science) or “soft” sciences (e.g. sociology and applied linguistics). In order to help writers link their comments with major categories of research results, the move of commenting on results has been in-depth analyzed in various disciplines, such as in applied linguistics and education (Lim, 2010) and in language teaching (Basturkmen, 2009).

2.2.4 Move Structure of Research Article Discussion

The purpose of the Discussion is to interpret and discuss the significance of findings, compare findings to previous studies and consider theoretical contributions or provide explanations for existing data. For this reason, the Discussion section has been understood to play an important role in research articles. Like previous studies of the other RA sections, particular attention has been given to the move structure of the Discussion in 3 aspects: discipline-specific features, disciplinary variations and language/cultural variations.

Of the previous studies on the Discussion section, Belanger's study (1982, cited in Swales 1990) perhaps was the pioneering work on the Discussion section. Following Swales' (1981) model of RA Introductions, 10 neuroscience Discussion sectoins were analyzed, revealing a 5-move sequence as follows: 1) *General introduction*, 2) *Summarizing results and stating conclusions with references to previous research*, 3) *What results suggest with references to previous research and/to the current work*, 4) *Further questions with possible explanations or with references*, 5) *General conclusions*. Among them, Moves 2, 3 and 4 were observed to occur in cycles according to the number of research questions.

While, Tony Dudley-Evans is probably one of the influential researchers to analyze the move structure of the Discussion section, as early as 1988 (Hopkins & Dudley-Evans, 1988). They have also underlined the cyclical organization of the Discussion section by analyzing unspecified number of master's theses in biology and conference proceeding papers in agricultural science. In this study, 11-move sequences were found, including 1) *Background information*, 2) *Statement of results*, 3) *(Un)expected outcomes*, 4) *Reference to previous research*, 5) *Explanation of unexpected results*, 6) *Exemplification*, 7) *Deduction*, 8) *Hypothesis*, 9) *Reference to previous research*, 10) *Recommendation*, and 11) *Justification*. These moves were noted to combine in a different way, yielding a cyclical pattern. Particularly when each result was discussed in turn, the move *Statement of results* was often repeated.

Later, Dudley-Evans (1994) proposed a 9-move sequence instead of a eleven-move sequence based on his previous empirical work. These nine identified moves included: Move 1 *Information move* (background about theory/research aims/methodology), Move 2 *Statement of results* (either a numerical value or reference to a graph or table), Move 3 *Findings* (same as statement of results, but without a reference to a graph or table), Move 4 *(Un)expected outcomes* (a comment on whether the result is expected or not), Move 5 *Reference to previous research*, Move 6 *Explanation* (reasons for unexpected results), Move 7 *Claim* (a generalization arising from the results: contribution to research), Move 8 *Limitations*, and Move 9 *Recommendations* (suggestions for further research). In contrast to the findings of Hopkins and Dudley-Evans' (1988) study, Dudley-Evans (1994) carefully pointed out that moves identified in the Discussion are cycled in a regular way, thus yielding a three-part framework as follows: I. Introduction (Moves 1, or 1+5, or 2/3); II. Evaluation (the "key move cycles" here are 2/3+5, 7+5, or 5+7), and III. Conclusion (Moves 3+7, or 9).

Using Hopkins and Dudley-Evans' (1988) framework in his analysis, Holmes (1997) finds considerable differences between soft science and hard science Discussion sections: 1) the chemical engineering Discussion sections contained more cycles, defined as segments of text beginning with Move 1 (Background information) or Move

2 (Statement of results), and were more complex than their soft science counterparts; 2) there is no completely obligatory move in soft science Discussion sections, whereas the four moves, including *Information*, *Statement of results*, *Comparison with previous results* and *Deduction*, always occurred in the chemical engineering texts.

Subsequently, Peacock (2002) tested Dudley-Evans' (1994) model by conducting a large-scale quantitative study of over two hundred fifty discussion texts across seven disciplines including, physics, biology, environmental science, business, language and linguistics, public and social administration, and law. A new model emerged based on the analysis of his corpus: Move 1 *Information move* (background about theory/research aims/methodology), Move 2 *Finding* (with or without a reference to a graph or table), Move 3 *Expected or unexpected outcome* (comment on whether the result is expected or not), Move 4 *Reference to previous research*, Move 5 *Explanation* (reasons for expected or unexpected results), Move 6 *Claim* [contribution to research (some with recommendations for action)], Move 7 *limitation*, and Move 8 *Recommendation* (suggestions for future research). He modified the framework by combining Move 2 *Statement of results (either a numerical value or reference to a graph or table)* and Move *3 Finding (same as statement or result, but without a reference to a graph or table)* into a new move, namely, Move *Finding (with or without a reference to a graph or table)*. Additionally, Peacock (2002) made a modification of the 3-part framework of the Discussion by adding new move cycles or deleting some move cycles. The modified 3-part framework was shown as follows: I. Introduction (Moves 1, or

2, or 6); II. Evaluation (the key move cycles are 2+4, 2+6, 3+4, and 3+5. Other less common cycles are 6+4 and 4+6); III. Conclusion (Moves 2+6, or 8, or 8+6, or 7+6). As claimed by Peacock, the model was broadly accurate overall, although there are differences between some disciplines, for example, the model was not very accurate for the field of public and social administration.

In addition to disciplinary variation, a few studies are concerned with the move structure of the Discussion in terms of linguistic/cultural variations, such as Atai and Falah (2005), Amirian, Kassaian and Tavakoli (2008) and Amnuai and Wannaruk's (2013b) studies. In particular, Atai and Falah (2005) studied cross-linguistic variation in the Discussion section following Swales' (1990) model. Both Moves *Explanation* and *Recommendation* occurred in Persian L1 corpus and English L1 corpus, but English L1 writers used these two moves more frequently than their Persian L1 counterparts. Conversely, the Moves *Unexpected outcome* and *Generalizability* were absent from the Persian L1 corpus. Atai and Falah (2005) attributed these differences to the peculiar conventions of the research article genre or cultural differences between English L1 and Persian L1.

Unlike Atai and Falah's (2005) study to compare move structures between different languages, Amnuai and Wannaruk (2013b) examined move structures of the Discussion section written in English but published in local Thai and international journals. In this study, sixty English texts in applied linguistics were analyzed, including thirty from local Thai journals and thirty from international journals respectively, following Yang and Allison's (2003) coding scheme. In total, seven moves emerged from the two corpora. The marked differences between the two corpora were found in Move 6 (Evaluating the study) and Move 7 (Deductions from the research). That is, Thai writers preferred to generalize their study (Move 7) to academic discourse communities more than their international counterparts. On the other hand, international writers appeared to evaluate their study (Move 6) more than Thai writers.

While these two studies above have investigated the move structure of the Discussion section in a 2-way comparison, Amirian, Kassaian and Tavakoli (2008) extended the contrastive study in an interesting 3-way comparison. They investigated 20 applied linguistics Discussions in English L1 and Persian L1 as well as English L2 by Persian speakers. Using Hopkins and Duddle-Evans' model (1988), they found considerable differences across the three corpora. With respects to variations between English L1 and Persian L1, three moves were found to be unique in Persian L1, including *Hedging statement*, *Reference to previously mentioned statement* and *Expressing wish for further research*. English L2 writers preferred to blend the "Results" and the "Discussion", however almost all the English L1 texts separated the two sections in content. Based on the findings of the English L1 corpus, a three-part model was proposed as follows: I. Introduction (*Presenting background*, *Reference to previous research* and *Statement of aims*); II. Body (*Findings*, *Explanations* and *References to previous research*), and III. Conclusion (*Restatement of findings*, *References to previous research*, *Limitations of the study* and *Recommendations for further research*).

In sum, the move analysis of RAs has been given considerable attention regarding Discussions, since Swales' pioneering work (1981) on the analysis of the moves in the Introductions of RAs. Although this section has been analyzed for different disciplines and for different languages, a uniform move structure still seems unlikely. This is possibly because researchers discussed the findings according to their communicative purposes. Thus, this necessarily leads to the need to raise awareness of disciplinary variations in ESP writing.

2.2.5 Move Structure of All Four Sections of RAs

Previous investigations tended to focus on the structure of only one or two sections of RAs with a particular attention on the Introduction and Discussion. As discussed in Chapter 1, it is much more useful to understand the complete move structure of RAs as a whole entity. However, to the best of our knowledge, only eleven studies deal with the move structure of all four sections of RAs. These include thee studies in medical science (ElMalik & Nesi, 2008; Li & Ge, 2009; Nwogu, 1997), two in computer science (Chang & Kuo, 2011; Posteguillo, 1999), two in biochemistry (Kanoksilapatham, 2005; Kanoksilapatham, 2007a); one in applied linguistics and educational technology (Pho, 2008b), one in applied linguistics (Amnuai, 2012), one in chemistry (Stoller & Robinson, 2013) and one in agricultural science (Shi, 2010) . Of these, four studies are not reviewed in this section because 1) Pho (2008b) and Amnuai (2012) focused on the soft science which is irrelevant to agricultural science; 2) Kanoksilapatham's (2005) framework was used as a reference for move identification and more details of this model are presented in Chapter 3; 3) Kanoksilapatham (2007b) used Kanoksilapatham's (2005) move structure of biochemistry RAs in English to compare them with biochemistry articles written in Thai. The remaining seven studies are classified and reviewed according to their fields.

The global structure of medical RAs has been examined in terms of moves and steps, originally by Nwogu (1997). Following Swales' (1990) model, Nwogu (1997) analyzed fifteen medical science RAs and identified the moves partly by inferencing from the context and partly by linguistic clues in the discourse. An eleven-move structure was identified: three in the Introduction, three in the Methods, two in the Results and three in the Discussion. This structure included Move 1 *Presenting background information*, Move 2 *Reviewing related research*, Move 3 *Presenting new research*, Move 4 *Describing data-collection procedure*, Move 5 *Describing experimental procedures*, Move 6 *Describing data analysis procedures*, Move 7 *Indicating consistent observations*, Move 8 *Indicating non-consistent observations*, Move 9 *Highlighting overall research outcomes*, Move 10 *Explaining specific research outcomes* and Move 11 *Stating research conclusions*. These results show that Moves 1, 6 and 8 were optional and the remaining moves were conventional. Although this study provided valuable insights into the nature of discourse organization in this genre of written discourse, it was limited in two aspects: First, Nwogu's (1997) corpus consisted of only fifteen articles so the generalization of his move analysis needs to be substantiated. Second, Nwogu (1997) just followed recommendations of medical specialists to select the journals, thus reflecting a strong individual preference rather than objectivity.

Using Nwogu's (1997) framework for reference, ElMalik and Nesi (2008) examined the cultural variations of medical RAs between ten papers written in English L1 and ten in English L2. The global structure of the two corpora was almost identical, although Move 1 was obligatory in the British and Sudanese articles, and Move 11 occurred in all the British articles, but only in seven Sudanese articles. Furthermore, clear differences were noted in the linguistic features to realize the rhetorical move functions. For example, Sudanese researchers made greater use of the passive than the British writers. The British researchers, on the other hand, were more likely to employ nominalization as an alternative means of depersonalizing their claims.

With a view to seeking structural and linguistic evolution, Li and Ge (2009) compared the English-medium medical RAs in twenty-five RAs published between 1985 and 1989, with twenty-five RAs published between 2000 and 2004, by using Nwogu's (1997) model. The results indicated that Moves 1 and 6 switched from optional to obligatory, while Move 9 switched from obligatory to optional. In terms of verb tense, the frequency of the past simple tense significantly increased in Move 3 as well as the present simple tense in Move 10. On the contrary, the frequency of the present perfect tense significantly decreased in Move 3 and Move 10. All in all, these three studies confirmed that medical RAs typically have a well-defined four-section organization, known as IMRD, while each section is clearly marked for its distinct communicative purpose by the name of the sections.

However, Posteguillo (1999) claims that the structure of computer science articles seems to depart from the IMRD pattern. In particular, Posteguillo (1999) only included the move analyses of Introductions, Results and Conclusions in his study because no clearly identifiable Methods was found in computer science RAs. The section following Introductions is conventionally termed “Methods” but computer engineers use the term “Preliminaries”, “Algorithms”, or “Analysis of a Problem” instead. He attributed this finding to the fact that computer science was a relatively new academic discipline at that time so the standard structure had not yet emerged. Another explanation is that his corpus mixed empirical RAs and theoretical papers because some articles were found to have the pattern of “problem-algorithm” or a “model-implementation” (Lin & Evans, 2012). A more recent study conducted by Chang and Kuo (2011) indicated that the Methods, the Results and the Discussion are often mixed between the Introductions and Conclusions in computer science RAs. Together, these results seemed to suggest that the IMRD pattern could not be applied systematically to RAs in computer science.

By adopting Kanoksilapatham’s (2005) framework, Shi (2010) identified a sisteen-move structure based on thirty agricultural science RAs: three in the Introductions, five in the Methods, four in the Results section and four in the Discussion. The differences were found not only at move level but also at step level, showing that the move structure of agricultural science RAs seemed to have its own format. However, the structural organizations were obtained only from thirty RAs so generalization from such move analysis is in doubt.

Stoller and Robinson’s (2013) study is perhaps the most recent investigation with emphasis on the structure of full-length RAs, particularly in the field of chemistry.

Following the seminal work of Swales (1990, 2004), ten articles were selected from each of the six target journals, yielding a corpus of sixty chemistry RAs. Of these, ten moves were found, showing a distribution of moves in each IMRD section, three for the Introduction section, three for the Methods section, two for the Results section and two for the Discussion. Yet, Stoller and Robinson's (2013) work was not adopted as a coding scheme in this study because that 1) their corpus mixed up RAs with stand-alone Results and Discussion or combined Results & Discussion pattern. In this case, potential variations among the different patterns can not be avoided; 2) ten-move structure was less detailed than sixteen-move structure identified by Kanoksilapatham (2005).

2.3 Corpus Linguistics and Move Analysis

While the genre-based approach is able to reveal the move structure of texts (Swales, 1990), corpus linguistics, on the other hand, is well-known as a powerful tool to extract the linguistic features occurring in a large number of texts (Biber, Conrad, & Reppen, 2000; Sinclair, 1997). However, little attention has been paid to a combination of the two approaches to discourse analysis. Therefore, the purpose of this section is to review the theoretical issues of corpus linguistics with a focus on a synthesis of a corpus-based approach and a genre-based approach to discourse analysis, showing that a combination of these two approaches can be beneficial.

2.3.1 Introduction to Corpus Linguistics

The issue of defining corpus linguistics has been debated for quite a long time due to the fact that the distinction between a theory and a methodology is blurred. For instance, some researchers often treated corpus linguistics as a methodology that can be applied to a wide range of linguistic study (Granger, Hung, & Petch-Tyson, 2002). Yet, some researchers raised the theoretical issues in corpus linguistics (Hunston & Francis, 2000; Mahlberg, 2005; Sinclair, 2004; Teubert, 2005). Teubert (2005) emphasizes corpus linguistics as a theoretical approach to the study of language. Similarly, Mahlberg (2005, 2006) proposed the term of corpus theoretical approach. Later, Mahlberg (2007) concluded the fundamental arguments in corpus linguistics as follows:

a. Language is a social phenomenon.

b. Meaning and form are associated.

c. A corpus linguistics description of language prioritizes lexis.

Clearly, the link between language and society receives particular attention in the work of Mahlberg. In her arguments, language is concerned with the social behavior in a discourse community. Meaning and form are associated; hence meanings should not be isolated from their forms and context. Then, repeated patterns can be observed in a corpus. Next, these repeated patterns are characterized according to their linguistic description. Certainly, a possible answer to the question as to whether corpus linguistics is a theory or a methodology is that it has a theoretical status as well as a methodological one, which has the potential to change perspectives on language.

Another fundamental issue, which needs to be addressed here, is the notion of representativeness in the corpora. This means that a more representative corpus will be better suited to answering the researchers' specific interests. For this purpose, it is certainly crucial to consider 4 variables which might have an effect on achieving representativeness through corpus design, including domain "topic" coverage (Biber, 1993), domain text type or register coverage (Sinclair, 1991), quality or relevance of texts sampled (Coxhead & Hirsh, 2007), and corpus size (Biber, Conrad & Reppen, 2000).

It is important to note that a corpus-based approach yields a reliable empirical investigation of authentic language use for 4 reasons: "1) It is empirical, analyzing the actual patterns of use in natural texts; 2) It utilizes a large and principled collection of natural texts, known as a "corpus", as the basis for analysis; 3) It makes extensive use of computers for analysis, using both automatic and interactive techniques; and 4) It depends on both quantitative and qualitative analytical techniques" (Biber, Conrad & Reppen, 2000, p.4). As can be seen then, the advantage of a corpus-based approach comes from the use of computers. This is because computerization is able to reduce or eliminate many of the aforementioned problems associated with non-computerized corpus studies and it enables researchers to have a much more stable and reliable way of storing large amounts of data.

However, as indicated by Hunston (2002), a corpus is of little use without an effective program to access it. For this reason, exploratory programs (e.g.Wordsmith, MonoConc, AntConc) are used to search through the corpora by presenting concordance lines and calculating frequencies. It is impossible to search for specific linguistic features from a raw corpus. Consequently, corpus annotation appears necessary by enabling researchers to extract linguistic features from annotated corpus in a number of ways.

Although a corpus-based approach is better than a native speakers' intuition or elicitation of artificial sentences for describing and explaining language (Biber, Conrad & Reppen, 2000), some criticisms have still been made against corpus-based approach to text analysis for 2 reasons. 1) A corpus-based approach works from the "bottom up". That is, the corpus-based methodologies lead to an investigation of language use which is limited to sentence-level or lexcio-grammatical patterning (Flowerdew, 2005). 2) Understanding language includes understanding social and contextual knowledge, not just knowledge of the language system (Tribble, 2002), whereas corpus methodologies ignore the contextual features of the text (Paltridge, 2006). Consequently, this limitation is problematic for researchers when analyzing pragmatic features of a text.

2.3.2 Interface between Corpus Linguistics and Move Analysis

Due to their innate limitations, it seems that neither corpus linguistics nor move analysis alone can provide detailed yet comprehensive description of language use. From this point, some studies actively seek an integration of corpus and discourse approaches. As far back as 1998, Flowerdew L. drew attention to the potential of corpus linguistics to contribute to the area of academic writing based on reviewing previous work. She called for the development of corpus techniques at the discoursal level instead of concentrating solely on the lexico-grammatical patterning of text. Also, she pointed out that this could lead to the improved exploitation of corpus findings for pedagogical purposes. Again, in 2005, Flowerdew saw that the corpus-based approach alone has unavoidable disadvantages and pointed out the need for integration of a corpus-based approach with move analyses. A combination of these two approaches can be seen in Kanoksilapatham's (2007a) and Flowerdew's (2008) work. Specifically, Kanoksilapatham provides a typical description of the discourse structure of each of the IMRD sections by integrating Swales' move analysis and Biber's Multi-Dimensional analysis approach to investigate the relation between moves and steps and their linguistic realizations. She is the first one to see corpus and move analysis as being complementary in specifying register variations across IMRD sections within the overall organizations of RAs. In relation to the concerns of contrastive corpus work, Flowerdew (2008) investigated the Problem-Solution pattern in technical reports written by professionals and students. She uses keyword analysis to identify the patterns realizing the move structure of this genre. More recently, Flowerdew and Forest (2009) further demonstrated the power of corpus techniques in investigating the relation between moves and steps and their linguistic realizations in the chosen genre, the PhD literature review. The study is presented as a contribution to genre analysis in showing the potential and value of investigating the realizations of patterns as well as move structure.

So far, the corpus-based approach has been distinguished as identifying the general patterns of discourse organization that are used to construct texts, whereas move analysis is more concerned with the macro structure of a text. Recent work seeks an integration of the two, suggesting that the corpus approach and move analysis should not be treated as opposing ideas, but as constituting a continuum. The next section reflects this view by reviewing previous corpus-based genre studies of RAs.

2.4 Corpus-based Studies of Linguistic Features of RAs

Although move analysis has provided valuable insights regarding the move structure of individual sections constituting complete RAs in various disciplines, learners need to know what linguistic features are conventionally used to realize the communicative purpose of move structure. As a result, the other line of research concerns the study of specific linguistic features, such as tense and voice, first person pronouns, and lexical bundles.

2.4.1 Tense and Voice

Corpus studies (Li & Ge, 2009; Salager-Meyer, 1992; Tseng, 2011) suggest that tense and voice are determined by the rhetorical functions of each move in RAs. Hence, increasing attention has been given to the correlation between tense/voice and moves in scientific RAs. As far back as 1982, Heslot (cited in Li & Ge, 2009) reported that the most frequently used verb tenses in RAs were the past simple tense, the present simple tense and the present perfect tense, based on a study of the tense distribution in a corpus of RAs in the field of plant pathology. Since then, a number of researchers have focused their studies on the use of these three most frequent used tenses at the move- or section-level.

Due to its important role in research communities, the genre conventions of abstracts have received considerable attention. For example, Salager-Meyer (1992) analyzed eighty-four medical RAs, case reports, and review articles and reported that because the past simple tense is concerned with a history type of discourse, it was widely used in the moves of *Purpose*, *Methods*, *Results*, and *Case presentation*. On the other hand, the present tense served the purpose of enhancing and emphasizing the generalizability of specific findings, thus being prevalent in the "comment" type of discourse in the *conclusion*, *recommendation*, and *data synthesis* moves. A recent work, carried out by Tseng (2011), examined the move structure of ninety abstracts in the soft science of applied linguistics. These two studies together showed that the present simple tense was used in the move of *Conclusions*, whereas the past simple tense was used in the moves of *Method* and *Results*. However, Salager-Meyer (1992) noted that the move of *Aims* was realized in the past simple tense, while Tseng (2011) found that this move was realized in the present simple tense. Thus, Tseng (2011) attributed this difference to disciplinary variation (i.e., medicine vs. applied linguistics).

Hanania and Akhtar (1985, cited in Gledhill, 2009) and Heslot (1982) found that the present simple tense is the key tense in the Introductions. Nwogu reflected this view in 1997 by examining the distribution of verb tenses in different moves in fifteen medical Introductions. For example, Move 1 *Presenting Background Information* was characterized by the predominant use of the present simple tense, while Move 2 *Reviewing Related Research* was characterized by the use of past simple, present simple and present perfect tense. Specifically, past simple tense refers to a single research event; on the other hand, both the present perfect and present simple tenses refer to more than one research event. However, the present simple tense refers to more than one previous research study even when those results have implications for new research. Move 3 *Presenting New Research* is realized by the use of the present simple and the present perfect tense.

Compared with the Introductions, the use of tense in the Methods and Results sections appears more uniform. Swales (1990) has noted that the most obvious feature of tense usage in the Methods and the Results is the consistent use of the past simple tense for methodology descriptions and results presentations. Later, findings from Nwogu' (1997) and Li and Ge's (2009) studies were in agreement with Swales' observation, revealing that Moves 4, 5 and 6 which correspond to the Methods, and Moves 7 and 8 which correspond to the Results, are expressed in the past simple tense.

Based on the Li and Ge's (2009) corpus, tense usage in the Discussion is complex, which is also in agreement with Burrough-Boenisch's (2003) findings. Despite the usage of the three common tense occurring in the Discussion, the moves of *Highlighting overall research outcomes* and *Explaining specific research result*s were characterized by the predominant use of the past simple and present simple tenses, while the move of *Stating research conclusions* was characterized by the predominant use of the present simple tense.

Of equal interest to that of tense, voice has also aroused the interest of the scholars who have analyzed their distributions and rhetorical functions. Biber et al. (1999) analyzed the distribution of voice choice in four registers, including academic writing, conversation, fiction and news. The passive voice was observed to be extremely frequent across four registers and often used in whole passages. Specifically, the short passive is far more common than the long passive, and was widely used in academic writing. In addition, Tarone, Dwyer, Gillette and Icke (1998b) summarized the discourse factors influencing the choice between active and passive verbs as follows: Generalization I: Writers tend to use the active verb forms to indicate points in their arguments where they have made a unique procedural choice; the passive seems to be used when the writers are simply following established or standard procedures. Generalization II A: The writer highlights the contrast between his own work and other contemporary work by the use of passive for reporting verbs. Generalization II B: The active form of the reporting verbs is used when writers just cite other contemporary work instead of making comparisons. Generalization III: The passive voice is used when writers refer to their own proposed future work. Generalization IV: The choice of voice seems to be conditioned by the discourse functions of focus or by the excessive length of certain sentence elements.

Apart from the studies of tense or the choice of voice alone, the correlation of tense and voice preferences has also attracted the attention of researchers (Shaw, 1992; Shi, 2011). For instance, Shi (2011) investigated tense and voice variation between the

Introduction and the Discussion in the context of agricultural science RAs. In this study, no predominant tense preference was found in the Introductions; while the past simple tense and the present perfect tense were the two fairly predominant tense preferences in the Discussion. On the other hand, voice preference follows the discourse function and use of some lexical words so writers prefer to use the active voice rather than the passive voice in the Introduction; whereas writers prefer to use the passive voice in the Discussion.

To sum up, considerable and substantial investigations have been conducted concerning tense/voice at different levels in RAs. These investigations varied from the straight counting of occurrences at section-levels or move-levels to the study of the relationships between specific verbs and their communicative functions and from the analysis of usage of tense or voice alone to the integration of tense and voice preferences. Generally, these studies of tense and voice conventions have provided significant pedagogical implications.

2.4.2 First Person Pronouns

Although scientific writing is generally characterized by the dense use of impersonalizing lexico-grammatical features, personalizing features expressed by, for instance, first person pronouns, also deserve attention. Research on first person pronouns indicate that they can be used by writers to express their stance, to communicate with readers and to establish their relations with the academic community of which they are, or they aspire to be, members.

The awareness of using first person pronouns was raised by Kuo's (1999) study, focusing on the role of personal pronouns used in thirty-six scientific journal articles from three journals in three scientific fields (computer science, electronic engineering, and physics). Kuo (1999) found that even in single-authored RAs, the writer refers to himself/herself as *we*. Meanwhile this research found that the first person pronoun *we* was used far more frequently than other types of personal pronouns for referring to the writers themselves (exclusive *we*). Kuo's findings were further supported by Hyland's investigation (2001) of two hundred-forty RAs in eight disciplines (mechanical engineering, electrical engineering, marketing, philosophy, sociology, applied linguistics, physics, and microbiology). Hyland focused on the use of self-citation and exclusive first person pronouns and found that first person pronouns, both singular and plural, are used to signal authorial identity.

In 2005, Martı´nez compared the use of first person pronouns (*we, our, us*) in biology RAs produced by native English-speaking writers and non-native English-speaking writers. Two corpora were compiled to examine the frequency and function of first person pronouns across the IMRD sections of RAs. The disaggregated analysis showed statistically significant differences between the usage of NES and NNES in the Results and Discussion sections. Interestingly, the differences observed in the Results section in the use of the personal pronoun between NES and NNES texts were almost six times higher in the NNES texts, clearly the NNES's lack of awareness of such a tendency. Considering that *we* was under-used in the NNES corpus, Martı´nez (2005) focused more closely on its use in the expert corpus, revealing that a high risk function, *Stating Results*, and a low risk function, *Explaining a Procedure*, revealed significantly greater use in the NES corpus, whereas in the NNES corpus a non-risk function, *Stating a Goal* was significantly higher. The problems of under-use, overuse or misuse might be solved by developing awareness by means of analyzing the function of a particular item in authentic texts or using concordances.

Subsequently, Due˜nas (2007) investigated the underlying reason why first person pronouns *I/we* in RAs written in English and in Spanish were used in a different way. Twenty-four business management RAs written in English and in Spanish selected from four journals showed that the number of *I/we* was much higher in the English corpus than in the Spanish corpus. Two possible reasons were found to explain the difference: One is that American scholars are facing fierce competition to publish their RAs in an international journal. They intend to present themselves as an original contributor to their academic discourse, by means of using first person pronouns in their RAs. The other reason is that Spanish writers seem to favor positive politeness strategies, which do not prompt the frequent use of self-mentions.

The above four previous studies investigated the frequency and function of first person pronouns across disciplines or across cultures. In 2009, Luzo´n (2009) particularly examined the collocates of *we* in a learner corpus, in addition to examining its frequency and discourse function. The learner corpus consisted of fifty-five writing assignments produced by undergraduate Engineering students, including twenty-three texts written by Computer Engineering students, nineteen by Industrial Engineering students and thirteen by Chemical Engineering students. The findings revealed that learners use *we* more frequently than expert writers, indicating a higher use of spoken language features in students' writing. This difference shows that Spanish Engineering students fail to use *we* effectively in the RAs genre, meanwhile, *we* was found to have nine discourse functions. Moreover, the clusters *going to*, *have to* and *want to* were found to be the three most frequently used collocations with *we*. Besides the three collocations, *we* appears to collocate frequently with the verbs *think*, *find*, *chosen*, *need* and *believe*.

It can be tentatively concluded that the distribution of first person pronouns seems to be influenced by the communicative purposes of first person pronouns across different IMRD sections or national cultures. Being aware of these factors is likely to facilitate writers' ability to present their authorial identity appropriately.

2.4.3 Lexical Bundles

Recurrent word combinations, ancestors of lexical bundles, were first identified through a frequency-based approach in the London-Lund Corpus of Spoken English edited by Altenberg (1998). With the purpose of determining actual amount of prefabricated language, Altenberg set the minimum frequency threshold at ten times per

million and limited the investigation scope to recurrent word combinations with a length of three or more words, for example, *I don't think that*, *do you know*, *on the other hand*. It is important to note that the majority of the word combinations do not have complete grammatical structures, with 76% being clause constituents and 14% incomplete phrases.

Biber et al. (1999) , following Altenberg's (1998) idea of recurrent word combinations, proposed the concept of lexical bundles, which "can be regarded as extended collocations: bundles of words that show a statistical tendency to occur" (Biber et al., 1999, p. 989). In order to identify the lexical bundles occurring in different registers, Biber et al. (1999) introduced distribution criteria to avoid individual idiosyncrasy in the identification process, besides adopting the frequency criteria first established by Altenberg (1998). This means that, word sequences, to qualify as lexical bundles, need to satisfy the criteria of a cut-off point of ten occurrences per million words in a range of five texts. Although these criteria represent a good starting point for lexical bundle identification in recent studies, they need to be altered depending upon the size and level of specialization of the corpora under investigation (Cortes, 2004, 2006; Hyland, 2008a; Jalali & Ghayoomi; 2010).

With this in mind, lexical bundles are characterized by their significant statistical features, which are distinct from idioms or multi-word fixed expressions (Moon, 1998; Saeed, 2003). As defined by Saeed (2003), an idiom means words collocated together which happen to become fossilized, becoming fixed over time, for example, *kick the bucket (die)*, and *spill the beans (to tell a secret)*. Moon (1998) distinguished fixed expressions and idioms (FEIs) from lexical bundles by means of three features, including institutionalization, lexicogrammatical fixedness and nomination. Since lexical bundles are sorted out mainly by the statistical feature of high frequency, they are not constrained by the three main features used to describe FELs.

Lexical bundles have been investigated according to two dimensions, namely structurally as well as functionally. In the first study of lexical bundles by Biber et al.(1999), they found that the structure types of lexical bundles have dependent relationships with a particular register. While forty-five percent of lexical bundles in conversations are used in the form of verbal and clausal units, such as, *I don't know why* and *I thought that was*, lexical bundles in academic prose are more likely to take the form of noun phrases with parts of prepositional phrases, such as, *the nature of the* and *the size of the*. The functional taxonomy of lexical bundles is developed by Biber, Conrad and Cortes (2004). By means of concordance lines and discourse context, they recognized three primary functions of the bundles: (1) stance expression, (2) discourse organizers, and (3) referential expressions. Additionally, they demonstrated a strong association between the structure and the function of the bundles. For example, VP-based lexical bundles are mostly used for stance expressions and discourse-organizing functions, while NP based lexical bundles are largely used for referential expressions.

Since then, numerous corpus-based studies have been specifically launched to explore possible differences and similarities in the use of lexical bundles between different disciplines (e.g. soft and hard), register (e.g. spoken and written), genres (e.g. thesis, research article and dissertation) and different degrees of writing expertise (e.g.

native speaker and non-native speaker). Hyland (2008a) observed considerable variations in the frequency of forms, structures and functions across four disciplines: electrical engineering, biology, business studies and applied linguistics. Structurally, the most striking difference between disciplines is that soft science (business studies and applied linguistics) corpora make far greater use of lexical bundles beginning with a prepositional phrase. On the contrary, hard science corpora employed significantly more lexical bundles using the passive voice, which were normally followed by a prepositional phrase fragment typically marking a locative or logical relation. Again, Byrd (2010) supported the findings from Hyland's (2008a) study, by showing that more lexical bundles identified in the field of law and commerce and relatively less lexical bundles in the field of arts and sciences.

In terms of register variation, Biber and Conrad (1999) compared conversation and academic prose, while Biber, Conrad and Cortes (2004) worked on two other registers: classroom teaching and textbooks. These two studies together showed that the number of lexical bundles in classroom teaching was almost twice than found in conversation and around four times more than that of textbooks and academic prose. The heavy use of lexical bundles in classroom teaching is attributed to the heavy reliance of this register on both "oral" and "literate" bundles. Biber and Barbieri (2007) extended this line of research by investigating the use of lexical bundles in a wider range of university registers. The analysis revealed a greater use of lexical bundles in non-academic university registers than in the core instructional registers. Most surprisingly, the lexical bundles were found to be much more common in writing than in speech, which is in contrast to the findings of Biber, Conrad and Cortes' (2004) study.

With regard to possible generic variation, Hyland (2008b) described and explained the possible differences and/or similarities between published academics and postgraduate students in the use of lexical bundles in their respective high stake genres: research articles, masters' theses and doctoral dissertations in four disciplines: electrical engineering, microbiology, business studies and applied linguistics. In terms of frequency, the masters' theses employed more lexical bundles than dissertations and many more than research articles. Structurally, compared with research articles, lexical bundles in student genres were more phrasal than clausal. In terms of function, lexical bundles in masters' theses and doctoral dissertations were more heavily research-oriented (describing the world, facts, and activities), whereas lexical bundles in RAs were, for the most part, text-oriented (organizing and connecting different parts of the discourse). The study concluded that less proficient and confident students at master's level were likely to rely more on multi-word expressions. While Hyland (2008b) investigated the use of lexical bundles in research articles, masters' theses and doctoral dissertations across different disciplines, Jalali and Ghayoomi (2010) focused on a comparison across three academic genres in the single discipline of applied linguistics. Also, some differences were noted across three groups of writers to the extent to which they rely on some specific bundles.

From the perspective of degrees of writing expertise, Cortes (2004) compared the use of lexical bundles, defined as three or more word combinations, between published academic papers and students' writing performance in the disciplines of history and biology. The first part of this study focused on the use of lexical bundles in published academic writing. The most frequent four-word lexical bundles in her study were identified and classified structurally and functionally. The second part concentrated on the use of those target lexical bundles in students' writing. The findings revealed that university students rarely used these target lexical bundles in their writing compared with published authors in these disciplines. Later, Chen and Baker (2010) compared the use of lexical bundles with a focus on similarities and differences across three groups of academic writers: native academic writers, Chinese students and native peers. The use of lexical bundles in native students' and non-native students' essays is surprisingly similar. They both contain many more VP-based lexical bundles and discourse organizers than native academic writers, which appear to be a sign of immature writing. By contrast, native professional writers exhibit a wider range of NP-based lexical bundles and referential markers. The second interesting issue is that published academic writing was found to exhibit the widest range of lexical bundles whereas Chinese students writing showed the smallest range, indicating the relationship between the numbers of recurrent word combinations and writing proficiency. A further qualitative examination on hedging devices revealed that both native groups are capable of comprehensively hedging their statements, whereas the Chinese group was found to use only four lexical bundles containing hedging expressions. Chen and Baker (2010) attributed this to a lack of introduction of hedging devices in EAP textbooks and L2 writers' strong tendency to over-generalize.

Despite the strong research tradition that lexical bundles have been investigated between disciplines, registers, genres and different degrees of writing expertise, empirical findings that linked multi-word combinations to moves or steps have been limited. To find out these move-linguistic feature connections in RAs, Cortes (2013) compiled a one-million word corpus of RA Introductions from various disciplines and identified lexical bundles in it. A further step was to analyze the identified lexical bundles in context for the purpose of discovering the communicative function that lexical bundle was performing. After this procedure was completed, the lexical bundles were classified to the moves and steps by adapting Swales' (1990, 2004) frameworks. Three specific findings need to be emphasized. First of all, Cortes' (2013) yielded extremely long lexical bundles which were never reported in previous studies on lexical bundles. Second, the longer bundles, in some cases, could be complete structures and sometimes even sentence, such as, *the objective of this study was to evaluate*, and *The rest of the paper is organized as follows.* Third, lexical bundles could convey communicative function of moves/steps of RA Introduction. The present study compared lexical bundles at move level in RAs published in two different contexts. In order to link identified lexical bundles with each move, the researcher followed the procedure as follows: First, two corpora were analyzed to look for two move structures.

Second, lexical bundles were identified at the move level from the two corpora, through frequency-based and distribution-based approaches. Third, lexical bundles were compared in terms of two different publication contexts.

2.5 Critique of Previous Studies of RAs

Since Swales (1981) originally put forward his CARS model, which provides a move analysis of Introductions to RAs, there have been numerous investigations of this type. Swales himself has refined his analysis of RA Introductions (1990, 2004), and other parts of this genre have been analyzed (e.g. Brett, 1994; Holmes, 1997; Samraj, 2005; Yang & Allison, 2003). Additionally, this line of research has been extended to study the disciplinary and cultural/linguistic differences (Samraj, 2002; Soler-Monreal, et al., 2011).

Despite the contributions made so far, several limitations to the previous research have emerged. First, most studies seem to focus on the Introductions and Discussions. Yet, relatively little attention seems to have been paid to the overall move structure of RAs, namely the complete IMRD sections. The possible reason for this might be that the Introductions and the Discussions have been claimed to be particularly difficult to write (Flowerdew, 1999b), consequently motivating researchers to investigate the move structure of these two sections in particular. Furthermore, Swales (1981, 1990, 2004) produced ground-breaking studies in these particular areas. Second, a comparison of the move structures of RAs between two publication cultures seems limited. For the most part, previous studies have been concerned with the generic variations of RAs across different languages. Third, a more representative corpus yields a more representative move structure, although some researchers have suffered from a bias in their sampling criteria. For instance, Nwogu's (1997) corpus consisted of thirty RAs from five journals recommended by medical practitioners; Posteguillo's (1999) corpus consisted of forty RAs from three journals suggested by subject teachers. Therefore, the sampling criterion is likely to reflect the subjectivity of those who recommended them. Fourth, the division of textual boundaries, in some studies, seems to combine content-based and linguistic-based approaches or be determined by the sentence as the coding unit. However, the combination of these two approaches has been criticized for its logical fallacy of circular reasoning (Paltridge, 1994) and, in the case of move embedding, more than one content appears to be realized within one sentence. Finally, early work on move analysis tended to employ discourse methods alone, focusing on analyzing move structure more than on investigating the linguistic realization of the patterns of moves and steps. Flowerdew and Forest (2009) indicated that probably the main reason for this might be methodological. Furthermore, they explained that it is extremely time-consuming to examine linguistic features from a large number of examples of individual moves and steps.

2.6 The Proposed Research

The research gaps have been identified as follows, along with each IMRD sections of RAs reviewed in Chapter 2. First, limited studies concerned move structure of RA introductions regarding publication cultural variations, whereas previous studies on this section compared RA introductions written in English with those in Chinese. Second, few studies are restricted to comparing move structure of RAs Methods written in English published in China and internationally, while previous studies on this section compared move structures of RAs written in English and Chinese. Third, limited studies on the Results conducted to explore variations from the aspect of publication cultural variations. On the contrary, most of them were concerned with language variations. Fourth, few studies on the Discussion compared move structures of RAs in English, but published in China and internationally.

In view of the above, the research gaps and the need to help Chinese academics in agricultural science publish internationally suggest that it would be worthwhile to conduct a contrastive investigation of agricultural science RAs published in two different contexts. As stated in Chapter 1, academic writing is accomplished by move structure and linguistic features to realize move structure. The objectives of the proposed research, therefore, are 1) to identify moves and the lexical bundles associated with each move occurring in local Chinese English scientific journals; 2) to identify moves and the lexical bundles associated with each move occurring in international journals; and 3) to find out the variations between the two corpora regarding moves/steps and lexical bundles.

2.7 Summary

This chapter helps frame the theoretical background from 2 aspects: genre analysis, particularly Swales' move analysis, and corpus linguistics; meanwhile previous studies on the RA genre related to these two perspectives have been reviewed. Besides, Chapter 2 points out those corpus techniques have great strength in extracting linguistic features of registers and genres, while on the other hand, move analysis is more concerned with the macrostructure of a text. Thus, the present study proposed to adopt a mixed method by synthesizing corpus linguistic techniques and move analyses in order to compensate for the disadvantages of using these methods in isolation. The details of this proposed mixed method are given in Chapter 3.

CHAPTER 3
RESEARCH METHODOLOGY

This chapter describes the methodology used in the present study, integrating move analysis with corpus analysis to compare the move structures of agricultural science RAs published in two settings. After a presentation of the research objectives, it introduces the overall research design, followed by a section dealing with genre-based and corpus-based approaches.

3.1 Research Objectives

As stated in Chapter 1, novice researchers often face difficulties in writing for international publication, particularly for Chinese academics, who study English as a foreign language. However, the "publish or perish" requirements force novice researchers and NNES learners to publish their work. They have to further publish their articles in English if they want their work to be accessible to the world science community (Li & Flowerdew, 2009). In order to try to help such people, the difficulties faced by NNES writers have been investigated. Two major obstacles were identified, including inadequate knowledge of rhetorical organization and inappropriate language use to realize each identified move. Although lexical bundles of RAs have been widely examined, as described in Chapter 2, to our knowledge, there have been few studies emphasizing the lexical bundles which characterize each identified move in RAs. As far as we know, no study has considered the variations in the move structures of agricultural science RAs between the Chinesel and international publications.

With this in mind, the present study seeks:1) to identify moves and lexical bundles occurring in English scientific journals published in China; 2) to identify moves and lexical bundles occurring in international journals; and 3) to investigate the variations in move structures between the two corpora. These three objectives are translated into the following research questions:

1) What are the move structures used in English agricultural science research articles published in Chinese and international journals?
2) How is the move structure used in Chinese agricultural science journals similar to or different from that in international agricultural science journals?
3) What lexical bundles are typically found in each move of English agricultural science research articles published in Chinese and international journals?
4) How are the lexical bundles used in agricultural science journals published in China similar to or different from those used in international agricultural science journals?

Questions 1 and 2 will be answered by conducting a move analysis and Questions 3 and 4 by using corpus-based method.

3.2 Research Design

To address the research questions, a mixed-methods approach was adopted to investigate the variations between these two corpora. In the first phase, move analysis was used to investigate the move structure of agricultural science RAs. In the second phase, corpus-based method was employed to examine the lexical bundles linked with each individual moves. The advantages of combining these two approaches have been explained in Chapter 2. Based on the findings from these two phases, the move structures of the two corpora were compared by using a contrastive analysis. The reasons for using contrastive rhetoric analysis have been discussed in Chapter 1. This research design was displayed in Figure 3.1.

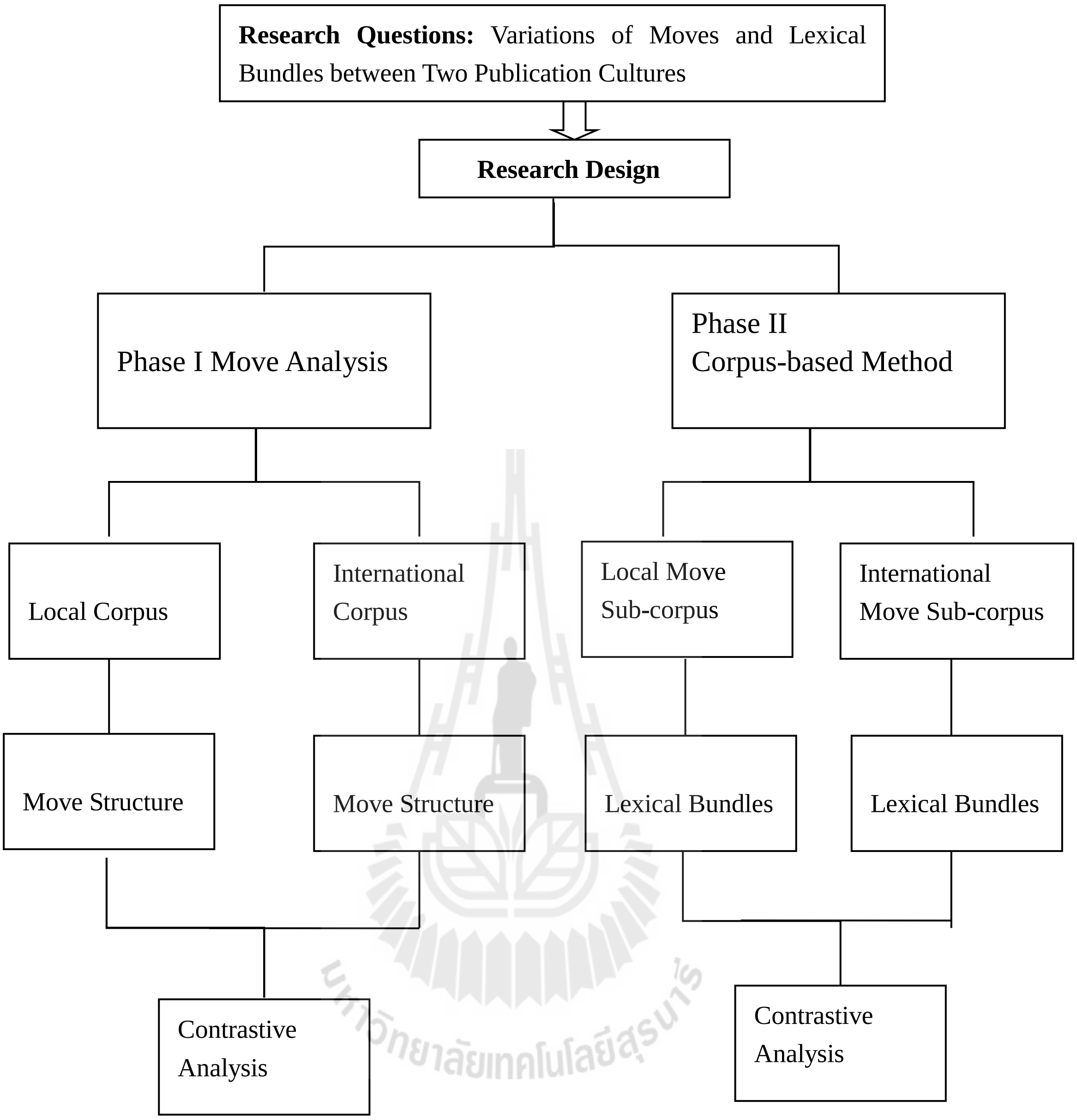


Figure 3.1 Methodology Flow Chart

3.3 Compilation of Paper-based Corpora

3.3.1 Corpus Size

Since this study sought to address the textual organization of agricultural science RAs and to explore the lexical bundles associated with each identified move, a specialized corpus needed to be systematically compiled to serve the objectives. This was because general corpora are constructed for the purpose of inferring generalizations about the language as a whole, not for the purpose of researching language patterns (Aston, 2001), but specialized corpora allow for more top-down, qualitative, contextually-informed analysis (Flowerdew, 2004).

The size of a specialized corpus was determined by the linguistic items under investigation (Flowerdew, 2004). Biber (2006) further explains that if the target feature is a frequent grammatical structure, such as, nouns or verbs, the size of the corpus can be smaller because these features occur frequently. However, if less common features are the target features, it is essential to work with a larger corpus. Another important factor influencing the corpus size was related to previous studies, which revealed that sample size often ranged from twenty to sixty RAs (Kanoksilapatham, 2005; Nwogu, 1997; Pho 2008b; Posteguillo, 1999), regarding move structure of complete IMRD sections as a whole entity. With this in mind and considering that the lexical bundles were the frequent linguistic phenomenon (Biber, et al., 1999), forty-five agricultural science RAs were sampled to construct a corpus, fifteen for each field, including animal science, food science and plant science.

Concerning the potential variations between the two different publication cultures, two corpora were systematically compiled as follows:

3.3.2 Chinese Corpus

3.3.2.1 Selection of Journals

The selection of English journals published in China was motivated by their availability and their representativeness, that is, they can be easily accessed and they were considered as established journals in the field of agricultural science. First, a total of eighteen English agricultural science journals were found in China National Knowledge Infrastructure (CNKI), which is the world's largest database of research content from China (**www.cnki.net**) (Tang, 2007). Second, to control possible disciplinary variations, nine out of eighteen journal titles that are apparently unrelated to the three sub-fields of agricultural science were excluded. Third, another four international peer-reviewed journals were removed from the remaining list of nine titles, since the present study aimed to compare RAs published in local journals and international journals. Finally, only five journal titles were selected as shown in Table 3.1.

Table 3.1 List of Journals in the Chinese Corpus

NO.	Journal Titles
1.	Agricultural Science & Technology
2.	Chinese Seed
3.	Journal of Animal Science and Biotechnology
4.	Animal Husbandry and Feed Science
5.	Journal of Northeast Agricultural University (English Edition)

3.3.2.2 Selection of Research Articles

In this study, great care needs to be taken to ensure comparability because if the RAs are not comparable, this might result in invalid findings. For example, Lee's (2001) corpora was constructed for the purpose of comparing published research articles and graduate students' writing. Shim (2005) argues that Lee's (2001) corpora were not comparable because they consist of experimental and theoretical papers, leading to invalid findings. It is, therefore, necessary to establish valid criteria of comparison to achieve maximum comparability, in other words, to examine sets of comparable original texts with maximum similarity by controlling any relevant confounding factors (Moreno, 2008). With this in mind, the local corpus was constructed following the guidelines below:

First of all, the academic discipline under investigation was one of the confounding factors (Çandarlı, 2012). This study attempted to control it by collecting articles only from three sub-disciplines of agricultural science, namely animal science, food science and plant science. There were two journals entitled *Agricultural Science & Technology* and *Journal of Northeast Agricultural University (English Edition)*, which were interdisciplinary and contained articles in other sub-fields, such as, biochemistry and landscapes articles. Furthermore, there did not appear to be any specialized journals on food science. Considering the comparability of the two corpora under investigation, three graduate students in the three sub-fields served as experts to verify these articles from the three sub-fields, by carefully checking the article titles together with their abstracts. Then, fifteen articles were purposively selected from each sub-field, starting from the most recent issue. Because of the limited number of English articles in local Chinese journals, the years of their publication was extended from 2007 to 2013. The number of RAs from each sub-field was listed in Table 3.2.

Table 3.2 List of Research Articles in the Chinese Corpus

Food Science	***NO. of RAs***	**Plant Science & Crop Production**	***NO. of RAs***	**Animal Science**	***NO. of RAs***
1. Agricultural Science & Technology	8	1. Agricultural Science & Technology	5	1. Agricultural Science & Technology	4
2. Journal of Northeast Agricultural University	7	2. Journal of Northeast Agricultural University	5	2. Journal of Animal Science and Biotechnology	4
		3. Chinese Seed	5	3. Animal Husbandry and Feed Science	4
				4. Journal of Northeast Agricultural University	3

Also, the move structure of the articles needs to be controlled due to the fact that the move structure of an article may vary in accordance with its type (Crookes, 1986; Ozturk, 2007). For this reason, the selection of the articles was restricted to articles with the IMRD format, which has been generally acknowledged (Swales, 1990). Some articles were also selected, if they satisfied one of the following criteria; a) articles with an unlabeled Introduction; b) articles having Methods but labeled differently, such as the Procedure or Materials & Experiments; c) articles having stand-alone Results but labeled differently, for example, Results & Analysis or Findings. In spite of the growing frequency of combined the Results (R) and Discussion (D) sections in agricultural science RAs, for pedagogical reasons, we decided to analyze the stand-alone R and D sections. This is due to the fact that it was important for students to understand and be able to distinguish the distinct functions of R and D sections, even if they ultimately write combined R and D sections (Stoller & Robinson, 2013). Along with the process of selection, fifteen RAs were purposively chosen from each sub discipline, yielding the Chinese corpus of forty-five articles in total. Finally, all forty-five RAs were coded. Each article in the three major fields was referred to by the abbreviation A (animal science), F (food science) or P (plant science), followed by a number (1-15). For example, the ninth article in food science of the Chinese corpus was referred to as CF9.

3.3.3 International Corpus

3.3.3.1 Selection of Journals

In this study, twenty-second journals, being selected from the three sub-fields of agricultural science, served as the primary database for the compilation of the international corpus and realized the criteria of representativeness, reputation and accessibility (Nwogu, 1997). First, the journals were systematically chosen to ensure a representative sample of the language of members of the agricultural science profession. That is, the articles from the selected journals were written by members of the agricultural science profession and accepted by prestigious international journals. Second, all twenty-second journals had a high impact factor, ensuring that they are reputable in the field of agricultural science. Third, all the journals can be obtained from online database.

Table 3.3 List of Journals in the International Corpus

Field	Journal Titles
Food Science	1. Nutrition and Food Science 2. International Journal of Food Microbiology 3. Food Chemistry 4. Journal of Agricultural and Food Chemistry 5. Food Hydrocolloids 6. Journal of Dairy Science 7. International Dairy Journal 8. Journal of Cereal Science
Plant Science	1. The Plant Cell 2. The Plant Journal 3. Plant Physiology 4. Journal of Plant Physiology 5. Postharvest Biology and Technology 6. Plant & Soil 7. Plant Science 8. Plant Physiology & Biochemistry 9. Journal of Agronomy & Crop Science
Animal Science	1. Animal Genetics 2. Domestic Animal Endocrinology 3. Journal of Animal Science 4. Animal Feed Science and Technology 5. Journal of Animal Breeding Genetics

3.3.3.2 Selection of Research Articles

Since the size of the Chinese corpus was forty-five RAs, forty-five articles published internationally were purposively drawn from twenty-two international journals, fifteen for each field, as shown in Table 3.4.

Table 3.4 List of Research Articles in the International Corpus

Food Science	***NO. of RAs***	**Plant Science**	***NO. of RAs***	**Animal Science**	***NO. of RAs***
1. Nutrition and Food Science	2	1. The Plant Cell	2	1. Animal Genetics	3
2. International Journal of Food Microbiology	2	2. The Plant Journal	2	2. Domestic Animal Endocrinology	3
3. Food Chemistry	2	3. Plant Physiology	2	3. Journal of Animal Science	3
4. Journal of Agricultural and Food Chemistry	2	4. Journal of Plant Physiology	2	4. Animal Feed Science and Technology	3
5. Food Hydrocolloids	2	5. Postharvest Biology and Technology	2	5. Journal of Animal Breeding Genetics	3
6. Journal of Dairy Science	2	6. Plant & Soil	2		
7. International Dairy Journal	2	7. Plant Science	1		
8. Journal of Cereal Science	1	8. Plant Physiology & Biochemistry	1		
		9. Journal of Agronomy & Crop Science	1		

To choose these articles, the following criteria were taken into account. First of all, the articles were published during the year 2009-2013. Since Shi (2010) analyzed thirty agricultural science RAs published in 2009 and 2010, those thirty articles were analyzed again to increase the reliability of results (Mahzari & Maftoon, 2007). Another fifteen articles published in 2013-2014 together with those thirty articles were examined in order to increase the generalizeability of results. Second, to make the international corpus closely comparable to the Chinese corpus, the selection was limited to articles only with the IMRD format. However, it was important to note that the status of a native speaker was not taken as a variable in the selection process. This was driven by the fact that the articles accepted by prestigious international journals have conformed to the rhetorical traditions of the English-speaking academic community (Vladimirou, 2006). Certainly, they could be considered as a representative sample of expert writing (Pho, 2008b). Third, some articles were collected, which corresponded to the following characteristics: a) articles with an unlabeled Introduction; b) articles having Methods but labeled differently, such as the Procedure or Materials & Experiments; c) articles having stand-alone Results but labeled differently, for example, Results & Analysis or Findings. Fourth, due to the need to balance the international and the local corpora, the RAs combining R and D were not included in the international corpus either. Finally, all forty-five articles were coded. Each research article in three major fields was referred to by the abbreviation A (animal science), F (food science) or P (plant science), followed by a number (1-15). So, for example, the ninth article in food science of international corpus was referred to as IF9.

3.4 Genre-based Approach

After the paper-based corpora were compiled, it was possible to compare the move structures between the two corpora. Then, a contrastive analysis was conducted to look for the move variations between the two corpora.

3.4.1 Framework of Move Analysis

This study used the framework developed by Kanoksilapatham's (2005) study for the purpose of move identification. Following Swales' (1990) model, Kanoksilapatham (2005) identified fifteen moves and thirty-eight steps by analyzing sixty biochemistry RAs (See Appendix): thee in the Introductions, four in the Methods, four in the Results and four in the Discussion. The selection of Kanoksilapatham's (2005) model over other frameworks was due to the following reasons:

First of all, in the academic context, the format of the IMRD has been considered as the norm of research articles in the empirical studies. Each section is clearly marked for its distinct communicative purpose by the name of the section. The move structure obtained from Kanoksilapatham's (2005) study allowed for a systematic examination of the IMRD sections.

Second, previous studies, as reviewed in Chapter 2, have clearly demonstrated a dependent relationship between move structures and disciplines, thus showing the need to find the framework that is relevant to a given discipline in order to control possible disciplinary variations. Since Kanoksilapathm's (2005) framework could potentially benefit learners from hard sciences (e.g. biology and chemistry), the natural sciences (e.g. environmental science and ecology), and applied sciences (e.g. biotechnology and food science) (Kanoksilapatham, 2005), this framework seemed to be an appropriate reference for the field of agricultural science, which belongs to hard applied science.

Third, Kanoksilapatham's (2005) study presents a valid and reliable move structure because the selection of journals was based on the impact factor, guaranteeing the objectivity of the sampling. In other words, her corpus was insured to be representative of the target discourse. Instead, for the most part, previous studies have suffered from a sampling bias by using journals recommended by the experts, for example Posteguillo's (1999) work, unavoidably reflecting individual preferences. Moreover, to assure the reliability of move identifications, an expert in biochemistry was employed as an inter-coder and reached 95.03% agreement with the researcher.

In view of the above reasons, the move structure obtained from Kanoksilapatham's (2005) investigation was proposed as the most relevant framework for this proposed research. This coding scheme was further fine-tuned because more codes have been developed to accommodate the new steps that emerged from the findings. Then, the modifications to the coding scheme were made accordingly, yielding an accurate description of the move structure of agricultural science RAs in the corpus.

Examples

1) Field studies were conducted at the Experimental Farm of Faculdade de Ciencias Agrarias e Veterinarias – UNESP, Brazil, 21^{o}*15S, 48*^{o}*19'E, 605m altitude, from November 2002 to June 2003.* (IA12, Move 5, Step 3 Describing the location where the study was conducted)

Describing location was found twenty-two times in the local and seven times in the international corpora. However, it is not a step in Kanoksilapatham's (2005) framework. Thus, this move was classified as Move 5, Step 3 *Describing the location where the study was conducted* in the present study.

2) The aim was to maximize the benefits accrued from sale of animals over the planning horizon. (IA15, Move 13, Step 3 Stating aims or hypothesis of the study)

In the Discussion section, statement of research aims occurred nineteen times in the international corpus. But it is not a step in Kanoksilapatham's (2005) framework. Therefore, this move was labeled as Move 13, Step 3 *Stating aims or hypothesis of the study* in the present study.

3.4.2 Move Identification

Move identification is usually accomplished through three approaches, including top-down, bottom-up approach and a combination of top-down and bottom-up approaches. Biber, Connor and Upton (2007) distinguished the first two approaches by the role of a functional versus a linguistic analysis. In the top-down approach, a move type was determined by its communicative purpose (Kwan, 2006). In the bottom-up approach, move identification relies heavily on the use of linguistic features instead. For example, Nwogu (1997) distinguished Move 4: *Describing Data Collection Procedure* by making explicit lexical items which signaled the information on methods of data collection as shown in this example: "*The methods used to collect data on patients with cervical and prostate cancer were identical with those reports in our retrospective study of colonic and rectal tumors*"(Nwogu, 1997, p.122).

The present study identified moves based solely on a top-down approach for three reasons. First, the combination of top-down and bottom-up eventually leads to "a circularity of the identification of rhetorical moves and linguistic realizations" (Pho, 2008a). Second, this is in accord with Kwan's (2006) and Zhang, Thuc and Pramoolsook's (2012) studies which suggested that textual boundaries were identified by cognitive judgment rather than a reliance on linguistic clues. Third, a top-down approach is in line with the theoretical definition of a move; that is, each move has a local purpose and also contributes to the overall rhetorical purpose of the text, whereas the bottom-up approach fails to realize the concept of a move by using the linguistic signals as a criteria (Paltridge, 1994).

For this reason, the notion of the communicative purpose appeared central to the identification of the moves in the present study, meanwhile move lengths varied with regard to the content that a writer wishes to express, ranging from several sentences to a phrase or a word. Considering the fact that multiple functions are probably served in one sentence, the analysis focuses on the most salient purpose based on Holmes' (1997) suggestion. This procedure, as pointed out by Holmes (1997) and Yang and Allison (2004), involved a degree of subjectivity which was perhaps unavoidable.

Additionally, a move type can be characterized by move frequency. Some move types, occurring more frequently than others in a text, can be described as conventional, whereas other moves, occurring less frequently, can be described as optional. Based on Kanoksilapatham's (2005) criteria, the cut-off point is 60%. That is, the occurrence of a conventional move ranges from 60% to 100%, whereas the occurrence of an optional move is below 60%. For example, Move 3, Step 1 *Stating purpose(s)* was found in forty-one out of forty-five of international papers or 91% of the international corpus. Thus, this step was qualified as a conventional move. While, Move 13, Step 3 *Stating aims or hypothesis of the study*, occurred in nineteen out of forty-five international papers or 42% of the international corpus. As a result, this step was classified as an optional move. At the same time, some move types in a text recurred in a cyclical fashion. In this case, each appearance was counted as an individual instance of that move. Similarly, the rules to identify a move type were the same as those employed to identify a step in a corpus.

Accordingly, the move structure of agricultural science RAs was proposed following the move identification criteria above.

3.4.3 Reliability of Move Identification

3.4.3.1 The Procedures of Inter-coder Reliability

Move boundaries were identified by the function or content of texts in the present study, however, the function-based approach can be criticized for its subjectivity (Paltridge, 1994). To ensure a high degree of agreement in the move analysis, inter-coder reliability was conducted in the present study, which referred to the amount of agreement between the researcher and additional reader(s)' assignment of all semantic functional units in the texts to moves and steps. The inter-coder procedures included coder selection, coder training, independent coding and assessment of inter-coder agreement.

First, to avoid unreliable textual boundaries identified by inexperienced coders, the background knowledge of coders was taken as a variable in the selection of coders (Crookes, 1986; Shohamy, Gordon, & Kraemer, 1992). Hence, the invited coder was an internationally published agricultural science professor, who was a native speaker with a Ph.D degree. He was considered an academic specialist with appropriate qualifications, knowledge and competence to provide reliable feedback on agricultural research articles. Together, two coders (including the researcher) were involved in the assurance of the reliability of the move identifications. In these circumstances, agreement was not be biased by the individual.

Second, coders were previously trained with respect to the research purposes and data collection, since insufficient training of coders often leads to disagreement in coding (Crookes, 1986). Thus, two training sessions were conducted for the purpose of increasing the reliability of inter-coder procedure: 1) In the first training session, the researcher explained to the expert the use of coding system, together with instructions about move identification. 2) After the initial meeting, the expert independently analyzed two sample texts with Kanoksilapatham's (2005) framework. In the second session, the expert was asked to prepare the coding scheme and two analyzed texts for the discussion. The researcher discussed the coding process with the expert until he clearly understood how to code a sample text using the coding scheme.

Third, twenty out of ninety articles, ten from the Chinese corpus and ten from the international corpus, were independently analyzed by the two coders. Since Kwan (2006) coded 10% of the corpus for an inter-rater reliability check, in the present study, ten for each set of RAs (22% of the entire corpus) was coded to conduct inter-rater reliability. Next, both the expert and the researcher went through the twenty texts to identify any coding disagreements. Because moves, by definition, perform communicative functions within a text, coders were likely to differ in understanding the purpose of a specific text. In order to reach an agreement, any disagreement was discussed and negotiated between the coders.

Example:

Tannin content and chemical structure determine if their effects on animal metabolism are beneficial or harmful (Barry and McNabb, 1999; Schofield et al., 2001). However, during silage fermentation, the presence of tannins is considered an advantage because they protect forage proteins from degradation (Salawu et al., 1999, Kondo et al., 2004) by inhibiting plant and microbial enzymes and/or by forming complexes with proteins (Makkar, 2003). These silages containing tannins lose less N as ammonia is well documented (e.g. Goncalves et al., 1999; Adesogan and Salawu, 2002), showing that they effectively reduce protein degradation. (IA12, Move 1, Step 1 Commenting on the importance of the topic)

At the beginning, the researcher classified this move as Move 1, Step 3 *Reviewing previous research* in the article of IA12. However, the expert labeled this move as Move 1, Step1 *Commenting on the importance of the topic*. After the researcher had read the article of IA12 again to understand the function of this move, she discussed with the expert and agreed to classify this move as Move 1, Step 1 *Commenting on the importance of the topic.*

Due to the fact that Kanoksilapatham's (2005) framework could not be fitted conclusively, we further fined-tuned this coding scheme and developed more codes to accommodate the new steps that emerged from the two corpora.

Example:

The results of this study could provide rice breeders and eventually commercial rice growers new opportunities to promote the production of rice with enhanced levels of the bioactive compounds. (IF15, Move 3, Step 5 Stating the value of the present study)

This move functions to state the value of the present study. It was absent in Kanoksilapatham's (2005) framework but found in 53% of the local and 11% of the international corpora in the present study. As a result, it was qualified as optional move labeled as Move 3, Step 5 Stating the value of the present study. Finally, the researcher independently coded the remaining seventy RAs, thirty-five for each corpus, and recorded occurrence frequency of moves or steps. If any problem occurred, the researcher consulted with the expert or graduate students in the field of agricultural science.

Fourth, the percentage agreement rate was applied to measure the inter-rater reliability of move identification because it is popular and relatively easy to interpret. It can be computed by using the formula A/(A+D) x 100, where A = the number of agreements; D= the number of disagreements. For example, if the two coders identify a total of one hundred move units, but they just agree ninety-five times, the percentage agreement rate is 95%. It should be noted that the satisfactory agreement level should reach at least 70% agreement for accessing coding reliability (Kwan, 2006).

3.4.3.2 The Results of Inter-coder Reliability

Tables 3.5 and 3.6 display the results of the inter-coder reliability analysis. In total, twenty articles were randomly drawn from the two corpora for checking the reliability of move identification, which reached 83.56% for the local and 84.43% for the international corpora respectively. Although the percentage agreement varied slightly in the two corpora, all exceeded 70% in inter-coder reliability, demonstrating that the coders can identify moves with a high degree of accuracy. Any discrepancies were solved through discussion and re-coding of the disagreed moves as shown in the following examples. After the discussion, the expert and research had no disagreement.

Examples

1) *For the δ^2H trends, less data were available, as only the samples, producing sufficient meat juice, could be analyzed for this parameter.* (Move 11, Step 4 Stating limitations)

Before discussion, the expert classified this move as Move 11, Step 1 *Explaining reasons why these results occur*. Yet, the researcher considered it as Move 11, Step 4 *Stating limitations*. After discussion, the expert agreed with the researcher.

2) *The low tannin levels in the present study indicate that the presence of tannins in parts of the plant other than grains was probably irrelevant and that the tannins present in the grains may have been diluted as the analysis were on whole plants.* (Move 14, Step 5 Making overt claims or generalizations)

At the beginning, the researcher classified this move as Move 14, Step 2 *Highlighting the selected findings*. However, the expert considered it as Move 14, Step 5 *Making overt claims or generalizations*. After re-coding, the researcher agreed to classify this move as Move 14, Step 5 *Making overt claims or generalizations*.

Table 3.5 The Results of Inter-coder Reliability for the Chinese Corpus

Section	Move Boundaries	Agreement	Disagreement	Percentage Of Agreement
Introduction	56	45	11	**80.35%**
Methods	180	152	28	**84.44%**
Results	90	78	12	**86.67%**
Discussion	160	132	28	**82.50%**
Total	**486**	**407**	**79**	**83.74%**

Table 3.6 The Results of Inter-coder Reliability for the International Corpus

Section	Move Boundaries	Agreement	Disagreement	Percentage Of Agreement
Introduction	94	78	16	**82.98%**
Methods	320	271	49	**84.69%**
Results	160	141	19	**88.13%**
Discussion	293	242	51	**82.59%**
Total	**867**	**732**	**135**	**84.43%**

3.5 Corpus-based Method

After the move boundaries were identified, electronic corpora were constructed to extract the lexical bundles associated with each move due to the close relationship between lexical choice and move structure (Flowerdew & Forest, 2009). Based on the corpus findings, the lexical bundles from the two corpora were further compared.

3.5.1 Electronic Corpus Construction

A total of ninety agricultural science RAs were downloaded and divided into separate .pdf files. They were converted to pure text format by using Adobe Acrobat Pro. and saved separately with a ".txt" extension to their files names in the two corpora. Then, those pure texts were cleaned up by deleting any irrelevant elements, since an electronic corpus needs plain texts. Such elements included abstracts, key words, graphics, tables, figures, empty lines, page numbers, headings, footnotes, references, acknowledgements, redundant spaces, hard carriage returns and foreign characters.

3.5.2 Move Sub-Corpus Construction

The move sub-corpora were drawn from the main corpus for the purpose of retrieving lexical bundles linked to each move as shown in Figure 3.2. As a result, the move texts were grouped, yielding a move sub-corpus containing a number of individual texts with the same move label. At the same time, the number of move sub-corpora accorded with the number of moves identified. Since sixteen moves were found in each main corpus, sixteen move sub-corpora were constructed for the local and international corpus respectively. These sub-corpora were named after their moves and their constituent texts were numbered. That is, in the local corpus, the sub-corpus of Move 1 included the texts of all Move 1 boundaries from forty-five Chinese papers; whereas, in the international corpus, the sub-corpus of Move 1 contained the texts of all Move 1 boundaries from 45 international papers.

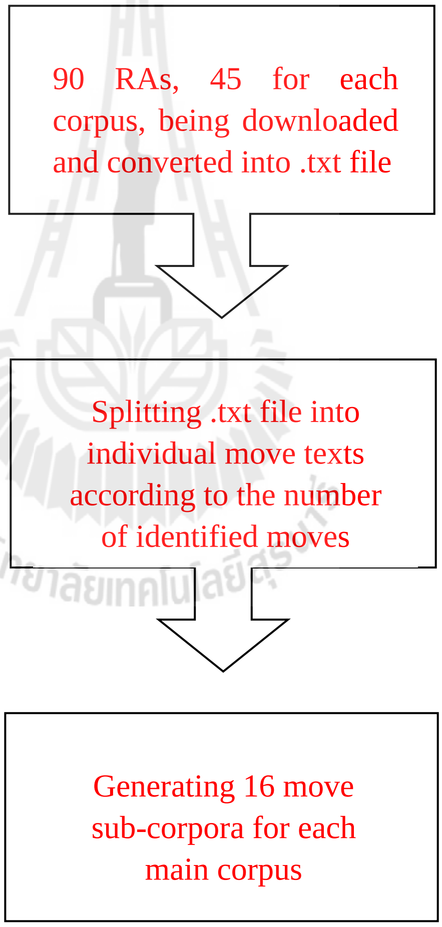


Figure 3.2 Flow Chart of Construction of Move Sub-corpora

In addition, the reason to identify lexical bundles at the move level was due to the difficulty of identifying the lexico-gramatical features at the step level in case of move combinations. For instance, in the international corpus, Move 14 *Consolidating results* was broken into seven steps. Of these, Step 3 *Referring to previous literature* often co-occurred with Step 5 *Making overt claims or generalizations*.

Example:

The way 250 mg L^{-1} PAA is suppressing the PAL-activity is not fully understood, but possibly the low PH induced in the surface tissue played an important role in the inhibition of PAL-activity (Ruiz-Cruz et al., 2007b). (Move 14, Steps 5 & 3) (IC10)

In this example, Move 14, Step 3 was found as citation. In this case, it seemed unlikely one would be able to identify lexical bundles from Move 14, Step 3 *Referring to previous literature*.

3.5.3 Lexical Bundles Identification

The main difference between lexical bundles and other lexical association patterns is the way in which lexical bundles are identified. The search for lexical bundles needs no intuition to look for which words can collocate with the searching word frequently. That is, word combinations, which meet the criteria of selection and are yielded by a certain computer program, are considered as lexical bundles. The procedures for identifying lexical bundles were introduced as follows:

3.5.3.1 Corpus Program to Identify Lexical Bundles

Once sixteen move sub-corpora for each main corpus were constructed, the lexical bundles can be automatically extracted from each move sub-corpus by using N-gram of AntConc. The program of AntConc was chosen for two reasons. First, it is a free and green software with an excellent user-friendly interface. Second, it has a reliable bundle-producing function, which has been confirmed in reference to the authority software Wordsmith 4.0 (Wang, 2009).

N-gram refers to a contiguous sequence or any combination of words from a given sequence of text. The size 1 of an n-gram is referred to as a “unigram”; size 2 is a “bigram”; size 3 is a “trigram”. Larger sizes are sometimes referred to by the value of n, e.g., “four-gram”, “five-gram”, and so on. For example, n-grams of size 2 for the sentence “This is a pen.” is “This is”, “is a” and “a pen”. This study therefore used n-grams from AntConc to identify lexical bundles on the basis of automatically extracted continuous strings of words that may occur more than once at least in identical form.

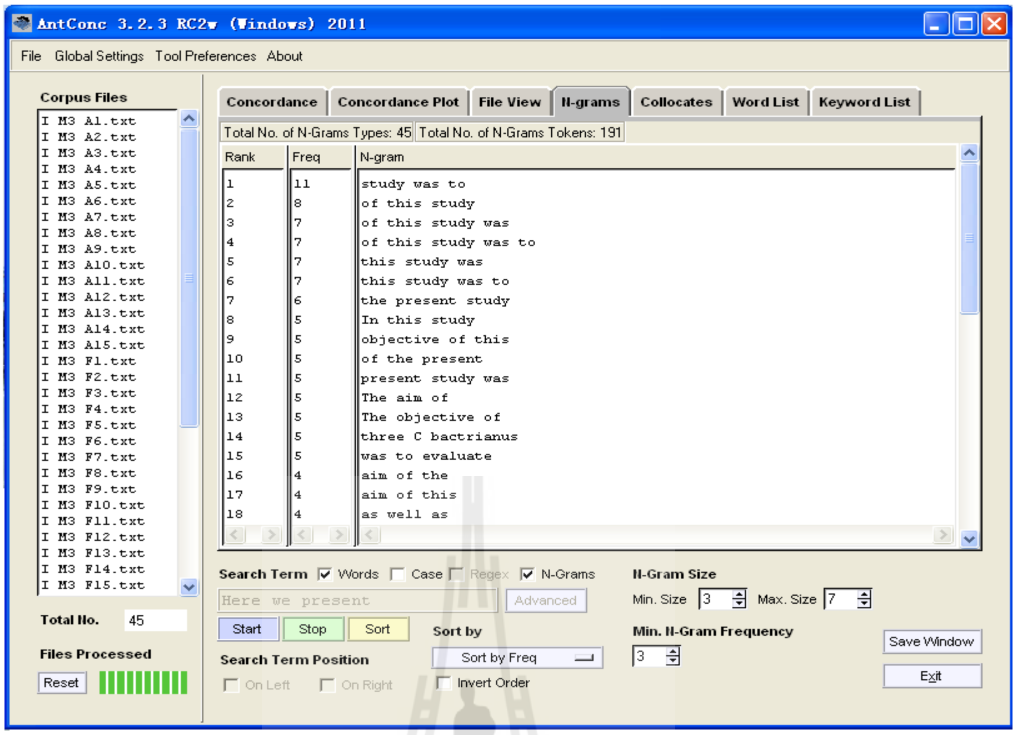


Figure 3.3 Example of Output of Lexical Bundles from Move 3

3.5.3.2 Criteria for Selection of Lexical Bundles

The selection of lexical bundles was driven by the four criteria: move label, cut-off frequency, distribution threshold and length of bundles. First of all, the multi-word expressions, which did not indicate the function of move label, were not identified as lexical bundles in the present study. For example, “three C bactrianus” as shown in Figure 3.3, did not reflect the function of Move 3 *Introducing the present study*. As a result, “three C bactrianus” was not selected in the present study. Second, as suggested by De Cock (1998) (cited in Chen & Baker, 2010), a cut-off frequency for relatively small corpora often ranged from two-ten times. We set the cut-off point to three times instead of two times due to the fact that the present study aimed to look for lexical bundles typically found in each move. Third, the distribution threshold, which helps avoid the idiosyncrasies of individual writers, was restricted to occurrences across at least three different texts (Biber & Barbieri, 2007). Fourth, the length of lexical bundles was limited to three words or more because many important recurrent words combinations were actually three word lexical bundles (Simpson-Vlach & Ellis, 2010).

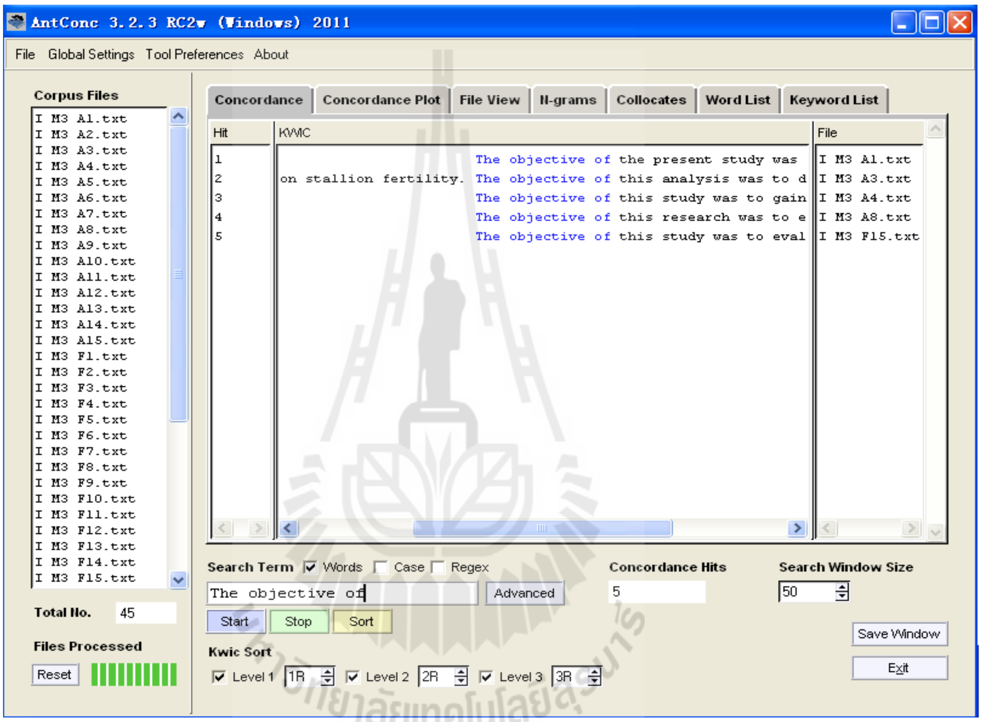


Figure 3.3 Example of Identified Lexical Bundles from Move 3

3.5.3.3 Reliability of Lexical Bundles

The reliability of lexical bundles was conducted for three reasons. First of all, lexical bundles should satisfy the criteria of reflecting the function of a particular move. For example, “the objective of” indicated the function of Move 3 *Introducing the present study*, while “three C bactrianus” did not reflect the function of this move. In this case, “three C bactrianus” was not included in the present study.

Second, the overlapping word sequences could inflate the results of lexical bundles. For example, “It has been suggested” and “has been suggested that”, both occurring more than three times, actually derived from a single longer lexical bundles of “It has been suggested that”. In this case, the overlapping word sequences were expected to be combined into one longer unit to avoid inflated results. Third, concordance programs did not have the capacity to differentiate words or signs by taking into account the context in which they appear. For instance, they cannot tell the difference between “I” being a personal pronoun or a roman numeral. For these reasons, a native speaker, who was an experienced teacher with a degree in Linguistics, verified the selected lexical bundles. Before checking the reliability, a training session was provided to make the expert understand the identification process of lexical bundles. That is, the researcher explained the expert instruction of move identification, construction of move sub-corpus and corpus program to identify lexical bundles from each move.

3.6 Summary

To answer the research questions, this chapter presents a detailed description of the research design. It comprises three main parts including the compilation of paper-based corpora, a genre-based approach to explore move structure and a corpus-based approach to investigate the lexical bundles associated with each move. At the end, variations of genre conventions were compared between the two corpora.

To make the two corpora comparable, each paper-based corpus was systematically compiled in relation to corpus size, selection of journals and articles. Justification was provided to ensure that the results of the move analysis were valid and reliable, in terms of the framework of the move analysis, move identification and reliability of move identification. Then, the electronic corpora was constructed in order to examine the lexical bundles used to realize each move. To assure the reliability of the selected lexical bundles, a native speaker was employed. The corpus tool was introduced in the procedures of the identification of lexical bundles, together with the justification for the use of the corpus tool. At the end, two corpora were compared in relation to the results of the move analysis and the corpus analysis in Chapter 4. Such a comparison will provide a greater insight into the writing of scientific texts in the field of agricultural science.

CHAPTER 4

RESULTS

This chapter reports the results of a move analysis carried out on each IMRD section and the identification of lexical bundles associated with each individual move. The results are expected to answer the research questions proposed in Chapter 1 as follows:

1) What are the move structures used in English agricultural science research articles published in Chinese and international journals?
2) What lexical bundles are typically found in each move of English agricultural science research articles published in Chinese and international journals?

4.1 Move Structures in the Chinese and International Corpora

To answer the first question, move analysis was employed to examine the structure of agricultural science RAs as follows: First, the two datasets were analyzed using Kanoksilapatham's genre analysis model (2005) to segment each IMRD text into moves and steps, respectively, according to their communicative functions. Then, text segments representing each move/step were scrutinized to capture the two typical sets of move structures used in agricultural science RAs for Chinese and international corpora respectively. Next, the results of the two sets of move structures are presented in order from the Introduction to the Discussion sections with an analysis of the move occurrences and move sequences. Finally, three main linguistic features are also mentioned, including tense, voice and personal pronoun *we*. The following describes the reasoning behind the inclusion of these three features. First, the verb form (verb tense and voice) is one of the most salient grammatical features of the register of English for Science and Technology and seems to be related to the signal discourse function (Shaw, 1992; Tarone, Dwyer, Gillette, & Icke, 1998a). Second, present simple tense, past simple tense and present perfect tense are included because these are the most common tense choices (Chen, 2010; Chen, 2009). Third, the word *we* is investigated because it was found to be the most frequent first person pronoun used in writing RAs (Luzo´n, 2009; Martı´nez, 2005).

Despite the fact that move labels display the communicative function of each move/step explicitly, a brief description of move and step functions follows. In order to make the description clearer, the moves and steps are accompanied by examples taken directly from the two corpora with three modifications as follows: First, citations for each example were replaced by the symbol (R) which is not contingent upon the number of references found in the source. Second, distinct lexical clues for individual moves and steps were bolded. Third, the RA number was shown in parentheses with each example. For instance, (CA9), (CF9) and (CP9) refer to the ninth article from the Chinese corpus of animal science, food science and plant science respectively, while (IA9), (IF9) and (IP9) refer to the ninth article from the international corpus of animal science, food science and plant science respectively. These modifications were applied to every text segment exemplified in this section. Finally, the frequencies of individual moves/steps found in each IMRD section were reported based on Kanoksilapatham's (2005) criteria that the occurrence of a conventional move should be between 100% to 60%, whereas the occurrence of an optional move is below 60%.

4.1.1 The Introduction Section

4.1.1.1 Moves and Steps

The three moves found in the introduction section included **Move 1: Stating why the topic is important**, **Move 2: Preparing for the present study** and **Move 3: Introducing the present study**. Comparing the two corpora, Moves 1 and 3 are present in all RAs. Move 2 occurs less frequently, showing up in 71% of the local corpus and in 78% of the international one. Based on Kanoksilapatham's (2005) criteria, all moves found in this section are conventional.

Table 4.1 Move Structures of the Agricultural Science Research Article Introduction Sections

Move/Step	Frequency	
	Chinese Corpus (N=45)	**International Corpus (N=45)**
M1: Stating why the topic is important	**45 (100%)**	**45 (100%)**
S1:Commenting on the importance of the topic	44 (98%)	45 (100%)
S2:Making topic generalizations	20 (44%)	33 (73%)
S3:Reviewing previous research	45 (100%)	45 (100%)
M2:Preparing for the present study	**32 (71%)**	**35 (78%)**
S1:Raising a research problem	16 (36%)	0
S2: Indicating a research gap	18 (40%)	35 (78%)
S3:Making a hypothesis	0	3 (7%)
M3: Introducing the present study	**45 (100%)**	**45 (100%)**
S1:Stating research purpose(s)	43 (96%)	41 (91%)
S2:Presenting hypotheses	0	3 (7%)
S3:Describing research procedures	19 (42%)	26 (58%)
S4:Presenting research findings	3 (7%)	10 (22%)
S5:Stating the value of the present study	24 (53%)	5 (11%)

Note 1. N = the total number of analyzed RA Introduction sections in this study
2. % = the frequency of occurrence of a move/step

Move 1: Stating why the topic is important

Move 1 functions as an orientation for readers by establishing the significance of the research within the field. This move is always present and usually occurs first in the Introduction. Consistent with Kanoksilapatham's (2005) model, the analysis of the two corpora confirmed that writers justify the importance of the topic in three ways: by commenting on the importance of the topic (Step 1), by making topic generalizations (Step 2) and by reviewing previous research (Step 3).

Move 1, Step 1: Commenting on the importance of the topic

Found forty-four times in the Chinese corpora and forty-five times in the international corpora, Step 1 should be included in academic writing to justify why a study is important and worth investigating. There is clear evidence that Step 1 is the most favored opening, found in forty-thee out of forty-four local and thirty-eight out of forty-five international Introductions. At the same time, linguistic features of this move type contain lexical items or phrases to indicate the significance of the research topic (e.g. *play an important role*, *is the most important*, *known*) using present simple tense, present perfect tense and past simple tense. But present simple tense was the predominant tense.

Examples:

1) *Skeletal muscle accounts for 40-50% of body weight, and* ***is the most important*** *product for the poultry industry. Nutritional and metabolic exposure during critical periods of early development can* ***have long-term programming effect on*** *health and in adulthood (R).* (CA4)

2) *The ER* ***plays an important role*** *in a variety of cellular processes, including lipid and protein synthesis, protein folding, and post-translational modification of proteins.* (IP14)

Move 1, Step 2: Making topic generalizations

Step 2 represents a statement about the general knowledge of the current study, so non-past tenses (present simple and present perfect tense) are prominent in this step. Five international papers began with this step and others used it elsewhere in this section. Step 2 was not used to open the Introduction section in the local corpus. Further comparison shows that the frequency of this step in the international corpus (73%) was far greater than in the local corpus (44%), indicating that international researchers prefer to generalize topic knowledge (Step 2) compared with their local counterparts.

Examples:

1) *Intermittent feeding, chickens fed ad libitum on one day and fasted on the other day,* ***is one of the common*** *strategies of feed restriction for higher feeding efficiency in the poultry industry in China.* (CA5)

2) ***There is growing concern that*** *food allergies are increasing at an alarming rate for reasons that are not well understood.* (IF11)

Move 1, Step 3: Reviewing previous research

The last step in establishing the importance of the study (Move 1) is to review specific research results relevant to the research topic (Step 3). Consequently, a citation must occur with this move type and becomes the most salient feature. As a reference feature, statements of citation can be signaled by reporting verbs (e.g. *report*, *describe*, *propose*, *show*, *suggest*) in the form of present simple tense, present perfect tense or past simple tense. Both local and international Introductions always have a review of the literature (Step 3) likely due to the fact that researchers can convince readers of the importance of the topic (Step 1) by showing familiarity with that topic.

Examples:

1) *This "nutritional or metabolic programming"* ***has been described*** *not only in mammals (R), but also in avian species.* ***A large number of studies have been done*** *in chickens to investigate the long-term effect of early nutritional manipulation on body and muscle growth (R).* (CA5)

2) *Polyethylene glycol (PEG)* ***has been commonly used in studies*** *to determine effects of tannins on silage preservation and animal metabolism (R), as PEG binds to tannins to inhibit their biological action.* (IA12)

Overall, Move 1 provides the rationale for the study by acknowledging the importance of the research topic shifting from general (Step 2, 44% of local and 73% of international corpora) to specific aspects (Step 3, 100% of local and 100% of international corpora). The analysis confirmed that a review of the literature (Step 3) can be presented with Steps 1 and 2, that is, Steps 1 and 2 were often followed by citations, providing a support function in claiming the significance of the study or generalizing the topic. This is consistent with the results of Samraj (2002) and Kanoksilapatham (2005), which reflect the richness of hard science literature. Finally, it is worth noting that the majority of the Introductions from the two corpora typically start by commenting on the importance of the topic (Step 1).

Move 2: Preparing for the present study

Move 2 functions as a "mini-critique" (Shehzad, 2008), and is a key move being the hinge connecting Move 1 (Stating why the topic is important) to

Move 3 (Introducing the present study), that is, "what has been done" to "what the present research is about". Hence, this move has a high frequency in both datasets, accounting for 71% and 78% in the Chinese and international corpora respectively. In this study, writers build "demand" for the current contribution and argue for the importance of the topic (Move 1) in three ways: by establishing a research problem (Step 1), by indicating a research gap (Step 2) and by crafting a hypothesis (Step 3).

Move 2, Step 1: Raising a research problem

Step 1, being absent in the international dataset, was found sixteen times in the local corpus, showing that Chinese writers could present their knowledge of "the state of the art" of their field by stating a problem. In the statement of the research problem, the researcher does not need to create a gap himself; rather he uses a problem occurring in the real world or found in previous research, to serve as a background for the presentation of his work. In this regard, a citation should accompany the statement of the research problem (Step 1) as found by previous studies. The function of this step can be signaled by words indicating a problem needing a solution, for example, *imperative problem, the more serious problems* and a *common problem*.

Examples:

1) *As a big country of soybean production, the soybean yield of China often* ***remains too low to satisfy its requirement***. (CP6)

2) *Nowadays chicken raiser often add antibiotics in the diet to prevent diseases in poultry, although adding antibiotics can achieve the effect, with larger number of continuous uses,* ***the more serious problems*** *in resistance and residual are caused. So results* ***are not very satisfactory****.* (CF12)

3) *According to recent studies, repeated application of poultry litter (R), pig slurry (R) or cattle manure (R) can also substantially increase the Cu and Zn contents in the upper soil layer.* ***There has been insecure factor that*** *a mass of livestock and poultry manures which have a high concentration of heavy metals have been applied for a long term (R).* ***It is the imperative problem to study*** *how to input the manures safely.* (CP1)

Move 2, Step 2: Indicating a research gap

The function of Step 2 is to pinpoint the insufficiency or absence of a research topic in the area of the study. In the international corpus, this step co-occurred with Move 1, Step 3 (Reviewing previous research) several times. This phenomena was only observed in the international corpus because the experiment presented in the international corpus is more complex than that in the local one (Kanoksilapatham, 2007b), thus likely leading to different gaps accounting for various aspects of a single study.

Example:

The genotypic diversity of some phytochemicals in rice bran layers has been widely characterized (R) ***(Move 1, Step 3)****.* ***However****, some phytochemicals,* *including phenolics and flavonoids,* ***have not received as much attention as*** *other compositions in rice grains and the phytochemicals in other cereals, fruits and vegetables (R)* ***(Move 2, Step 2)****. Phenolics are compounds possessing one or more aromatic rings with one or more hydroxyl groups (R). Phenolic compounds in diet may provide health benefits associated with reduced risk of chronic disease (R)* ***(Move 1, Step 3)****.* ***There have been few reports on*** *characterization of other flavonoids such as flavonols, flavones, flavanols, and flavanones* ***(Move 2, Step 2)****. (IF15)*

To accomplish its function, the linguistic indicators of gaps include the words *however*, *but*, *few, not been, no*, *little*, *while*, *although* and *limited*. Although this step is heavily loaded with a variety of linguistic indicators, the use of *however* is by far the most common, with nine and sixteen occurrences found in the local and international corpora. Finally, Step 2 can be used in three linguistic forms, including present simple tense with active voice, present perfect tense with passive voice and past simple tense with active voice.

Examples:

1) *How satellite cell GH receptor and IGF-I receptor expression responds to long-term early-age feed restriction* ***has not been adequately elucidated****.* (CA5)

2) *Although cytosolic Hsp90 proteins have been well characterized in plants, ER-resident Hsp90 proteins* ***are still largely unknown****.* (IC14)

3) *Unfortunately, the limited sampling and poor resolution of the molecular markers* ***provided little decisive information about*** *the actual evolutionary relationship between them.* (IA2)

Move 2, Step 3: Making a hypothesis

The statement of Step 3, signaled by the word "hypothesis" or "hypothesized", was raised at the end of the review of the literature (Move 1, Step 3) and might recur with reviews of individual items for several times. Although this step can be used to construct research objectives explicitly, only three international Introduction sections were found to use this step. At the same time, local Introduction sections did not use Step 3.

Examples:

1) *During homogenization of fat in milk protein solution, competitive absorption between CM and PM (native or aggregated) occurs leading to the formation of a complex layer (R). Absorption of aggregates leads to bridging flocculation between droplets favoring the structuring of the emulsion. Moreover, Esuston, Finnigan and Hirst (2000) suggested that WP were only partly unfolded at oil droplet surface and consequently some hydrophobic amino-acid residues remained directed towards the aqueous phase favoring droplet aggregation.* **(Move 1, Step 3)** *In line with these results,* ***we hypothesize*** *changes in protein structure caused by heat treatment could induce different structures of the interfacial layer (difference of thickness and of homogeneity) with or without disulfide bridges.* **(Move 2, Step 3)** (IF9)

2) ***It was hypothesized that*** *feeding of forage combinations (FC) of Pterocarpus erinaceus (PE) and Gamba grass (Andropogon gayanus) (AG) could improve the overall performance of goats compared to feeding of single forages (SF), and that feeding of sole forage of PE could be better than sole forage of AG.* (IA10)

The presence of Move 2 not only reflects the value of the research but also strengthens the researcher's justification for his study, thus leading to Move 2 being frequently used in both datasets. In terms of Move 2 steps, the two groups of writers shared the step of indicating a research gap, but the Chinese researchers used the additional research problem step and their international counterparts used the additional step of making a hypothesis.

Move 3: Introducing the present study

Move 3 (Introducing the present study) is closely connected to Move 2 (Preparing for the present study) as it functions to fill in gaps. Unlike Kanoksilapathm's (2005) study, in which three steps were found, this move was accomplished in four steps for the Chinese dataset and in five steps for the international dataset. As for the frequency, all ninety articles exhibit this move, qualifying it as a conventional move in both datasets.

Move 3, Step 1: Stating research purpose(s)

Step 1, the most frequent in both datasets, can be presented either in the statement of purpose(s) explicitly or in the form of research question(s) as shown in Example 1. Compared with the international dataset, Step 1 in the Chinese corpus is quite short, often consisting of no more than one sentence. Yet, this step, found in the international corpus, varies in length: it can be as short as a sentence or elaborated on in a number of sentences to accommodate several research aims of a study, as illustrated in Example 2. Perhaps, the length of the statement of purpose(s) is correlated with the degree of complexity of the experiments published in the two different contexts since the studies reported internationally are more complex than the ones presented locally (Kanoksilapatham, 2007b). Meanwhile, a closer look at Step 1 revealed that this step was recycled in six international papers but wasn't recycled in any Chinese articles.

Examples:

1) *Specifically,* ***we tested whether*** *the VAZ cycle activity is triggered in darkness by dehydration.* (IC8)

2) *For this reason, we selected SPATA1 to analyse for its influence on stallion fertility.* ***The objective of this analysis was to develop*** *intragenic single nucleotide polymorphisms (SNPs) for the SPATA1 gene and then to test informative SNPs for significant associations with the least square means (LSM) of the pregnancy rate per oestrus and breeding values (BVs) of the paternal and embryonic component of the pregnancy rate per oestrus of stallions.* (IA3)

Typically, this step is marked by the linguistic indicators (e.g. purpose(s), aim(s), objective(s)) and the present simple tense or past simple tense of the verb-to-be. In fact, the combination of these grammatical and lexical features forms a typical formula to state the research purposes as follows:

	objective(s)			paper		is/are
The	purpose(s)	+ of the/this	+	work	+	
	aim(s)			study		was/were
				research		
				experiment		

Examples:

3) ***The purpose of this study was to further study*** *the effects of different facilities on the laying performance, egg quality and air quality for commercial layers under free range system.* (CA9)

4) ***The aim of the present study is therefore to compare*** *the influence of two gelled dairy matrices, having the same composition, similar rhetorical properties but differing by their mode of coagulation, on milk protein digestion and amino acid absorption.* (IF5)

In addition, the research purpose(s) could be expressed in the form of *this* or *the* plus the common nouns (e.g. *research*, *paper*, *experiment*) or the word *we* (even in single-authored RAs) at the beginning of a certain sentence, followed by verbs using the past simple tense (e.g. *tested*, *investigated*, *examined*, *attempted to*, *focused*). As seen, the second linguistic form to indicate research objective(s) emerged from the combination of these grammatical and lexical features.

study		compared
This /The research		investigated
experiment		tested
	+	focused
We		attempted

Examples:

5) ***This research tested the effect of** one ingredients mulberry leaves on the performance of laying hens serum biochemistry and egg quality.* (CA10)

6) *Moreover, **this study investigated the effect of** an initial allele frequency on benefits.* (IA15)

7) *In this study, **we attempted to address** the question about the evolutionary relationship of the two camels based on sequence variations.* (IA2)

The linguistic features of Move 3, Step 1 included the past simple tense, present simple tense and the pronoun *we*. It is likely that Chinese researchers were more reluctant to use *we* (four times) than their international counterparts (ten times). Perhaps, this was because Chinese academics would express modesty and humility by avoiding the use of *we* in their papers.

Move 3, Step 2: Presenting hypotheses

This step, functioning to state research hypotheses, was found three times in international papers while it was completely absent in the local corpus. This is in contrast to the finding of Loan and Pramoolsook' s (2014) study, in which this step was found in every Introduction thesis chapters written by novice Vietnamese TESOL postgraduates, demonstrating disciplinary and genre variations in the Introduction section. At the same time, Step 2 was used concurrently with Step 1 (Stating research purpose(s)). Clearly, the word *hypothesis* is the most salient linguistic indicator to introduce this step.

Examples:

1) ***The objective of this study was to*** *gain insight to on the physiological involvement of miRNAs in follicular maturation in the mare.* **(Move 3, Step 1)** ***The overall hypothesis*** *was that differences in miRNA levels between these 2 types of follicles would be in each case consistent with follicular roles proposed in earlier in vitro studies.* **(Move 3, Step 2)** (CA4)

*2) Finally****, our last hypothesis*** *was that this unique mechanism might not be restricted to desiccation-tolerant species, given the ecological relevance of its pre-emptive photo protective role.* (IP8)

Move 3, Step 3: Describing research procedures

The statement of the major procedural features was found nineteen times in local, and twenty-six times in international publications, indicating that international researchers seemed to favor the use of this move to encourage readers to continue reading. In addition, Chinese researchers preferred to combine the description of procedures (Step 3) with the statement of the research purpose (Step 1) in one sentence, thus making this step relatively short for the local corpus as shown in Example (1); while, in the international dataset, Step 3 was sometimes elaborated so its length could vary from one sentence to a number of sentences. As indicated by its move label, Step 3 was mainly expressed by prevalent research activity verbs (e.g. *collect*, *measure, estimate, perform*, and *compare*) used together with the past simple tense.

Examples:

1) *To obtain a better detection method for CSFV and PRRSV, two primer sets* ***were designed and used*** *in a multiplex RT-PCR for rapid detection of CSFV and PRRSV in different samples*. (CA13)

2) *In this study, the antioxidant capacity of theabrownin* ***was measured by*** *DPPH method after isolating.* (CF5)

3) ***We examined the effect of*** *RF treatment on brown rot at different times after inoculation of the fruit, on fruit challenged with different inoculum concentrations, and with fruit at different maturity stages. The efficacy of the RF treatment also* ***was tested*** *with naturally infected fruit. In addition, the effect of RF treatment on fruit quality* ***was evaluated*** *in peaches and nectarines.* (IC9)

In addition, the pronoun *we* is perhaps the most striking difference between the two data sets. Specifically, the pronoun *we*, completely absent in the local corpus, was observed in eight out of twenty-six international papers. It is likely because the word *we*, as indicated by its plural form, can increase the sense of reliability of the study (Li & Ge, 2009). Instead, Chinese researchers used the word "writer" or "author" in their papers, as illustrated in the following example:

4) ***The writer selected 17 varieties*** *that are suited for Ningxia and researched the effect of different sowing date on their growth period，yield，yield structure and agronomic traits.* (CP12)

Move 3, Step 4: Presenting research findings

Step 4 presents the main findings of the study with a small number of occurrences in the Chinese (7%) and international datasets (22%). However, the higher percentage of this step in the international context seemed to indicate an emerging trend to include the important results of the experiments in the agricultural science Introductions. Typically, this step was marked by prevalent lexical features (e.g. *results, analysis* and *effects*) and the past simple tense with passive voice. In addition, the word *we* can be followed by verbs in the form of past simple tense (e.g. *reported*, *presented*, and *showed*). However, it should be noted that *we*, missing in the local corpus, was used in six out of ten international RAs. Possibly, this difference can be explained by the fact that the use of plural first person pronouns may help shorten the distance between researchers and readers (Li & Ge, 2009).

Examples:

1) ***The results indicated*** *that the CRFs had significant effects on controlling nutrient release.* (CP5)

2) ***The bicarbonate was determined*** *as the bulk* ^{14}*C presence in plant parts and as distribution of C-tracer in ryegrass and white clover.* (IP11)

3) *Here,* ***we presented results*** *from both small RNA gel blots and deep sequencing of small RNA populations from several genotypes of soybean.* (IP1)

Move 3, Step 5: Stating the value of the present study

Through this step, the possible contribution of the research results was introduced. Step 5 was optional in both corpora, but this step was with a higher frequency in the local corpus (24%) than in the international corpus (5%), showing that Chinese researchers placed more emphasis on highlighting the value of their own research than their international counterparts. Examples of phrases related to the application or significance of the study included *provide scientific basis* and *provide theoretical reference*.

Examples:

1) Meanwhile, the experiment ***provided the theoretical basis*** *for the effective prevention of uraturia and the rational use of cotton-by product resources.* (CA1)

2) The results of this study could provide rice breeders and eventually commercial rice growers new opportunities to ***promote the production*** *of rice with enhanced levels of the bioactive compounds.* (IF15)

Move 3 was often used to conclude the Introduction section in agricultural science. Similar to Moves 1 and 2, Move 3 was found to be used cyclically, but this phenomenon was only observed in the international corpus. Particularly, Move 3, Step 1 (Stating research purpose(s)) recurred several times in six international papers, while Step 1 (Stating research purpose(s)) co-occurred with Step 3 (Describing research procedures) in fifteen Chinese papers. For the linguistic feature, the most striking difference between the two corpora is the use of *we*. In other words, international researchers make greater use of *we* than their Chinese counterparts. In addition, announcement of purpose(s) of the study (Step 1, 96% of the local and 91% of the international corpora) and a preview of methods (Step 3, 42% of the Chinese and 58% of the international corpora) were employed in a high number of agricultural science Introductions, whereas a statement of findings (Step 4) was less frequent (7% of the Chinese and 22% of the international corpora). This was likely due to the fact that agricultural science researchers tend to report main findings before the Results section in order to motivate readers to read further.

4.1.1.2 Move Sequences and Cyclical Moves

Table 4.2 Sequences and Cyclical Moves in the Introduction Section

	Chinese Corpus			International Corpus		
	M1	M2	M3	M1	M2	M3
Opening Move	96%	4%	0%	96%	4%	0%
Closing Move	0%	0%	100%	0	4%	96%
Cyclical Move	22%	11%	0%	64%	18%	12%

Move analysis of the Introduction section further determined which moves were likely to open and end the section and which moves were the most cyclical. By cyclicity, we mean a recurrent sequence of moves. For example, in the case of move sequence M1-M2-M1-M3, Move 1 was an intervening move. The results from the two corpora are presented in Table 4.2.

First, 96% of the Introduction sections began with Move 1, giving a justification for carrying out the study. However, 4% of the local and 4% of the international corpora raise the possibility that the Introduction section can be opened with Move 2, in addition to Move 1. Perhaps, positioning Move 2, Step 2 (Indicating a research gap) first was used to attract readership by claiming an absence of detailed studies.

Second, 100% of the local corpus ended the Introduction section with Move 3. In terms of steps, twenty-four out of forty-five Chinese papers stop at Move 3, Step 5 (Stating the value of the present study), demonstrating that Chinese researchers preferred to convince readers of the value/significance of the study before closing the section. Except for two articles (IA13 and IC13), which stop at Move 2, 96% of the international corpus closed with Move 3. The example below was taken from the last paragraph of the Introduction of IC13 to illustrate how the Introduction ends with Move 2, Step 2 (Indicating a research gap).

Example:

This work was initiated before the rice genome sequence was published as an attempt to isolate and clone an anther specific promoter based on the available sequence data of the gene in the database during that period. ***(Move 3, Step 1)*** *However, there are many plants whose genetic resources are unexploited and could be utilized by employing similar technique as described here.* ***(Move 2, Step 2)***

In this example, the research gap (Move 2, Step 2) was presented towards the end of the section to strengthen the significance of the study. Nevertheless, ending the Introduction by indicating a research gap (Move 2, Step 2) was done rarely, being found only twice.

Third, the results from the two corpora confirmed that Move 1 was the most cyclical, although Moves 2 and 3 sometimes recurred in the Chinese and international corpora. A closer look at the cyclical phenomenon revealed that, first, the cyclical characteristic of Move 2 in the local corpus was not as great as that in the international corpus; second, Move 3 recurred in 12% of the international corpus but this cyclical characteristic was absent in the local corpus. Taken together, these results seem to indicate that internationally reported studies are often justified by the presence of different research gaps (Move 2, Step 1) and research purposes (Move 3, Step 1). Subsequently, various move structures, resulting from various cyclical moves, are presented in the following sections.

4.1.1.3 Move Patterns

As suggested by Amnuai (2012), move patterns, occurring in at least three different papers, were reported in this study because they represent preferred patterns for the Introduction section. The same criterion was applied to the Methods, Results and Discussion sections as well.

Table 4.3 Move Patterns found in the Introduction Section of the Two Corpora

Move Pattern	**Chinese Corpus**		**International Corpus**	
	No.of Articles	**%**	**No.of Articles**	**%**
M1-M2-M3	15	33%	8	17%
M1-M3	14	31%	6	13%
M1-M2-M1-M3	6	13%	16	36%
M1-M2-M1-M2-M3	4	8%	-	-
M1-M2-M1-M2-M1-M3	-	-	3	7%
Total	39	87%	33	73%

As shown in Table 4.3, four patterns emerged from the Chinese and international corpora respectively. Firstly, three similar patterns, including M1-M2-M3, M1-M3 and M1-M2-M1-M3, were shared by the two corpora. One additional pattern, M1-M2-M1-M2-M3 was identified in the local corpus, whereas another additional pattern, M1-M2-M1-M2-M1-M3 was exhibited in the international corpus.

Secondly, the two groups of RAs differed in the use of the most preferred move pattern. The majority of Chinese researchers tend to employ move structure M1-M2-M3 (fifteen out of forty-five papers), which is congruent with those in Swale’s model (1990) and studies of other disciplines, e.g. civil engineering (Kanoksilapatham, 2011) and applied linguistics (Amnuai & Wannaruk, 2013a). In contrast, a majority of the international researchers favor the use of move structure M1-M2-M1-M3 (sixteen out of forty-five papers) with an intervening Move 1 between Move 2 and Move 3. Concerning different publication contexts, the extensive use of Move 1 (particularly Step 2: *Making topic generalizations* and Step 3: *Reviewing previous research*) in the international corpus helps readers from related or parent disciplines by providing a more theoretical background for the investigated topics (Ozturk, 2007).

Third, the local and international corpora differ in the use of the least frequent pattern. Specifically, the sequence M1-M2-M1-M2-M3 in the local corpus indicated that some Chinese researchers were trying to motivate the readership by providing an extensive presentation of the research problem (Move 2, Step 1), research gap (Move 2, Step 2), or review of the literature (Move 1, Step 3). Conversely, some international researchers motivate their potential readership with a strong focus on the importance of the topic (Move 1, Step 2), resulting in a pattern of M1-M2-M1-M2-M1-M3 (presented three times in the international corpus).

In sum, all three moves were considered conventional in this section, despite variations in their frequencies. In the local corpus, two move structure patterns were almost equally frequent, including M1-M2-M3 (33%) and M1-M3 (31%), while, in the international corpus, the sequence M1-M2-M1-M3 (36%) was the favored pattern. Less deviation in the patterns were found in the local corpus. That is, 87% of the local and 73% of the international Introductions were expressed in the identified patterns, indicating that local Introduction sections were more likely to conform closely with the typical move patterns than the international ones. Finally, the results from the two corpora confirmed that Move 1, Step 3 (Reviewing previous studies), was the most cyclical pattern in the Introduction section. Meanwhile, the most common step used to open Introductions, Move 1, Step 1 (Commenting on the importance of the topic), was often used as a lead-in to the Methods section.

4.1.2 The Methods Section

4.1.2.1 Moves and Steps

In this study, five moves were used to achieve the function of the Methods section, including **Move 4: Describing materials**, **Move 5: Describing experimental procedures, Move 6: Detailing equipment, Move 7: Presenting equations describing the phenomena or models of the phenomena,** and **Move 8: Detailing statistical procedures**. The frequencies of Moves 4, 5, 6 and 7 are quite similar between the two corpora. That is, Moves 4, 5 and 6 are conventional. The occurrence of Move 7 is much less frequent, being found in 31% of the local and 13% of the international corpora respectively. A difference between the two corpora is that Move 8 was optional in the local but conventional in the international corpora.

Table 4.4 Move Structures of the Agricultural Science Research Article Methods Sections

Move/Step	Frequency	
	Chinese Corpus (N=45)	International Corpus (N=45)
M4:Describing materials	**45 (100%)**	**45 (100%)**
S1:Listing materials	45 (100%)	45 (100%)
S2:Detailing the source of the materials	18 (40%)	24 (53%)
S3:Providing the background of the materials	11 (24%)	21 (47%)
M5:Describing experimental procedures	**45 (100%)**	**45 (100%)**
S1:Describing experimental design	10 (22%)	0
S2:Documenting established procedures	27 (60%)	41 (91%)
S3:Describing the location where the study was conducted	22 (49%)	7 (16%)
S4:Detailing experimental procedures	45 (100%)	45 (100%)
S5:Providing the background of the procedures	24 (53%)	36 (80%)
M6:Detailing equipment	**28 (62%)**	**39 (87%)**
M7:Presenting equations describing the phenomena or models of the phenomena	**14 (31%)**	**6 (13%)**
M8:Detailing statistical procedures	**24 (53%)**	**34 (76%)**

Note 1. N = the total number of analyzed RA Methods sections in this study
2. % = the frequency of occurrence of a move/step

Move 4: Describing materials

Move 4 introduces the materials or animals used in the experiment (Step 1) together with the source (Step 2) or background information (Step 3) for the materials or experimental animals. Forty-five agricultural science RAs contained this move in each corpus.

Move 4, Step 1: Listing materials

Step 1 can be explicitly characterized as items or lists of items, including chemicals, animals, samples, cultures and other tangible items used to conduct the experiment. This step, representing the first move of the Methods section, was invariably presented with the same frequency, accounting for 100% of each corpus. One difference between the two corpora was that Chinese researchers listed materials (Step 1) separately and exclusively under subsections titled "Materials", "Test Materials" or "Experimental Animals". However, international researchers presented materials (Step 1) either in an individual subsection or in a pattern integrated within the materials and methods sections. Action verbs (e.g. *list*, *use*) in the form of past simple tense and passive voice indicate this communicative unit.

Examples:

1) *Total 14 rapeseed lines* ***were used*** *in this study.* (CP7)

2) *Mature Angus-cross, nonpregnant, nonlactating, ertrous-cycling beef cows* ***were used*** *in these experiments.* (IA6)

Move 4, Step 2: Detailing the source of the materials

The materials (Step 1) were often described together with information on how the materials were obtained (Step 2), for example, purchased or contributed by an organization. Typically, the past simple tense with passive voice was used to introduce how the materials were obtained. As for the status, Step 2 was used slightly more frequently than in the international corpus (53% as opposed to 40% in the local corpus).

Examples:

1) *The experimental Pu-erh tea* ***was purchased from*** *the China Tushu Yunnan Tea Imp.& Exp.Corp.* (CF5)

2) *A batch of 18 kg of carrots (Daucus carota L.)* ***was obtained from*** *a local wholesale business (Van Landschoot, Ghent, Belgium).* (IC10)

Move 4, Step 3: Providing the background of the materials

Step 3, the least frequently used step of Move 4, was used to provide additional information regarding the features of the materials or the selection criteria for the materials. Therefore, past simple tense with passive voice and linguistic indicators (e.g. *selection*, *criteria* and *approved*) were used to accomplish this function.

Examples:

1) *All the chemicals and reagents* ***were analytically pure***. (CF5)

2) ***Selection criteria traits*** *were ADG, LM area, back fat thickness, and intramuscular fat.* (IA9)

Move 4 describes the materials used in the experiment in three ways: listing the materials used (Step 1), introducing the source of the materials (Step 2) and giving additional background information (Step 3). Further analysis revealed that the frequency of this move was conventional in both corpora. Following the description of materials (Move 4), the experimental procedures were described in Move 5.

Move 5: Describing experimental procedures

Similar to Move 4, Move 5 was always present, functioning to explain how the experiment was carried out in a logical and sequential manner. This procedural move is useful to readers who would like to know how the methodology of the study has influenced the results, or who are interested in replicating or extending the study. Move 5 was presented with five steps in the local but four steps in the international corpora.

Move 5, Step 1: Describing experimental design

Step 1 appeared to be a characteristic of the local Methods section. That is, it was missing in the international dataset but present in 22% of the local corpus. Some local articles preferred to describe the experimental design exclusively under one subsection. Using this way, the subheadings that were generally used included “Trial design”, “Experimental design”, “Test design” and “Single-factor experimental design”. Under the subsection, the experimental design statement can be signaled by the word “design” pre-modified by adjectives, denoting the category of research conducted, for example, “a random block design” or “single factor experiment design”.

Examples:

1) *The field experiment was conducted in Tanggouzhen of Zongyang County,* ***following the randomized block design****, with three repetitions for each treatment (variety).* (CP3)

2) *Four repetitions were set for each treatment,* ***arranged as randomized block design****.* (CP4)

Move 5, Step 2: Documenting established procedures

Since Step 2 recounts an established experimental procedure, it can be expressed in one sentence with reference to the specific name of the established method. For this reason, the most distinct phrases to signal this function included *according to the modified method as previously described*, *according to the manufacture's suggestion*, *following the method of* and *by the method of*, allowing researchers to direct readers' attention to the reference of the method. The frequency of Step 2 in the international corpus (91%) is greater than that in the local one (60%), indicating that Chinese researchers probably need to include a statement of established procedure (Step 2) if they want to publish internationally. At the same time, the lower frequency of Step 2 in the local corpus probably indicates that Chinese researchers have fewer linguistic expressions to describe the established procedures.

Examples:

1) *Satellite cells were isolated from the lateral gastrocnemius muscles* ***according to a protocol described by Doumit and Merkel*** *(R)* ***with some modifications***. (CA5)

2) *Clinical scoring (on a scale of 0 to 5) was performed by 2 individuals* ***according to the method described previously*** *(R).* (IF11)

3) *Testis tissue was conserved in RNAlater solution (Macherey-Nagel) and transcribed into cDNA using QIAzol^{TM} Lysis Reagent (Qiagen)* ***according to the manufacture's protocol***. (IA3)

Move 5, Step 3: Describing the location where the study was conducted

Agricultural science experiments do not always take place in labs. Sometimes, they take place on farms, for example, where animals are raised or plants are grown. In this regard, Step 3 is used to describe the location of the farm or experimental field where the study takes place, being identified in 49% and 16% of the local and international corpora respectively. The locative adjuncts were found to specify the site of the experiment, for example, *in the Cedar Creek Natural History Area, Minnesota* and *at the Experimental Farm*.

Examples:

1) ***The experiment was conducted in greenhouse***, ***located in*** *Institute of Soil and Fertilizer, Fujian Academy of Agricultural Sciences.* (CP5)

2) ***Field studies were conducted at the Experimental Farm of*** *Faculdade de Ciencias Agrarias a Veterinarias-UNESP,Brazil, 21° 155, 48° 19'E, 605m attitude, from November 2002 to June 2003.* (IA13)

Move 5, Step 4: Detailing experimental procedures

Step 4, generally describing what has been done in a logical manner, was perhaps the most central move of the section. It was found in every article for both corpora and was used in three different ways. First, when the statement of established experimental procedure (Step 2) was not presented, the details of the experimental procedure (Step 4) needed to be present to allow replication of the experiment. Second, if the name of the established procedure (Step 2) was provided, researchers are expected to highlight certain details of the experimental procedure (Step 4). Third, in the case of a modified procedure, specific features of the experiment were described to facilitate readers' understanding. The action verbs (e.g. *washed*, *exposed*, *preserved*) were used in the form of passive voice or the alternative choice of *we* + active voice (one instance in the local as opposed to six instances in the international corpora). In this way, the use of *we* might increase the sense of reliability of the study, as indicated by its plural form (Li & Ge, 2009).

Examples:

1) *Fresh purple cabbage* ***was peeled off, washed and air-dried****. Then, they* ***were inactivated at*** *80^{0}C for 10 min, and* ***dried at*** *50^{0}C. After grinding, the powder* ***was filtrated by*** *60 mesh sieve, and* ***preserved in*** *dark place for late use.* (CF3)

2) *Groups of mice (n=5-10 per group)* ***were exposed to*** *saline (100 uL per mouse per application) or milk whey protein (1 mg and 2.5 mg per mouse per application).* (IF11)

3) ***We analyzed*** *the pregnancy rate per oestrus.* (IA3)

Move 5, Step 5: Providing the background of the procedures

During the presentation of experimental procedures (Step 4), information needs to be added to help readers understand the justification for a certain procedure, approval for the use of animals, comments on the whole experiment or observations made during the experiment. This additional information refers to Step 5, which was optional in the local but conventional in the international corpora. In this move type, the most salient linguistic feature was the use of conjunctions indicating cause and effect (e.g. *thus*, *because*, *since*) or the phrase *was/were approved by* to signal approval.

Examples:

1) ***Since*** *theabrownin precipitate in 80% ethanol, only ethanol with concentration less than 60% was used when preparing DPPH solution, along with the addition of a small amount of toluene to help the dissolution.* (CF5)

2) *The animal procedures used* ***were approved by*** *the Institutional Animal Care and Use Committee (Michigan State University, East Lansing).* (IF8)

As expected, past simple tense might be the predominant choice. Surprisingly, present simple tense was occasionally used in the local as well as the international corpora, in the case of observation being made during the experiment.

3) *An increase in cell number* ***results in*** *an increase in the amount of MTT formazan formed and an increase in absorbance.* (CA5)

4) *Details of allocation of genotypes to treatments* ***is in Table 2***. (IA11)

In Move 5, Steps 2 and 4, which are the most frequently used steps, likely co-occurred, and this co-occurrence might recur several times, particularly, when the whole study consists of several sub-experiments. In these cases, the established knowledge of each sub-experiment (Step 2) needs to be presented with a statement of experimental procedures (Step 4).

Examples:

1) *The test was conducted according to the method introduced in "crop seed science" with slight changes (R)* ***(Move 5, Step 2)***. *100 net seeds were randomly selected with three repeats and packed with gauze, then soaked in 4 ºC cold water for 3 d. Seeding growth test was carried out, and the seeds without cold water and liquid nitrogen treatment were set as control (CK)* ***(Move 5, Step 4)***. *According to the methods by XUE Gang el at (R), 100 net seeds were randomly selected and weighted with three repeats* ***(Move 5, Step 2)***. *The seeds were rinsed with double distilled water for two times, and then the filter paper was used to absorb the floating water* ***(Move 5, Step 4)***. (CP15)

The main part of the methods section includes a description of the materials (Move 4) and the experimental procedure (Move 5). However, other elements are commonly described in this section as well. For instance, equipment used with each step in the experimental procedure is described through Move 6.

Move 6: Detailing equipment

Move 6 gives details related to the apparatus, such as the name of the manufacturer, to allow future research replication. Such information, presented in 62% and 87% of the two datasets, was at a much higher frequency rate than that in Nwogu's (1997) study. This seemed to indicate that disciplinary variations play a key role in determining the frequency of a certain move. The identification of the research apparatus was realized using a passive verb in the past simple tense in connection with the nouns of the apparatus, followed by the name of the manufacturers.

Examples:

1) ***Gas detector tube method*** *was used to determine daily average* NH^3, CO^2 *concentration during 32 weeks (**Beijin Institute of Labor Protection**, the range of* NH^3 *of detector tube 2-100 mg/*m^3*, and* CO^2 *2-4 000 mg/*m^3*).* (CA9)

2) *Finnigan MAT 251 and Finnigan Delta + XL, each of which was coupled to **an automatic equilibration device equipped with pneumatic values (manufacturer: Finnigan and Parcom)**.* (IF6)

Move 7: Presenting equations describing the phenomena or models of the phenomena

Move 7, predicting measured variables in experiments, was optional in both corpora (31% and 13%). The information in Move 7 can be signaled by the use of explicit lexemes (e.g. *parameter*, *assumed*, *estimated*) and the presence of a model or formula. Since the details of the mathematical model are established knowledge, they can be expressed in present simple tense (Malcolm, 1987), in addition to past simple tense.

Examples:

1) *The extraction rate of procyanidins* ***was calculated according to the following formula***.

Extraction rate of procyanidins (mg/g)=C×X×V/1 000W

Where C is procyanidins concentration of samples (ug/ml); X is the dilution multiple of extraction liquid; V is the extraction volume (ml); W sample quality (dry weight, g). (CF3)

2) *The objective function of mate selection is the cumulative discounted performance (CDP), which is calculated as:* (IA15)

$$CDP = \sum_{t-1}^{h} \frac{\sum_{i=1}^{3}(MS_{i,t}\, g_i + FS_{i,t}\, g_i)}{(1+dr)^{t-1}}$$

Move 8: Detailing statistical procedures

Move 8 involves statistical approaches to the analysis of data. The frequency of Move 8 in the international corpus (76%) was higher than that in the local corpus (53%). To accomplish its function, the information of Move 8 might include types of software, accounts for their application, analytical instruments and the analysis procedure. The length of this move can vary from one sentence to multiple paragraphs, depending on the degree of complexity of the study. Since

Move 8 is concerned with statistical procedures, it can be signaled by the name of the software (e.g. *SPSS 17.0*, *Statistical Analysis System* and *Data Analysis 5.1 software*) or by statistical terminologies (e.g. *ANOVA*, *T-test*, *descriptive statistics* and *mean*).

Examples:

1) *The results were expressed as the Mean ± SEM.* ***All data were subjected to one-way ANOVA analysis*** *testing the main effect of the treatment. When the main effect of treatment was significant,* ***statistical differences of the means*** *assessed by least-significant difference.* (CA5)

2) ***Data were subjected to multi-way ANOVA*** *to determine which factors (treatment or storage time) mostly influence the response variable (microbial parameter, sensory attribute and nutrient content) and whether an important interaction exists between treatment and storage time.* (IC10)

4.1.2.2 Move Sequences and Cyclical Moves

Table 4.5 Sequences and Cyclical Moves in the Methods Section

	Chinese Corpus					**International Corpus**				
	M4	M5	M6	M7	M8	M4	M5	M6	M7	M8
Opening Move	100%	0%	0%	0%	0%	80%	20%	0%	0%	0%
Closing Move	0%	29%	4%	16%	51%	0%	27%	9%	4%	60%
Cyclical Move	42%	58%	24%	4%	4%	62%	98%	78%	7%	27%

Table 4.5 provides results for the analysis of the opening/closing moves and cyclical moves from the two datasets. Regarding the opening move, all the Methods sections published locally were opened with Move 4 (Listing materials), whereas 80% of the Methods sections published internationally began with Move 4 and the remaining 20% of the international papers opened the section with Move 5 (Describing the experimental procedure). Except for Move 4, every move in the two corpora were used to close the section. However, Move 8 (Detailing statistical procedures) pervasively ended 51% of the local and 60% of the international corpora. That is, Move 8 was the most favored strategy for closing the Methods sections.

As for cyclical characteristics, every move seemed recursive in both corpora. Nevertheless, Move 5 (Describing experimental procedures) appeared to be the most cyclical and had close relations with Move 4 (Listing materials) and Move 6 (Detailing equipment). To be specific, Move 5, particularly Step 4 (Detailing experimental procedures), was presented with Move 4 (Listing materials) and was recursive in the section. However, the cyclical characteristic of Moves 4 and 5 in the local corpus was not as great as that in the international corpus. This difference was likely due to the fact that Chinese researchers preferred to list materials (Move 4) separately and exclusively under one subsection. In contrast, their international counterparts were more likely to present materials (Move 4) either in individual subsections or in a pattern integrated with materials and methods.

Example:

Then, the cycle of exposure to saline or milk whey protein was continued for 6 wk, with mice exposed once a week. Blood samples were collected from the saphenous vein ***(Move 5, Step 4)*** *into heparin-coated microvette collecting tubes (CB300, Sarstedt AG & Co. Numbrecht, Germany) and plasma was used in the antibody analysis* ***(Move 4, Steps 1 & 2)****.* (IF11)

At the same time, Move 5, Step 4 (Detailing experimental procedures) and Move 6 (Detailing equipment) were highly interwoven and recursive, suggesting that instruments were presented simultaneously in articles when each procedural step was mentioned. Similar to the co-occurrence of Moves 4 and 5, the recursive pattern of Moves 5 and 6 occurred less frequently in the local corpus than in the international corpus. Taken together, the diversity of cyclical moves may yield various move patterns for the two corpora, which were present in the following example:

Example:

A 3-step protocol (denaturation at 95 ^{o}C for 10 s, annealing at 56 ^{o}C for 20 s and elongation at 72 ^{o}C for 10 s) with 40 cycles followed by a melting curve analysis was performed ***(Move 5, Step 4)****. The PCR fluorescence was detected using the iQ ^{TM} 5 Multicolour Real-Time PCR Detection System (BioRad)* ***(Move 6)****. A threshold cycle (Ct) under 38 and a specific melting temperature (Tm) indicated a positive result. Y. enterocolitica and Y. pseudotuberculosis were isolated using direct plating, non-selective and selective enrichment* ***(Move 5, Step 4)****. Hundred microliters was directly plated on a selective CIN (cefsuloding-rigasan-nonvobiosin) agar plate (Merck) after homogenization* ***(Move 6)****.* (IF4)

4.1.2.3 Move Patterns

Table 4.6 Move Patterns Found in the Methods Section of the Two Corpora

Move Pattern	**Chinese Corpus**		**International Corpus**	
	NO. of Articles	**%**	**NO. of Articles**	**%**
M4-M5-M8	6	13%	-	-
M4-M5-M6-M5	4	9%	-	-
M4-M5-M6-M8	3	7%	-	-
M4-M5	3	7%	-	-
M4-M5-M6-M5-M6-M5-M6-M5-M8	-	-	5	11%
M4-M5-M4-M5-M6-M5-M8	-	-	3	7%
Total	**16**	**36%**	**8**	**18%**

From Table 4.6, two observations can be made. First, in contrast to the Introduction section, no frequent patterns were shared by the two groups of writers. To be specific, four patterns emerged from the local corpus. Of these, the pattern of M4-M5-M8 occurred six times. The pattern of M4-M5-M6-M5 was found four times. Two patterns occurred equally, three times for each, including M4-M5-M6-M8 and M4-M5. On the other hand, only two patterns emerged from the international corpus, including patterns of M4-M5-M6-M5-M6-M5-M6-M5-M8 (occurring five times) and M4-M5-M4-M5-M6-M5-M8 (occurring three times).

Second, the local Methods sections appeared less diverse than the international ones. That is, 36% of the local articles were expressed in the identified patterns; whereas only 18% of the international corpus did. In general, the pattern of the Methods section was found to be diverse, not as uniform as the Introduction section. This finding lends support to Kanoksilapatham's (2003) claim that the Methods section is heavily content-driven and reflects the variety of experimental procedures in a study.

In summary, five moves were used in the Methods section in each corpus. The major move structures of the local papers tended to be less diverse than the international ones. However, the majority of the RAs in both corpora confirmed that Moves 4 and 8 were most likely to begin and close the section. Move 7, less frequent, but when presented, usually ended the section. As for the move cycling, Move 5 was found to be the most recycled for the two datasets, indicating that the description of the experimental procedures (Move 5) was the most central move of the Methods section.

4.1.3 The Results Section

4.1.3.1 Moves and Steps

This section was made of four moves, including **Move 9: Stating research procedures, Move 10: Justifying procedures or methodology, Move 11: Stating results** and **Move 12: Commenting on the results** as shown in Table 4.7. The frequencies of Moves 10, 11 and 12 between the two corpora were quite similar.

That is, Move 10 was the least frequent (16% and 29%), but Move 11 was the most frequent, being always present in every Chinese and international RAs. Move 12 was conventional in the two datasets. The only difference was observed with Move 9, which was optional in the local but conventional in the international corpora.

Table 4.7 Move Structures of the Agricultural Science Research Article Results Sections

Move/Step	**Frequency**	
	Chinese Corpus (N=45)	**International Corpus (N=45)**
M9:Stating research procedures	**21 (47%)**	**32 (71%)**
S1:Describing aim(s) and purpose(s)	9 (20%)	20 (44%)
S2:Making hypotheses	0	5 (11%)
S3:Listing research procedures	20 (44%)	23 (51%)
M10:Justifying procedures or methodology	**12 (27%)**	**13 (29%)**
S1:Detailing methods that people used before	8 (18%)	10 (22%)
S2:Commenting on whether the method yielded successful results	4 (9%)	10 (22%)
M11:Stating results	**45 (100%)**	**45 (100%)**
M12:Commenting on the results	**33 (73%)**	**39 (87%)**
S1:Explaining reasons why these results occur	16 (36%)	27 (60%)
S2:Making generalizations or interpretations of the results	31 (69%)	32 (71%)
S3:Evaluating the current findings against those from previous studies or with regard to the hypotheses	5 (11%)	16 (36%)
S4:Stating limitations	1 (2%)	7 (16%)
S5:Summarizing	10 (22%)	9 (20%)

Note 1. N = the total number of analyzed RA results in this study
2. % = the frequency of occurrence of a move/step

Move 9: Stating research procedures

Move 9, aimed at reminding readers *how* the data was produced, serves as a reminder and connector between the Methods and Results sections, as it prepares for the presentation of the results by restating the aims (Step 1), hypotheses (Step 2) and data collection procedure (Step 3). Thus, this procedural move can be placed at the beginning of the section. The frequency of Move 9 was optional in the local but conventional in the international datasets. As explained by Kanoksilapatham's (2007b), the study reported in the international corpus is more complex than that in the local one so the findings occurring in the local corpus do not need to be accompanied by statements of research aims or hypotheses to remind readers of the background of the study. In addition, *we*, being absent in the local corpus, was used frequently in eighteen out of thirty-two international RAs, adding support to the claims made by Martı´nez (2005) that "crucial procedures are personally assumed in the Results section to highlight the authors' responsibility for particular methodological decisions that led to the results obtained" (p.184). This striking difference strongly suggested that Chinese academics may use the first pronoun *we* if they want to follow the conventions of international journals. Subsequently, the distribution of the word *we* is reported in accordance with the description of the three steps as follows:

Move 9, Step 1: Describing aim(s) and purpose(s)

By stating the aims of the study, Step 1 functions to guide readers to the other parts of the text (e.g. the report of the findings). Usually, the statement of aim(s) was signaled by linguistic indicators (e.g. *aim(s)*, *purpose(s)*, and *objective(s)*). Sometimes, it can be expressed as the infinitive phrase (e.g. *to understand the function of*, *to investigate the effects of*) or the form of question as shown in Example 1. The plural pronoun *we*, absent in the local corpus, was observed in five out of twenty international articles, as illustrated in Examples 1 and 2. Finally, this step was found nine times in the local corpus, whereas it occurred with twice that frequency in the international corpus.

Examples:

1) *Thus, **we examined whether** theasinensin A inhibits I EB-R degradation.* (IF7)

2) *Thus, **we aimed to** elucidate whether this phenomenon might occur in species other than C. officinarum, and performed a survey covering five desiccation-tolerant and seven non-tolerant plants.* (IC5)

3) *Improvement of oil content of rapeseed **is one of main objectives** in rapeseed breeding program. The positive heterosis was desirable for this trait.* (CP7)

Move 9, Step 2: Making hypotheses

The statement of hypotheses, missing in the local papers, was present in five out of forty-five international papers. Linguistic indicators (e.g. *speculated*, *postulated*, *assumed* and *hypothesized*) were the most salient feature in introducing the hypotheses. In order to avoid the strong assumptions, hedging devices (e.g. *may*, *can* and *might*) were used as well. Further analysis revealed that international researchers seemed to favor the use of *we* (found in three out of five papers), when introducing hypotheses.

Examples:

1) ***We therefore hypothesized*** *that overexpression of various histones could protect incoming transgene DNA and that increased transgene stability was the cause of increased transgene expression.* (IP2)

2) ***It can be assumed that*** *the elements observed arise from the glucose units of starch, OSA, etc*. (IF10)

Move 9, Step 3: Listing research procedures

Step 3, found infrequently in the two datasets, provides readers with information on the experimental procedures. Regarding linguistic features, action verbs in the past simple tense were used to recount experimental activities. In addition, the first person pronoun *we*, was used frequently in thirteen out of twenty-three international articles, indicating that the word *we* should be employed in academic writing since *we* can be used to "highlight the authors' responsibility for particular methodological decisions that led to the results obtained" (Martı´nez, 2005, p.184).

Examples:

1) *GLM* ***was used for further analysis of*** *main effect and interaction effect of perches and laying boxes.* (CA9)

2) ***We performed dose-response and time-course experiments and analyzed*** *antibody responses in mice following transdermal exposure to milk protein.* (IF8)

Move 9 (Stating research procedures) differed for the two corpora in the move frequency and the presence of steps. That is, it was qualified as optional in the local corpus and was present in two steps, while it was found as conventional in the international corpus where it was present in three steps. A closer look at Move 9 revealed that Step 1 (Describing aim(s) and purpose(s)) often co-occurred with Step 3 (Listing research procedures) in the two corpora.

Examples:

1) *To test the accuracy of multiplex PCR for diagnosis of porcine viruses* ***(Move 9, Step 1)****, three reference specimens (PRRSV CH-1a, CSFFV C-strain, and CSFV Shimen strain) and 56 clinical specimens were tested for CSFV and PRRSV by using multiplex PCR and confirmed by a routine RT-PCR by using the same two sets of specific primers and DNA sequencing of PCR products* ***(Move 9, Step 3)****.* (CA13)

2) *To determine number of copies of T-DNA* ***(Move 9, Step 1),*** *the genomic DNA was digested with EcoRI and the blot was probed with the 1.1 kb Xhol digest of the the plasmid pCAMBIA 1305.1 which is the hph gene fragment.* ***(Move 9, Step 3)****.* (I C13)

Move 10: Justifying procedures or methodology

Following Move 9 (Stating research procedures), Move 10 provided the rationale for the researcher's decisions on particular procedures, techniques or apparatuses enabling readers to understand the credibility of the procedure. The statements of justification can be realized by detailing methods (similar to these) that people used before (Step1) or by commenting on whether the method yielded successful results (Step 2). The occurrence of Move 10 in the two groups of RAs was quite low (27% and 29%), which was the least frequent in the Results section.

Move 10, Step 1: Detailing methods that people used before

Step 1 not only aims to provide a rationale for choosing a particular method/procedure but also to justify the choice of equipment. Since the rationale is usually from established knowledge, this move is often realized using the present simple tense (Malcolm, 1987). The occurrence of Step 1 was quite low, being found eight and ten times in each corpus.

Examples:

1) *Each viral target gene could* ***be specifically amplified by using its defined primer pair***. (CA13)

2) *The genome walking technique which we refer to as random amplification of genomic end (RAGE)* ***is a well-demonstrated tool*** *for the isolation and cloning of genomic regions flanking a known sequence.* (IC13)

Move 10, Step 2: Commenting on whether the method yielded successful results

Step 2 was used to evaluate whether the selected method yielded successful results. Similar to Step 1, the frequency of Step 2 was low. That is, it was found in only four local and ten international RAs. The pronoun *we* was observed in three out of ten international RAs, suggesting that international researchers prefer using the pronoun *we* to strengthen their justification for choosing a particular method or procedure. Also, within this step, further justification may be provided by citing previous studies (as in Example 2).

Examples:

1) *Ion exchange chromatography* ***is a means to*** *achieve the separation based on the electrostatic interaction between chromatographic medium and solute*. (CF7)

2) ***The method has been previously used*** *by other groups to isolate other promoters from other plants* ***(R)***. ***We*** *have also used this method to isolate a stress inducible promoter from different species of wild rices in a separate study. In our experience,* ***this is an excellent method for*** *the isolation for promoters from plants.* (IC13)

Move 10 enables researchers to assume that the results gained from justified method are acceptable. In order to encourage the acceptance of the results, the position of Move 10 was not fixed. That is, sometimes it followed Move 9 (Stating research procedures) or preceded Move 9 (Stating research procedures).

Move 11: Stating results

Through Move 11, the results of the studies were reported in an accurate and unbiased way occurring in 100% of each corpus. This move was accompanied by past simple tense, passive voice and linguistic indicators, such as, *as shown in Table (Fig.), is (are) shown in Table (Fig.)* and *is (are) presented in Table (Fig.)*. Consistent with Martínez's (2005) finding, the frequency of *we* in the local dataset (only three articles) was much lower than that found in the international dataset (in fourteen articles). A difference by almost a factor of five provided clear evidence that international writers seem to favor a positive politeness strategy, emphasizing in-group and involvement relations (Luzo´n, 2009).

Examples:

1) ***As shown in Fig. 4**, the amounts of absorbed N, P and K in cauliflower were the highest, followed by tomato and celery.* (CP2)

2) *In the presence of GA, the intrinsic ATPase activity of GST-DgHsp90 was abolished **(Fig. 4B)**. In addition, the chaperone activity of GST-DgHsp90 was dramatically decreased compare to that in the absence of GA **(Fig. 4C)***. (IC14)

3) *Together with the four polymorphic SNPs from the SNP-tables of the Broad Institute, **we found** eight SNPs, of which seven were intragenic.* (IA3)

Move 12: Commenting on the results

Having reported the results in Move 11, the researchers can present comments through Move 12. This move between the two datasets might have resemblance in three aspects. First, it was considered conventional in both corpora. Second, Move 12 in the two corpora was found to have five steps. Third, of these, four steps bearded resemblances in terms of frequency. One difference is that Step 1: *Explaining reasons why these results occur* was optional in the local but conventional in the international corpora. It should be noted that the first person pronoun *we* was found only in the international corpus, reflecting international scholars' awareness of mediation in the relationship between their arguments and their discourse communities (Li & Ge, 2009). Accordingly, the distribution of the word *we* was reported in relation to each step in this move type.

Move 12, Step 1: Explaining reasons why these results occur

Step 1 provides the explanations to account for the results. It was far more prevalent in the international corpus, as twenty-seven out of forty-five international articles included it, while only sixteen out of forty-five Chinese papers incorporated it. This apparently showed that the international researchers were more likely to include reasons or explanations in support of their findings than their Chinese counterparts. The prominent words denoting the function of Step 1 contained *explained*, *reason*, *due to*, *because*, *caused*, *resulted in* and *leaded to*. To avoid highly subjective explanations, hedging devices were often added before linguistic indicators (as in Example 1), for instance, *may be*, *might be*, *possible*, *may* and *probably*. The occurrence of *we* was quite low in the international dataset (three out of twenty-seven papers), whereas it was absent in the local one.

Examples:

1) ***This is may be due to*** *the difference in the time and period of fermentation in different tea piles with different times of mixture, which caused the difference in the major chemical constituents in tea leaves.* (CF5)

2) ***This difference in the initial values is explained by*** *the minced pork and the pork chunk having been taken from different carcasses.* (IC10)

3) ***The reason for this was that*** *only those haplotypes (including SNP BIEC2-968854) were significant, and these significant haplotypes differed only by the two alleles of the SNP BIEC2-968854. For the paternal component of BVs,* ***we could not find*** *SNPs with a significant association.* (IA3)

Move 12, Step 2: Making generalizations or interpretations of the results

Step 2, aiming to interpret the results of the study, occurred frequently in both corpora. The statement of interpretation can be denoted by linguistic signals (e.g. *suggest*, *indicate*, *imply*, *support* and *confirm*) in present simple or past simple tenses together with hedging devices. Occasionally, the first person pronoun *we*, absent in the local papers, was used in three international papers.

Examples:

1) *The increments of P were 9.6% and 11.2%, and 10.3% and 8.7%, and those of K were 14% and 12.1%, and 17.5%and 15.6%,* ***indicating*** *CRF70 displayed a better effect of improvement of nutrient use efficiency.* (CP5)

2) ***These results suggested that*** *a fragment spanning up to -323 was sufficient for anther specificity of the promoter as no staining was observed in Pbkgtap200.* (IC8)

3) *So* ***we postulate that*** *these mutations may be interbreed polymorphisms.* (IA3)

Move 12, Step 3: Evaluating the current findings against those from previous studies or with regard to the hypotheses

Through Step 3, writers link past and current research results for two purposes: 1) to motivate readers to view his/her findings as having stronger defenses, and 2) to gain readers' acceptance of his or her findings as part of the contribution to the field of research. When presented, this step was often combined with Move 11 (Stating results) to achieve these two purposes.

Example:

The exonic sequences of SPATA 1 were monomorphic in the tested stallions ***(Move 11)*** *and identical to the reference sequence of the horse genome assembly EquCab 2.0* ***(Move 12, Step 3)*** (IA3)

Corresponding to the function of Step 3, citations occurred together with linguistic signals in the present simple tense, past simple tense and present perfect tense (e.g. *show*, *support*, *agree with*, *contrast*, *similar to, in agreement with*) as shown in Examples 1 and 2, indicating degrees of consistency between the current results and the previous results. The occurrence of the first person pronoun *we* was high in the international dataset, with seven instances in sixteen international papers that used Step 3 as illustrated in Example 3.

Examples:

1) *Yield of theabrownin obtained with the method adopted in this study* ***was similar to*** *that obtained with the traditional method (R).* (CF5)

2) *These results* ***are in agreement with*** *the results obtained by De Greef et al. (2001) and Deeb et al. (2002).* (IF9)

3) ***We had previously shown that*** *most rat mutants, although resistant to somatic cell transformation, are highly susceptible to flower dip transformation (R).* (IP2)

Move 12, Step 4: Stating limitations

Step 4 reminds readers of factors potentially affecting the results of the study, implying that future research could be improved by avoiding those factors. The higher occurrence found in the international corpus (36% as opposed to 11%) indicated that the necessity for including the statement of limitations was likely dependent on the publication context. To express the statement of limitations, linguistic features included negative adverbs (e.g. *few*, *only* and *less*) and conjunctions indicating cause and effect.

Examples:

1) ***Due to*** *the damage of cell membrane and the destruction of cell membrane integrity，deteriorated seeds will leak out much electrolyte during the soaking process*. (CP15)

2) *For the d2H trends* ***less data*** *were available, as* ***only*** *the samples producing sufficient meat juice could be analyzed for this parameter.* (IF6)

Move 12, Step 5: Summarizing

The principal findings of a study were summarized through Step 5, occurring in 22% and 20% of the local and international corpora. This implies that there was almost no difference in the writers' tendencies in summarizing the main findings in their studies. The linguistic signals (e.g. *be concluded, we concluded, taken together, in summary*) denoted the function of summarizing the findings. Additionally, present simple tense and past simple tense were equally favored by the two groups of writers.

Examples

1) ***It can be concluded from*** *Fig.3, Fig.4 and Table 2 that vanillic aldehyde, epicatechin and rutin of balsam pear in different varieties were of significant differences ($P < 0.05$).* (CF8)

2) ***Taken together, these findings demonstrate that*** *the T-DNA insertion in the ITB2/ALA3 gene causes the itb2/ala3 trichome phenotype, and that the small plant phenotype observed segregating in SALK line 082157 is not caused by the T-DNA insertion.* (IP4)

Comments on results (Move 12) can be accomplished by several steps, including explanation (Step 1), generalizations or interpretations (Step 2), comparison with previous studies (Step 3), limitations (Step 4) and summary (Step 5). The occurrences of Steps 1-4 in the international corpus were higher than those in the local one, since international scholars were more aware of giving comments on results than their Chinese counterparts. A possible reason for this difference might be related to the researcher's need to promote their research by highlighting the value of their new research (Basturkmen, 2009). Four moves were found in this section for both datasets, but further analysis was needed to determine which particular moves are more likely to open and end the Results section. The results are reported in the subsequent section.

4.1.3.2 Move Sequences and Cyclical Moves

Table 4.8 Sequences and Cyclical Moves in the Results Section

	Chinese Corpus				**International Corpus**			
	M9	M10	M11	M12	M9	M10	M11	M12
Opening Move	11%	4%	84%	0%	22%	7%	71%	0%
Closing Move	0%	0%	67%	33%	4%	0%	67%	29%
Cyclical Move	31%	7%	76%	64%	53%	20%	91%	80%

Regarding the opening move, the majority of RAs in both corpora began the section with Move 11 (Stating results) or Move 9 (Stating research procedures). Opening the section with Move 11 (Stating results) can attract readers' attention to the finding of the study, whereas opening with Move 9 (Stating research procedures) can remind readers of the background of the study. Occasionally, Move 10 (Justifying procedure) was placed at the beginning of this section (4% of the local and 7% of the international papers) as well. Perhaps, positioning Move 10 (Justifying procedure) in the opening was done to assure readers that results were obtained using a justifiable methodology.

In terms of the closing move, 67% of both the local and international papers stopped using Move 11 (Stating results). In addition, Move 12 (Commenting on results) could be used as a closing substitute. That is, 33% of the local and 29% of the international papers ended the section with Move 12. Only 4% of the international RAs closed the section using Move 9 (Stating research procedures).

As for cyclical moves, four moves in the two datasets seemed to have a cycling characteristic. In particular, Move 11 (Stating results) appeared to co-occur with Move 9 (Stating research procedures) and Move 12 (Commenting on results), thus yielding a pattern of Stating procedure—Results—Commenting on results.

Examples:

Move 9, Step 3: Listing research procedures, Move 11: Stating results and Move 12: Commenting on results

1) *With 60% ethanol as extracting agent, different ultrasonic powers were chosen for single factor experiment under the same extraction condition of material-liquid ratio 1:15 (g/m), temperature 50 ^{o}C and extraction time 1 h,* ***(Move 9, Step 3)*** *and the results are shown in Fig. 5. As shown in Fig. 5, extraction rate of procyanidins slowly increases with the increasing ultrasonic power, which reaches a maximum as the power is 540 W (maximum power of test machine)* ***(Move 11)****.*

Considering the factors of ecological environmental protection, energy waste and small errors produced in experiment, the power of 300 W is more appropriate ***(Move 12, Steps 2&5)***. (CF3)

2) *We tested nine of these SNPs in eight Hanoverian stallions* ***(Move 9, Step 3)***. *Four of them were polymorphic (BIEC2-968879 upstream of SPATA1, BIEC2-968877 in UTR of exon 1, BIEC2-968854 in intron 6 and BIEC2-968853 in intron 7). The SNPs -96883 upstream of SPATA1,BIEC2-968864 in intron 5 and BIEC2-968840 in intron11 were not found in eight Hanoverian stallions* ***(Move 11)***, *so we postulate that these mutations may be interbreed polymorphisms* ***(Move 12, Step 2)***. (IA3)

In fact, the co-occurrence of Move 11 (Stating results) and Move 12 (Comments on results) was the core of a cycle that was repeated several times when different variables were discussed in the various steps of Move 12. For example, Move 11 (Stating results) was combined with explanations of results (Move 12, Step 1), interpretations of results (Move 12, Step 2) and reference to previous studies (Move 12, Step 3). Such phenomenon occurred not only in the local but also in the international corpora.

Examples:

Move 11: Stating results and Move 12, Step 2: Making generalizations or interpretations of the results

Examples:

1) *It could be indicated from Fig. 8 and 9 that the average NH^3, CO^2 concentration of group 3 and 4 were significantly higher than that of group 1 and 2 in the 32 nd week ($P<0.05$)* ***(Move 11)****, demonstrating that different facilities had effects on inside air quality to some extent* ***(Move 12, Step 2)***. (CA9)

2) *After 5 d of storage the score for flavor was exceeding the acceptability limit* ***(Move 11)****. In conclusion, a treatment with 250 mg L^{-1} PAA affected the sensory quality of grated carrots by a change in texture and the development of a sour taste and odor, even in the early stage of the shelf-life (Fig.6).* ***(Move 12, Step 2)***. (IC13)

Move 11: Stating results and Move 12, Step 3: Evaluating the current findings Examples:

1) *N accumulation assumed the "slow-quick-slow" changing tendency (Fig.2).* ***(Move11)*** *This result was also proved by Wang et al.* ***(Move 12, Step 3)*** (CP6)

2) *The exonic sequences of SPATA 1 were monomorphic in the tested stallions* ***(Move 11)*** *and identical to the reference sequence of the horse genome assembly EquCab 2.0.* ***(Move 12, Step 3)*** (IA3)

Move 11: Stating results and Move 12, Step 1: Explaining reasons why these results occur

Examples:

1) *Efficient leaf area of the four fertilized treatments increased from the seedling stage to heading stage, while no significant difference was found during the two growth stages except that the CRF70 treatment was significantly higher than that of the CF1 treatment at the stem elongation stage.* ***(Move11)*** *At mature stage, the efficient leaf area of all treatments decreased quickly due to leaf senescence, especially the CK treatment, decreased from 2 646 to 462* cm^2 *per plant.* ***(Move 12, Step 1)*** (CP5)

2) *The initial* $\delta^{18}O$ *values in the minced pork and the chunk of pork were -4.9 and -5.6*‰*, respectively (Fig.2).* ***(Move 11)*** *This difference in the initial values is explained by the minced pork and the pork chunk having been taken from different carcasses.* ***(Move 12, Step 1)*** (IC10)

4.1.3.3 Move Patterns

Table 4.9 Move Patterns Found in the Results Section of the Two Corpora

Move Pattern	Chinese Corpus		International Corpus	
	NO.of Articles	%	NO. of Articles	%
M11	9	22%	-	
M11-M12-M11-M12-M11	4	9%	7	16%
M11-M12	3	7%	-	
Total	**16**	**38%**	**7**	**16%**

Three observations were made with the reference of move pattern: First, Chinese researchers favored three move patterns, including M11, M11-M12-M11-M12-M11 and M11-M12. Surprisingly, international researchers followed only one pattern of M11-M12-M11-M12-M11. Second, the Results section is not only where new findings are reported but also where they may be interpreted and commented (e.g. Brett, 1994; Posteguillo, 1999; Yang & Allison, 2003). However, in the present study, Chinese researchers tended to report their findings without making comments, thus yielding nine occurrences of Move 11 (Stating results). This result clearly demonstrated that Chinese researchers were more likely to reserve their comments on the results in the Discussion section than their international counterparts. Third, the organization of Results section from the local dataset seemed less diverse than that from the international dataset. That is, 38% of the Chinese papers were expressed in identified move patterns, while only 16% of the international papers did.

To sum up, four moves were used to construct agricultural science Results section. In particular, Move 11 was present in 22% of the Chinese papers, whereas M11-M12-M11-M12-M11 was favored in 16% of the international ones, demonstrating that M11-M12 (Results—Commenting on results) was the core of the cycling pattern. In addition, the results confirmed that Move 11 was the most common strategy used to open the section in each corpus.

4.1.4 The Discussion Section

4.1.4.1 Moves and Steps

Four moves were found in the Discussion section of both corpora, including **Move 13: Contextualizing the study**, **Move 14: Consolidating results, Move 15: Stating the limitations of the present study** and **Move 16: Suggestions for further research** as illustrated in Table 4.10. Move 14 was always present (100%) in both corpora, whereas Move 13, occurring less frequently, was present in 78% and 87% of the local and international publications. The occurrences of Moves 15 and 16 were less than 60% for both datasets, qualifying them as optional moves.

Table 4.10 Move Structures of the Agricultural Science Research Article Discussion Sections

Move/Step	Frequency	
	Chinese Corpus (N=45)	**International Corpus (N=45)**
M13:Contextualizing the study	**35 (78%)**	**39 (87%)**
S1:Stating what is already known from previous studies	33 (73%)	34 (76%)
S2:Detailing conclusions, claims, deductions or research gaps based on analysis from previous studies	22 (49%)	27 (60%)
S3:Stating aims or hypotheses of the study	0	19 (42%)
M14:Consolidating results	**45 (100%)**	**45 (100%)**
S1:Restating the methodology	25 (56%)	32 (71%)
S2:Hightlighting the selected findings	41 (91%)	43 (96%)
S3:Referring to previous literature	28 (62%)	42 (93%)
S4:Explaining results or differences in findings	20 (44%	36 (80%)
S5:Making overt claims or generalizations	36 (80%)	42 (93%)
S6:Exemplifying	0	6 (13%)
S7:Stating the value of the study	3 (7%)	10 (22%)
M15: Stating the limitations of the present study	**6 (13%)**	**25 (56%)**
S1:Limitations of the findings	2 (4%)	10 (22%)
S2:Limitations of the methodology	5 (11%)	10 (22%)
S3:Limitations of the claims made	0	7 (16%)
M16:Suggestions for further research	**14 (31%)**	**21 (47%)**

Note 1. N = the total number of analyzed RA Discussion sections in this study
2. % = the frequency of occurrence of a move/step

Move 13: Contextualizing the study

Move 13, framing the context of the study, usually opened the Discussion section, thus drawing readers' attention to the report or discussion of the results that follow. It includes background information regarding established knowledge or previous studies (Step 1), generalizations made based on previous studies (Step 2) and a statement of the research objectives (Step 3). In addition, the pronoun *we*, lacking in the local dataset, was present in the international RAs.

Move 13, Step 1: Stating what is already known from previous studies

Step 1 was used to report established topic knowledge or to cite previous research to ensure that readers are provided with a sufficient background to follow the discussion of the topic. In particular, the information from previous studies was specific and can be expressed in three tenses, including present simple, past simple and present perfect. The frequency of occurrence for this step was similar (73% and 76%) between the two corpora indicating that there was almost no difference in using this strategy between the two groups of academics.

Examples:

1) ***Many researchers think that*** *the selection of super-brid rice is the main trend of hybrid rice breeding in China and the foundations is still the utilization of heterosis.* (CP10)

2) ***A previous study on*** *mutation detection in CRISP genes used only exonic polymorphisms for association analyses with stallion fertility (R) and thus, mutation screening was much more laborious.* (IA3)

3) *Transit peptides for import into the chloroplast or mitochondria* ***have also been identified*** *in the N-terminal region of chloroplast- or mitochondria-localized Hsp90 (R).* (IP14)

Move 13, Step 2: Detailing conclusions, claims, deductions or research gaps based on analysis from previous studies

Step 2 was used to generalize the conclusions based on analysis or the collection of data from previous studies or to point out research gaps. Its occurrence in the international corpus (60%) was slightly higher than that in the local corpus (49%). This move type can be signaled by linguistic indicators, for example, *however, little, limited, no study, unknown, unclear* and *not much*. Similar to Step 1 (Stating what is already known from previous studies), three tenses were found in this move type (Examples 1-3). In order to better contextualize the current study, Steps 1 and 2 were integrated in some articles (as shown in Example 4).

Examples:

1) ***However, it is unclear*** *how expression of the thyroid hormone receptor in satellite cells responds to nutritional status and thyroid hormone levels.* (CA5)

2) ***Li et al. (2006) suggested*** *the method of maximization of benefits from sold animals in a two-way crossbreeding system by optimizing mating and selections.* ***However****, in that study, discrete generations* ***were assumed*** *and only cases of a complete dominant QTL and an over-dominant QTL* ***were considered****.* (IA15)

3) ***Other models have used*** *IgE response* ***but not*** *clinical disease features* (R). (IF11)

4) *It is largely unclear whether exposure to allergenic foods such as milk whey proteins via skin might lead to food allergy in humans.* ***(Step 2)*** *There is extensive discussion on this topic in the recent literature (R). One epidemiological study suggested the possibility of peanut allergy in children following skin exposure to peanut (R).* ***(Step 1)*** ***We*** *are not aware of such a study in milk allergy.* ***(Step 2)*** (IF11)

Example 4 was a representative example of an extensive Move 13. It began with Step 2 (generalization from previous studies). Then, a previous study (Step 1) was reported to support generalization made (Step 1) at the beginning and proceeded to a research gap (Step 2).

Move 13, Step 3: Stating aims or hypotheses of the study

Step 3 reminds readers of the aims or hypotheses, being found nineteen times in the international corpus but absent in the local one. This reflected that scholars situated the research within the large research field, perhaps for a better understanding of the results to be discussed (Kanoksilapatham, 2003). The most salient feature of this step were phrases to indicate the study aims, for example “The purpose of this study…” or “The research objectives of the study…”. If such expression is placed at the beginning of a sentence, then it will be followed by the “to be” verb. Another linguistic feature was the use of the first person pronoun *we*, used seven times in nineteen international papers that used Step 3. Sometimes, the expressions, “We examined…”, “We conducted experiment to…” or “We presume…” were used to realize this step.

Examples:

1) ***The primary objective of the current study was to evaluate*** *the impact of a decontamination step with PAA on all quality aspects of grated carrots during storage, including physiological responses, microbial proliferation and spoilage, sensory quality and nutrient content.* (IC10)

2) ***The aim was to maximize*** *the benefits accrued from sale of animals over the planning horizon.* (IA9)

3) *According to these data,* ***we presume that*** *the higher inhibitory activity of theasinensins A and DonCOX -2 expression may be associated with the higher affinity of its galloyl moiety to cellular membrane, although it is required to be proven in further works.* (IF7)

A total of three steps of Move 13 (Contextualizing the study) were used in the two corpora. Step 1 (Stating what is already known from previous studies) was conventional, while Step 2 (Detailing conclusions, claims, deductions or research gaps based on analysis from previous studies) was present infrequently. However, Step 3 (Stating aims or hypotheses of the study) was identified only in the international corpus.

Move 14: Consolidating results

After presenting the background information of the study (Move 13), writers defend their findings through Move 14 by restating the methodology (Step 1), stating the selected findings (Step 2), referring to previous literature (Step 3), explaining the results or differences in the findings (Step 4), making overt claims or generalizations (Step 5), exemplifying (Step 6) and stating the value of the study (Step 7). In so doing, Move 14 for this section was typically found with 100% occurrence in both corpora. To help consolidate results, the word *we* was used in Steps 1, 2, 4 and 5.

Move 14, Step 1: Restating the methodology

Step 1 includes the statement(s) of research purpose(s) and the experimental procedures. It was more prevalent in the international publications, as 71% of the international articles included it, while only 56% of the Chinese RAs incorporated it. This difference likely implied that international academics were more aware of recounting methodology before presenting the selected findings. Typically, experimental procedure was recounted in passive voice, but verbs performing research actions may also occur in the active voice and be preceded by the word *we*, for example, *We analyzed*…, *We investigated*… and *We identified*….. The higher occurrence of *we* (seventeen cases as opposed to two cases) may indicate that international researchers were more aware of “highlighting the authors’ responsibility for particular methodological decisions that led to the results obtained” (Martı´nez, 2005, p.184).

Examples:

1) *Subsequently, absolute ethanol* ***was added into*** *the tea liquor to bring the final ethanol concentration to 80%, which makes most Pu-erh tea extracts including tea polyphenols, flavonoid, theaflavins, thearubigins dissolve in the ethanol, followed by the sedimentation of theabrownin.* (CF5)

2) *Therefore,* ***Experiment 2 was designed to further determine*** *the influence of interval from onset of estrus until GnRH treatment on subsequent concentrations of progesterone.* (IA6)

3) *In this study,* ***we measured*** *the chaperone activity as preventing aggregation and promoting protein folding of proteins by light scattering of MDH and CS under thermal stress.* (IC9)

Move 14, Step 2: Highlighting the selected findings

Since the discussion was developed in relation to the statement of results, the presentation of results occurred frequently in both corpora (91% and 96%). The verbs indicating the findings included *found*, *observed*, *revealed*, *caused* and *showed*. In particular, *found* and *observed* were usually associated with the choice of passive voice, whereas *revealed*, *caused* and *showed* were present in active voice.

Sometimes, the findings can be expressed in the form of *we* plus the verbs in past simple tense, for example, *we clearly showed that*, *we also found that*, *we reported that* and *we observed that*. In this way, the pronoun *we* was found thirty-eight cases in the international and five cases in the local corpora. The more than seven-times higher rate of occurence suggested that the word *we* can be employed in academic writing being used as a strategy to claim responsibility for findings that may carry novelty to the scientific community (Martı´nez, 2005).

Examples:

1) *Here, the morphological differences of the satellite cells* ***revealed*** *the significant impact of early-age intermittent feeding on cell proliferation and differentiation.* (CA5)

2) ***Treatment with GnRH caused*** *a surge release of LH during the first 6 h after treatment.* (IA3)

3) ***We also found that*** *the in vitro growth rate for itb2/ala3 pollen was substantially reduced compared with the wild type. However, the root hair length in itb2/ala3 mutants was significantly longer than in the wild type.* (IP4)

Move 14, Step 3: Referring to previous literature

Through comparison with previous studies, Step 3 is used to convince readers of the credibility of the results. As for move status, it was found frequently (62%) in the local corpus, but not as frequently in the international one (93%). Usually the statements started with either a non-personal subject, such as "The results of the current study support…", "This is consistent with…", "This was confirmed by…" "This is in agreement with…", or names of researchers, such as "Zhang [17] proposed ….".

Examples:

1) ***GENG Ai-Lian et al.***[9] *carried out a comparative study of free range equipped with and without perches.* (CA9)

2) ***The finding agrees with previous data*** *in which exogenous GnRH caused a surge release of LH from the pituitary (R).* (IA3)

Move 14, Step 4: Explaining results or differences in findings

Step 4 aims to explain results or differences between two sets of data in the current study, for example, treatment A vs. treatment B, or differences between results in this paper and previous literature. The frequency of Step 4 in the international corpus (80%) was almost two times greater than that found in the local corpus (44%), apparently suggesting that this step should be included if Chinese writers are to follow the conventions of international journals. To realize its function, such words as "explained, because, due to, attributed to" were used to indicate the cause and effect. Another linguistic feature was hedging device, being used to avoid making strong claims, including *perhaps*, *possible*, *possibly*, *may*, *might*, *can* and *could*. The first pronoun *we*, missing in the local dataset, was found in the international corpus in seven instances (as in Example 3).

Examples:

1) ***The reason may be that** good facilities would affect the behavior of layers, especially the formation of rhythmic laying behavior, and then promote metabolism and hormonal secretion.* (CA9)

2) ***This could also explain** the very low isolation rate of Y. pseudotuberculosis (3%) in the present study.* (IF4)

3) *If **we** take into account the outliers **we** get a slight trend towards increasing values with time, but if **we** disregard them there is no trend for either the minced meat or the meat chunk.* (IF6)

Move 14, Step 5: Making overt claims or generalizations

Step 5, generalizing or interpreting the findings of the study, appeared to be important in agricultural science papers as it was observed in 80% of the local and 93% of the international corpora. This step was found in forty-two international and thirty-six local RAs. The interpretation of the results can be characterized by prominent words, for example, *suggest*, *indicate*, *demonstrate*, *confirm*, and *imply*. In order to increase the accuracy, quality and meaning of the results (Li & Ge, 2009), the first person pronoun *we* was used in nine out of forty-two of the international papers with nineteen instances, but in only two out of thirty-six of the local papers with two instances.

Examples:

1) *Thus**, it could be concluded that** FSH hormone is accumulated for a short time in vivo.* (CA2)

2) *However, **the insignificant difference** between the intake of CT-free AG- and CT-containing PE **suggests** that the CT concentration of 60 g/kg of PE did not induce bitterness, decrease palatability and consequently voluntary intake.* (IA10)

3) *Thus, this intronic mutation of the SNP BIEC2-968854 may have an effect on transcription factor binding. Therefore, **we assume that** this SNP may be involved in gene regulation via recruitment of a transcription factor.* (IA3)

Move 14, Step 6: Exemplifying

Exemplifying can be used to strengthen an interpretation of the results. The occurrence of Step 6 was the lowest in this section. That is, this step, lacking in the local corpus, was found in only 13% of the international corpus. The expressions, including "for example and for instance", were the most salient linguistic feature in realizing its function.

Examples:

1) ***For example**, in tobacco all the CAT isoenzymes are inhibited by SA (R) but not in rice (R). In rice, SA inhibited the activity of the CATb isoenzyme, but not that of CATa (R).* (IP15).

2) ***For instance**, the CH3 domains of both IgA and IgM have short tailpieces that bind with the J-chain by means of disulfide bonds (R).* (IA1)

Move 14, Step 7: Stating the value of the study

The statement of the contribution of the study refers to Step 7. This step occurred slightly more frequently in the international dataset (22%) than that in the local one (7%). Aligned with the function of Step 7, only the present simple tense was employed. Additionally, the word to signal this move type, such as "valuable contribution" and "provides a theoretical basis", were commonly used.

Examples:

1) ***The study provides a theoretical basis*** *for scientific and reasonable utilization of procyanidins in purple cabbage.* (CF3)

2) ***The present study thus adds valuable contribution to*** *the increasing body of evidence underlining the importance of food matrix designing at the technological level for the control of nutrients delivery, especially for specific subpopulations, such as the elderly or the overweighed people*. (IF5)

A total of seven steps were identified in Move 14 (Consolidating results). Three out of seven steps differentiate the two corpora. That is, Step 1 (Restating the methodology) and Step 4 (Explaining results or differences in findings) were optional in the local dataset, but conventional in the international one. Step 6 (Exemplifying) was missing in the local corpus but was found as optional in the international corpus. In addition to consolidating their results, researchers are also willing to put forward limitations in this section as follows:

Move 15: Stating the limitations of the present study

Through Move 15, writers attempted to make readers aware of the conditions under which the study was conducted, thus encouraging caution in overgeneralizing the findings. The occurrence of Move 15 in the local corpus (13%)

was much lower than that in the international corpus (56%). As for the occurrence of *we*, it was present in five international papers as opposed to only one local paper, clearly displaying that Chinese academics were reluctant to claim limitations for their findings by using the first person plural pronoun *we*. This was likely due to Chinese conventions in academic writing in which writers are afraid of losing objectivity in claiming limitations of the study, when overusing the first person pronoun (Zhang, 2011). The distribution of *we* is reported in accordance with a description of three steps as follows:

Move 15, Step 1: Limitations of the findings

The limitations of the results can be indicated through Step 1, which was found as optional in both corpora. Present simple tense appeared to be the most frequent choice, although three tenses were observed in this move type. The linguistic indicators, for example, *however*, *although*, *few* and *nevertheless*, were used to signal the limitations of the findings. The pronoun *we*, absent in the local corpus, was employed only once in the international corpus.

Examples:

1) ***The data was not representative enough*** *due to limited testing area and insufficient range of sowing period*. (CP13)

2) *However, the presence of outliers in Experiment 1 shows that hydrogen isotopes* ***might be less reliable*** *at "non-ideal" storage conditions.* (IF6)

Move 15, Step 2: Limitations of the methodology

The statement of the limitations of the methodology was present infrequently in both datasets. Similar to Step 1, present simple tense was the most frequent tense preferences. In addition, the word *we* and linguistic signals (e.g. *failed to*, *must be used with caution*, *requires* and *implausible*) were used in the two international papers.

Examples:

1) *N fertilizer is also* ***a limiting factor*** *of tomato yield*. (CP2)

2) *This does also mean that in the case of a significant association of one SNP, the other SNPs* ***are not necessarily significantly*** *associated with the trait analyzed.* (IA3)

3) ***We have failed to identify*** *the direct descendant of the extant wild camel despite having sampled domestic individuals extensively.* (IA2)

Move 15, Step 3: Limitations of the claims made

Step 3, stating the limitations of the claims made, was found only in the thirteen international papers. To accomplish its function the present simple tense, the first person pronoun *we*, and hedging devices (e.g. *may* and *might be*) were used.

Examples:

1) ***A lack of this hypothetical component would not*** *compromise the rapid expansion of the trichome, but would instead lead to expansion occurring in the wrong locations, resulting in a misshapen trichome*. (IP4)

2) ***We assume that*** *there exist further polymorphisms in other genes influencing the fertility traits of stallions. Thus, the SPATA1 SNP BIEC2-968854 explains only a part of the variation of the pregnancy rate per oestrus of stallion.* (IA3)

Move 16: Suggestions for the further research

Move 16 was used to suggest recommendations for further studies based on the limitations or deductions from the current research. This move was optional in both corpora. Move 16 was expressed using present simple tense and future tense. Also, the salient linguistic features included signal words (e.g. *need*, *require* and *further*), hedging devices (e.g. *may* and *would*) and the word *we*.

Examples:

1) ***It may provide assistance for the further*** *experimental studies on anti-mastitis transgenic animals.* (CA15)

2) *Consequently,* ***we suggest that future investigations*** *on human milk allergy consider transdermal exposure to milk protein as a possibility in the pathogenesis of milk allergy in humans.* (IF11)

The Discussion section accomplishes its function through the use of four moves between the two corpora. The following section presents which particular moves are likely to open or close the section and which move/s is/are the most cyclical.

4.1.4.2 Move Sequences and Cyclical Moves

Table 4.11 Sequences and Cyclical Moves in the Discussion Section

	Chinese Corpus				International Corpus			
	M13	M14	M15	M16	M13	M14	M15	M16
Opening Move	64%	36%	0%	0%	40%	60%	0%	0%
Closing Move	0%	73%	7%	20%	0%	62%	7%	31%
Cyclical Move	44%	58%	2%	2%	53%	76%	16%	16%

In terms of opening move, both corpora began with Move 13 (Contextualizing the study) and Move 14 (Consolidating results) interchangeably. In particular, Chinese researchers preferred to open the section with Move 13 (64% of the local corpus), whereas their international counterparts have a stronger tendency to begin the section with Move 14 (60% of the international corpus). This finding suggested that Chinese writers were more likely to give background knowledge of the topic than international writers in order to facilitate reading.

Regarding closing move, Moves 14, 15 and 16 seemed possible to close the section in the two corpora. Nevertheless, a closer look revealed that Move 14 (73% and 62%) was the most frequent strategy to end the section, particularly, Move 14, Step 5 (Making overt claims or generalizations) and Move 14, Step 7 (Stating the value of the study). At the same time, Move 15 (Stating limitations of the present study) and

Move 16 (Suggestions for the further research) did not necessarily occur at the end of section but may follow the statement of individual result (Move 14, Step 2).

As for cyclical moves, Move 14 (Consolidating results) tended to be the most frequent cyclical move in both datasets. In particular, Step 3 (Referring to previous literature) often co-occurred with Step 2 (Highlighting the selected findings), Step 4 (Explaining results or differences in findings) and Step 5 (Making overt claims or generalizations). These move co-occurrences were likely repeated in this section when needed.

Examples:

Move 14, Step 2: Highlighting selected findings and Move 14, Step 3: Referring to previous literature (occurred in *eight* and *twenty* Chinese and international RAs)

1) *Furthermore, total phenols of balsam pear were found positively correlated with FRAP ($r = 0.855$, $P < 0.01$)* ***(Move 14, Step 2)****, which is in line with those researched by Du et al.* [25] *and Kriengsak et al.* [26] ***(Move 14, Step 3)***. (CF8)

2) *DgHsp90 strongly suppressed the heat-induced aggregation of MDH and CS* ***(Move 14, Step 2)***. *This folding activity of DgHsp90 is a distinct function of molecular chaperones (R)* ***(Move 14, Step 3).*** (IC14)

Move 14, Step 4: Explaining results or differences in findings and Move 14, Step 3: Referring to previous literature (present in *five* and *sixteen* Chinese and international RAs)

1) ***The differences*** *in chemical profiles can be attributed to such comprehensive impact factors as production areas, climate, season, ecology, etc (R).* ***(Move 14, Steps 4 & 3)*** (CF9)

2) *A significant reduction of the initial total aerobic count of about 0.5 log cfu g^{-1} was established when shredded carrots were treated with 40 mgL^{-1} PAA for 2 min* ***(R)****.* ***(Move 14, Step 3)*** ***Differences between the results reported here and the ones reported elsewhere*** *can be related to differences in the initial contamination, treatment time, produce-disinfectant volume ratio, temperature and the concentration used.* ***(Move 14, Step 4)*** (IC11)

Move 14, Step 5 Making overt claims or generalizations and Move 14, Step 3: Referring to previous literature (observed in *six* and *fourteen* Chinese and international RAs)

1) ***Previous experience with the chimeric-somatostatin vaccines indicated*** *antibody responses are first demonstrable at 4 to 10 days post-vaccination (IgM and IgG subclasses).* ***(Move 14, Steps 5 & 3)*** (CA7)

2) *The way 250 mg L^{-1} PAA is suppressing the PAL-activity is not fully understood, but possibly the low PH induced in the surface tissue* ***played an important role*** *in the inhibition of PAL-activity* ***(R)****.* ***(Move 14, Steps 5 & 3)*** (IC10)

These co-occurrences revealed that international researchers had a much stronger tendency to link outcomes (Step 2), explanations (Step 4) or interpretations of results (Step 5) with previous studies (Step 3) than Chinese researchers.

Presumably, international researchers would like to place their findings in the context of previously published research in order to gain the acceptance from international discourse community (Basturkmen, 2009).

4.1.4.3 Move Patterns

Table 4.12 Move Patterns Found in the Discussion Section of the Two Corpora

Move Pattern	**Chinese Corpus**		**International Corpus**	
	NO. of Articles	**%**	**NO. of Articles**	**%**
M13-M14	7	16%	3	7%
M14	6	13%	-	-
M13-M14-M13-M14-M13-M14-M13-M14	5	11%	-	-
M13-M14-M13-M14	4	9%	-	-
M14-M13-M14	3	7%	3	7%
M14-M15-M13	-	-	3	7%
M14-M13-M14-M13-M14-M13-M14	-	-	3	7%
Total	**25**	**56%**	**12**	**27%**

As presented in Table 4.12, four observations can be made comparing the local and international publications. First, the organization of the international Discussion sections appeared more diverse than the local ones, since 27% and 56% of the international and local papers were expressed in four and five patterns respectively. Second, in the local corpus, the five patterns had a different frequency of occurrence.

However, in the international corpus, the four patterns shared an equal frequency of occurrence, namely three times each. Third, in fact, the pattern of M13-M14 recycled in both corpora. Typically, this cycle was opened with citations that established familiarity with a particular methodology or research aims (Move 13) and proceeded through a statement of results (Move 14, Step 2) accompanied by comments on specific results in Move 14, thus yielding a cyclical organization of *background information – results – comments on results*. This cyclical sequence was repeated for each major finding, paralleling the order in which results were presented in the Results section.

In conclusion, four moves were found in the Discussion section, including Moves 13, 14, 15 and 16. However, no linear structure of M13-M14-M15-M16 emerged from the two corpora. Local papers were likely opened with Move 13 (Contextualizing the study), while international corpus tended to begin with Move 14 (Consolidating the results). For the cyclical pattern, Moves 13 and 14 were the most repeated cyclical pattern in both corpora; meanwhile, Moves 15 and 16 were less frequently cyclical, but usually ended the Discussion sections. The following section covers the results of lexical bundles identified from each move.

4.2 Lexical Bundles Associated with Each Move Found in the Two Corpora

This section answers the second question asked at the beginning of the Results: What lexical bundles are typically found in each move of English agricultural science research articles published in Chinese and international journals? , by summarizing lexical bundles linked with each move from the two datasets. As suggested by Amnuai (2012), the selected lexical bundles should appear in at least three different texts in each corpus. A list of lexical bundles drawn from their contexts was displayed in the following section.

4.2.1 The Introduction Section

The Introduction section orients readers, giving them the perspective they need to understand the detailed information coming in later sections (Weissberg & Buker, 1990). This section consisted of three moves, including Move 1 (Stating why the topic is important), Move 2 (Preparing for the present study) and Move 3 (Introducing the present study). As shown in Table 4.13, lexical bundles were identified from these three moves. In total, twenty-one lexical bundles were found in the Chinese corpus and forty-eight lexical bundles were found in the international one respectively. Note that lexical bundles were highlighted in **bold** type.

Table 4.13 List of Lexical Bundles and Their Contexts in the Introduction Section

The Introduction Section		
Move	**Chinese Corpus**	**International Corpus**
Move1: Stating why the topic is important	**…is one of the…** …is one of the most popular fruit varieties. …is one of the common strategies of… …is one of the most important product for the poultry industry. …is one of the main sources of… …is one of the main components determining meat flavor. **…widely used in…** The tea polysaccharide can be widely used in… It has been widely used in… The citrus is widely used in… **It has been…** It has been used as… It has been shown that… It has been reported that… It has been demonstrated that… **…has become a…** It has become a common means in… …has become a key industry goal. …has become a hot topic. …has become an urgent task.	**…is one of the…** …is one of the most important … …is one of the major… …is one of the most widespread ... **It has been…** It has been suggested that… It has been identified that… It has been debated that… It has been noticed that… **…role in the…** …plays an important role in the… …takes an important role in the… …plays a critical role in the… …plays a key role in the… …has a pivotal role in the… **…considered to be…** …is considered to be a promising approach to… These are considered to be a main cause of… …have been considered to be… **There has been an increasing demand for…** There has been an increasing demand for minimally processed organic produce…

Table 4.13 List of Lexical Bundles and Their Contexts in the Introduction Section (Cont.)

The Introduction Section		
Move	**Chinese Corpus**	**International Corpus**
Move1: Stating why the topic is important	**…is the most important…** …is the most important product for… …is the most important factor affecting… …is the most important task. **…considered to be…** …was considered to be one of the most important… …were considered to be an effective method of… **…have (has) been done…** In recent years, intensive studies have been done toward… A large number of studies have been done in… Much work has been done in… **…has/have been shown to be…** …have been shown to be influenced by… …have been shown to be involved in … **It (it) is of significance for…** It is of significance for development of honey in… Hence, it is of significance for… **…important role in…** …plays a very important role in… …has played an important role in… …plays an important role in…	**…an important factor…** …has been suggested to be an important factor for COX-2 expression …has become an important factor in current breeding programs. **…been (increasingly) reported to…** …has been reported to be involved in… …have also been reported to exhibit… …has been reported to have a beneficial effect on… …have been increasingly reported to… **…have been widely…** …have been widely studied for many years. …have been widely implicated in… …has been widely characterized. …have been widely identified and characterized in… **…has been extensively…** …has been extensively studied. …has been extensively characterized with regard to… …has been extensively investigated. **…thought to be…** …were thought to be… …was thought to be…

Table 4.13 List of Lexical Bundles and their Contexts in the Introduction Section (Cont.)

The Introduction Section		
Move	**Chinese Corpus**	**International Corpus**
Move1: Stating why the topic is important		**…used as a…** …has been used as a… …is extensively used as a… …can be used as a… **…have indicated that…** Several lines of studies have indicated that… Recent finding in animal studies have indicated that… **…is strongly influenced by…** Micronutrients bioaccessibility is strongly influenced by… **…are likely involved in…** P4-ATPases are likely involved in… **…has been shown to…** …has been shown to result in… …has been shown to increase… **…insight into the…** Knowledge of genetic parameters can provide more insight into the genetic control of… ROH length can give insight into the… A detailed spatially resolved below ground sampling helped to get further insight into the possible effects of…

Table 4.13 List of Lexical Bundles and Their Contexts in the Introduction Section (Cont.)

The Introduction Section		
Move	**Chinese Corpus**	**International Corpus**
Move1: Stating why the topic is important		**There is growing concern that…** There is growing concern that food allergies are increasing at alarming rate for reasons that… **…is essentially caused by…** Brown rot is essentially caused by … **…is mainly caused by…** UV radiation is mainly caused by… **…have been discussed by various authors** The results from…have been discussed by various authors. **…been commonly used in…** …has been commonly used in studies to determine effects of… **…show opposite influence on…** Antioxidants show opposite influence on… **…have been analyzed recently…** Some of the genes have been analyzed recently in… **…has been found…** SA has been found to induce heat intolerance in…

Table 4.13 List of Lexical Bundles and Their Contexts in the Introduction Section (Cont.)

<table>
<tr><th colspan="3">The Introduction Section</th></tr>
<tr><th>Move</th><th>Chinese Corpus</th><th>International Corpus</th></tr>
<tr><td>Move2: Preparing for the present study</td><td>There (there) are a few reports about…
However, there are a few reports about…
There are only a few reports about…

…has not been…
…has not been reported.
…has not been adequately elucidated.

There is no information on …
There is no information on the growth especially physical activity of …

Only (only) a few…
However, only a few researches are reported on…</td><td>Little (little) information is…
Little information is known about…
Very little information is available about…

…still remains unknown.
The detailed function of SPATA1 still remains unknown.

Few studies have…
Few studies have evaluated…
Few studies have investigated…

…has been done on…
Relatively little work has been done on…

Few (few) researches suggested…
However, few researches suggested the non-Newtonian nature…

It (it) is not yet known…
But it is not yet known how this pathway is…

Little (little) work has been done on…
Relatively little work has been done on starch modification…</td></tr>
</table>

Table 4.13 List of Lexical Bundles and Their Contexts in the Introduction Section (Cont.)

The Introduction Section		
Move	**Chinese Corpus**	**International Corpus**
Move2: Preparing for the present study		**…has not been…** …has not been extensively studied. …has not been reported in… **…have not been…** …have not been caracterized. …have not been investigated. **Little is known…** Little is known about… Little is known regarding… **…not well understood** …are not well understood. …is still not well understood. **…not yet understood well** …are not yet understood well. … is not yet understood well. **There (there) is a lack of studies on…** However, there is a lack of studies on the effects of… **There is little (limited) information about the…** There is little information about the… There is limited information about the impact of…

Table 4.13 List of Lexical Bundles and Their Contexts in the Introduction Section (Cont.)

The Introduction Section		
Move	**Chinese Corpus**	**International Corpus**
Move3: Introducing the present study	**…provided a theoretical basis for…** The experiment provided a theoretical basis for… **…provided reference for the…** These questions were investigated to provide reference for… The results will provide the reference for… **In (in) order to…** In order to make full use of it, it is necessary to analyze … … in order to explore the effect of … In order to further and better understand the influence of … … in order to provide theoretical guidance for … **…so as to provide…** …so as to provide reference for developing methods and standards to… …so as to provide a theoretical basis for… …so as to provide theoretical reference for… …so as to provide basic data for… …so as to provide scientific references for…	**The objective of this…** The objective of this research was to estimate… The objective of this analysis was to develop… The objective of this study was to develop… The objective of this study was to estimate… The objective of this study was to evaluate… The objective of this study was to gain insight on… The objective of this study was to comprehensively investigate… **The objective of the…** The objective of the present experiment was to… The objective of the current study was to… **The objective was to…** The objective was to evaluate… The objective was to investigate… **The (main) aim of this…** The main aim of this study was to analyze… The aim of this paper was to investigate… The aim of this study was to evaluate…

Table 4.13 List of Lexical Bundles and Their Contexts in the Introduction Section (Cont.)

The Introduction Section		
Move	**Chinese Corpus**	**International Corpus**
Move3: Introducing the present study	**The (the) purpose of…** The purpose of the present study was to determine if… …with the purpose of studying the effects of… The purpose of this study was to further study the effects of… The purpose of this research was to investigate… **The aim was to…** The aim was to survey whether… The aim was to provide a better basis for… **The (the) objective of…** Therefore, the objective of these experiments was to determine… The objective of this study is to evaluate… …with the objective to provide scientific references for…	**The aim of the…** The aim of the current research was to study… The aim of the present study was to investigate… **…the effect of…** We measured the effect of … We examined the effect of … **Here, we present…** Here, we present evidence that… Here, we present a comparative study between… Here, we present results from… **The present study was…** The present study was undertaken to determine… The present study was intended to estimate… **This study was carried out to…** This study was carried out to investigate the possible role of… **We focused our…** We focused our efforts to develop… We focused our attention on the identification of…

4.2.2 The Methods Section

The Methods section describes the steps the researchers followed in conducting their study and the materials the researchers used at each step (Weissberg & Buker, 1990). In this section, five moves were found, including Move 4 (Describing materials), Move 5 (Describing experimental procedures), Move 6 (Detailing equipment), Move 7 (Presenting equations describing the phenomena or models of the phenomena) and Move 8 (Detailing statistical procedures). At the same time, lexical bundles were identified from those five moves for each corpus. Thirty-nine lexical bundles were found in the local corpus and seventy-seven were found in the international corpus, as displayed in Table 4.14.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move4: Describing materials	**…was purchased from…** Fresh purple cabbage was purchased from… **…were used in this…** …were used in this experiment. …were used in this study. **…were obtained from…** ELISA reagents were obtained from… **…was provided by…** Yupingfeng Oral liquid was provided by… **…was supported by…** Soybean was supported by… **…was used as…** …was used as the test materials. …was used as the seed fertilizer.	**…was obtained from…** Sample D was obtained from… **…were obtained from…** Reference compounds were obtained from… **…were purchased from…** Chemicals and reagents were purchased from… **…were grown in…** …were grown in mixture on a loamy sand. …were grown in soil. … were grown in the farm. **…are listed in Table X.** Mutagenic oligonucleotides and primers used to amplify various portions of HTA1 are listed in Table1. **…was donated by…** Food grade bacterial a-Amylase (BC 3.2.1.1) was donated by… **…was used as…** …was used as a positive control. **…were used in…** …were used in the antibody analysis. …were used in the study as experimental materials.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures	**…was carried out in…** The experiment was carried out in… This trial was carried out in… This test was carried out in… The region trial was carried out in… The variety comparison trial was carried out in… **…was added to…** 4.5 L water was added to each pot to enable… **…was used to…** …was used to calculate… …was used to determine… …was used to measure… …was used to absorb… …was used to investigate the effect of… **The experiment was conducted in …** The experiment was conducted in field of… The experiment was conducted in green house located in…	**According (according) to the (a) …, …** …according to a neighbor-joining method implemented in MEGA (XXX, 2004). …according to a published procedure. According to a published report, … …according to a standard trypsin protocol. …according to the manufacture's manual. … according to the manufacture's instructions. …according to the manufacture's protocol. …according to the procedures of XXX (1990). According to the method of XXX (1974), … According to the formula of XXX (1938), … According to the procedure previously described, … …according to the modified method as previously described. …according to the supplier's recommendations. According to the production method, … According to the spectrophotometer method described by XXX (1978), … …according to the following criteria. …according to the methodology described in Experiment.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures	**According (according) to the…, …** According to the experimental design principle of…, … According to the literature and our preliminary experiment, … …according to the method of GB/T 17138-1997[10]. …according to the method mentioned above. …according to the manual of. …according to the nutritional requirements of. **…as described in…** …as described in the references …as described in references …as described in Exp.1 **…were randomly selected…** Seeds were randomly selected to sow in… **…was determined by…** The pest resistance was determined by… **…shown in Table…** …were shown in Table 1. …are shown in Table 2. …is shown in Table 2.	**…as described previously.** …was /were performed as described previously. …was /were prepared as described previously. …was /were established as described previously. …was determined by FISH essentially as described previously. **…as described by…** …were undertaken as described by XXX (1996). …was performed as described by XXX (2002). …was carried out as described by XXX (1998). **…was used to…** …was used to obtain… …was used to separate… …was used to determine… …was used to identify… …was used to control… …was used to assess… …was used to indicate… **…was carried out…** …was carried out as follows. …was carried out as described above.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Sections		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures	**…was diluted with…** …was diluted with water. …was diluted with absolute ethyl alcohol. **…in accordance with…** … was carried out in accordance with the Chinese guidelines for… …were determined in accordance with standard method. **…was mixed with…** …was mixed with germfree water. …was mixed with sand. **…were collected from…** Blood samples were collected from… **…were isolated from…** Satellite cell were isolated from… **…were rinsed with…** …were rinsed with tap water for… …were rinsed with double distilled water for… **…was adopted to…** …was adopted to carry out… …was adopted to detect…	**…by the method of…** …was determined by the method of XXX (1976). …was estimated by the method of XXX (1983). **…following the method of…** …was determined following the method of XXX (1992). …was performed following the method of XXX (1969). **…in accordance with…** …in accordance with the manufacture's protocol. …in accordance with the guidelines formulated by the European Community. **…were collected from…** The seeds were collected from… **…were incubated for…** …were incubated for additional 7 days. …were incubated for 16 hours for 37.8C. **…was determined by…** ADFom was determined by the method of … Ambient temperature was determined by measuring…

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures	**…was collected for…** …was collected for measuring… …was collected for analysis of… **…were randomly divided into…** …were randomly divided into two groups. **…were stored at…** …were stored at -20°C until needed for analysis. **…under the condition of…** …were raised under the condition of… …were treated under the condition of… …were treated for 48 h under the condition of… **…in a random complete block design…** The experiment was conducted in a random complete block design with… **The experiment was divided into…** The experiment was divided into five periods.	**…were expressed as…** The results were expressed as… Color measurements were expressed as… **…were mixed with…** Samples were mixed with a liquid solution of… The later supernatants were mixed with those of… **…was isolated from…** …was isolated from a leaf from each individual plant. … was isolated from a heat-treated two-week-old orchardgrass 1ZAPII cDNA library (Stratagene, La Jolla, CA, USA), as described previously. **…was performed in…** …was performed in duplicate. …was performed in the solution. **…was determined as…** …was determined as previously described. …was determined as described above.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures		**…was removed from…** One sample was removed from the hot surface… **…was taken from…** One big chunk of pork was taken from a fresh carcass… **…were used for…** …were used for the calculation. …were used for identification purpose. …were used for hybridizing the blots over night. **Samples were analyzed for…** Samples were analyzed for serum concentrations of… Samples were analyzed for Ti02 content in triplicate. **The experiment was…** The experiment was carried out at… The experiment was conducted at …

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures		**…was estimated using…** …was estimated using the method by Japanese Feeding Standard for Swine (JFSS, 2005). **…was measured in…** …was measured in duplicate. …was measured in triplicate. **…was transferred into…** Finally, the ITB2/ALA3 was transferred into… **…was transformed into…** The destination clone was transformed into… **…were applied to…** …were applied to determine the characteristic pore size. **…were assigned to…** …were assigned to 1 of 2 treatment groups. **…were immersed in…** …were immersed in water. …were immersed in the different solutions.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures		**…were suspended in…** …were suspended in distilled water. …were suspended in an equal volume of… …were suspended in the culture for… **The reaction was carried out…** The reaction was carried out at 95°C for… The reaction was carried out under the following conditions. **Samples were taken for…** Samples were taken for different analysis from… Samples were taken for measuring the PH, color… **…was digested with…** For copy number analysis, the genomic DNA was digested with… The plasmid pSAT 6-EYFP-N1 was digested with… **…was evaluated at…** Intensity of reaction was evaluated at 450nm… …was evaluated at the end of radio frequency heating.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures		**…was heated at…** The mixture was heated at 80°C for 30 min… **…was measured by…** Activity was measured by mixing 10mL of juice… **…was monitored by…** Formation of the gels was monitored by measuring… **…was neutralized with…** The solution was neutralized with… **…were housed in…** Pigs of each group were housed in… **…were immersed in water…** …were immersed in water at 40°C. …were immersed in water for 4 d. **…were recorded using…** …were recorded using methods detailed by XXX (2005).

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move5: Describing experimental procedures		**…with slight modification** ...was assayed by the Folin CCioalteu colorimetric method with slight modification. …was estimated according to the method of XXX (1987) with sight modification. **…were prepared in…** …were prepared in single batches at the university. …were prepared in our pilot plant facilities.
Move6: Detailing equipment	**…was used to…** …was used to determine… …was used to detect… …was used to align… **…were measured with…** Individual plasma samples were measured with… The weights were measured with… **…was determined with…** …was determined with a spectrophotometer. …was determined with iron vitriol.	**…was equipped with…** …was equipped with a diamond knife. …was equipped with a 5-mHz curved array transducer. …was equipped with a temperature programmable injector. …was equipped with a pH-electrode. **…was measured using…** …was measured using a kit. …was measured using a temperature probe. …was measured using a pres-sure chamber. …was measured using a trigonometric carpet.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move6: Detailing equipment		**…was recorded using…** …was recording using a Setaram III calorimeter. …was recording using a spectrophotometer. …was recording using a portable infrared gas analyzer. **…was performed using…** Detection was performed using a Dionex ED 40 module… Transrectal ultrasonography was performed using an Aloka 500V ultrasound… **…according to the manufacture's…** …was extracted using RNeasy Mini Kit (Qiagen, Hilden, Germany) according to the manufacture's recommendations. …was synthesized by random hexamer primer according to the manufacture's instructions. **…was used for…** …was used for viscosity measurement. …was used for studying the thermal behavior of samples. …was used for monitoring the laccase activity.

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move6: Detailing equipment		**…was provided with…** …was provided with three DIN concentric cylinder measuring… …was provided with parallel elec-trodes of 150cm A 100cm. **…was performed with…** Viscoelastic measurement was performed with… Analysis was performed with… Detection was performed with… **…was used to…** …was used to determine the eye temperature of each pig. …was used to measure the amount of gusa DNA in each sample. …was used to estimate the size of the bands. …was used to perform the experiments. **…was extracted with…** Total DNA was extracted with the miRNeasy mini kit (Qiagen) as per the manufacture's instructions. **…was measured by…** The pH was measured by a pH-electrode with a… The protein concentration was measured by absorbance at 660nm using an…

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move7: Presenting equations describing the phenomena / models of the phenomena	**…was calculated according to the…** …was calculated according to the formula. …was calculated according to the following formula. **…were calculated as…** …were calculated as follows. …were calculated as the following formula.	**…can be calculated as…** The number of newborns can be calculated as… The number of males and females can be calculated as… **…was calculated as follows.** The shearing resistant stability was calculated as follows. The number of variables was calculated as follows. **…assured to be…** Breeding values were assured to be distributed… All unselected animals are assured to be sold… The total number of selected males for replacement was assured to be constant… **…was equal to…** The total number of matings was equal to the product of… The total number of variables was equal to the number of…

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move8: Detailing statistical procedures	**…was used to…** …was used to determine the density of… …was used to estimate a breakpoint according to… …was used to input the experiment data… **…was used for…** …was used for the analysis of data. …was used for fitting the logistic model. …was used for variance analysis. **All data were input into…** All data were input into Excel database. **Data (data) were analyzed…** Data were analyzed as… All data were analyzed by… Data were analyzed using… **…were carried out by…** The T test and LSD test were carried out by… The multiple comparisons were carried out by…	**…was used to…** Cluster analysis was used to determine area under… The Bayesian Output Analisis package was used to calculate… The LSMEANS procedure was used to test… Wilcoxon nonparametric test was used to compare… Analysis of variance was used to analyze… **…analyses were performed…** All analyses were performed using the ASREML software package… The analyses were performed using the Gibbs sampling… Statistical analyses were performed using the mixed model… Linear regression analyses were performed between… Separate RMA analyses were performed for…

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move8: Detailing statistical procedures	**…were expressed as…** The results were expressed as… The value were expressed as…	**Data were (separately) analyzed…** Data were analyzed with… Data were analyzed in… Data were separately analyzed for… Data were analyzed by… **…were performed using the…** All analyses were performed using the… Statistical analyses were performed using the… Calculations were performed using the… All statistical analyses were performed using the… **…evaluated using the…** Association was evaluated using the… The data were evaluated using the… **The data were…** The data were acquired and processed using the… The data were considered parametric by the… **…were (was) analyzed by…** Follicle size was analyzed by ANOVA using the… Data were analyzed by Statistical Analysis System for … Differences among treatments were analyzed by…

Table 4.14 List of Lexical Bundles and Their Contexts in the Methods Section (Cont.)

The Methods Section		
Move	**Chinese Corpus**	**International Corpus**
Move8: Detailing statistical procedures		**Data (data) were subjected to…** All data were subjected to the analysis of variance for… Data were subjected to multi-way ANOVA to determine… The data were subjected to statistical analysis using… **…were estimated by means of…** …were estimated by means of univariate analyses. …were estimated by means of bivariate analyses. **…was calculated from the…** Microbial protein synthesis was calculated from the results of… The mean was calculated from the data of… **Data were analyzed with…** Data were analyzed with Student t tests for… Data were analyzed with Data Analysis 5.1 software for… **Differences were considered significant…** Differences were considered significant for… Differences were considered significant if…

4.2.3 The Results Section

The Results section presents the findings of the study in both figures and in written text. Figures (graphs, tables, and diagrams) present the complete findings in numerical terms, while the accompanying text helps the reader to focus on the most important aspects of the results and to interpret them (Weissberg & Buker, 1990). In this section, four moves were observed, including Move 9 (Stating research procedures), Move 10 (Justifying procedures or methodologies), Move 11 (Stating results) and Move 12 (Commenting on the results). That is, lexical bundles were identified from the four moves for each corpus. In total, thirty-eight lexical bundles were found in the Chinese corpus, whereas sixty-three lexical bundles were found in the international one.

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move9: Stating research procedures	**In order to…, …** In order to verify the effectiveness of …, … In order to avoid nutrition loss and destruction of pigment layer, … In order to determine whether is was fitting…, … **…was one of the main objectives…** Improvement of oil content or rapeseed was one of main objectives in … **…was used to…** …was used to compare the difference. …was used to test… **…was calculated according to…** …was calculated according to plot yields. …was calculated according to surrounding index.	**…the effects of…** To investigate the effects of… To identify the effects of… To analyze the effects of… **We (we) focused on…** Here, we focused on the protein encoded by… We focused on CAZY family GT31… **We (we) investigated the…** Thus, we investigated the effect of… We investigated the viability of… Thus, we investigated the influence of… We investigated the presence of… **We (we) hypothesized that…** Initially we hypothesized that over expression of… Therefore we hypothesized that over expression of…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move9: Stating research procedures		**In order to…, …** In order to determine the molecular composition from data in Table 3, … In order to unlink the effects of…, … In order to exclude these differences, … **To identify the…, …** To identify the donor substrate, … To identify the CHS-derived siRNAs from…, … **To examine the…, …** To examine the ability of…, … To examine the cause of…, … **To investigate the…, …** To investigate the effects of…, … To investigate the function of…, … To investigate the potential role of…, … **To test whether…, …** To test whether histones can protect and stabilize incoming single-stranded DNA, … To test whether the various histone derivatives passively diffused into the nucleus, … **We constructed a…** We constructed a phylogenetic tree based on… We constructed a series of vectors in which… We constructed a virtual gene map of…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move9: Stating research procedures		**To determine the…, …** To determine the amount of… To determine the size class that… To determine the reason for… **To determine if…, …** To determine if the different lactadherin bands observed in SDS-PAGE resulted from… **We tested the…** We tested the additive and dominance effects of… We tested the rectal temperature of mice before…
Move10: Justifying procedures or methodologies		**…have shown that…** We have shown that… Recent studies have shown that… **A (recent) report suggested that…** A report suggested that… A recent report suggested that…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move11: Stating results	**…as shown in…** …as shown in Table. …as shown in Figure. **…significantly higher than…** …was significantly higher than… …was extremely significantly higher than… …was very significantly higher than that of… **…as can be seen from…** …as can be seen from Table. …as can be seen from Figure. **…was found in the…** The maximum value was found in the… **…no significant difference…** …had no significant difference with that of… …had no significant difference according to Table 1. …show no significant difference. There was no significant difference between ….	**As shown in…** As shown in Figure, …. As shown in Table, … **…are (is) shown in Figure X.** The average means are shown in Figure 1. The ratio of caseins is shown in Figure 4. **…are (were) shown in Table X**. Error covariances are shown in Table 2. The relationships were shown in Table 5. **There was a…** There was a tendency (p=0.07) for an effect of… There was a dietary treatment effect on… There was a positive relationship between… There was a statistically significant difference between… There was a significant reduction of… There was a significant difference at… There was a variation of… There was a significant difference in… There was a positive correlation between…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move11: Stating Results	**The difference was…** The difference was not significant… The difference was significant at… The difference was significant among the… The difference was extremely significant at … The difference was significant against… **…was lower than…** …was lower than that in the IF group (p=0.08). …was lower than other groups. …was lower than that of the control. …was lower than others. **…showed that the…** The result showed that the… The results showed that the… Table 3 showed that the… Figure 1 showed that the… **…were listed in…** …were listed in order as follows. …were listed in Table X. …were listed in Figure X.	**There was no…** There was no difference (p=0.01) in… There was no effect of… There was no interactive effect of… There was no obvious growth difference between… There was no correlation between… **…positively correlated with…** Daily feed intake was moderately and positively correlated with… Measures of residual feed intake were strongly and positively correlated with… The phenolic contents were highly positively correlated with… Only flavonoid contents were poorly positively correlated with… The flavonoid contents were positively correlated with… **…was negatively correlated with…** It seems that the antioxidant capacity was negatively correlated with… H202 and MDA were negatively correlated with… **…presented in Table X.** …are presented in Table 1. …were presented in Table 3. …was presented in Table 5. …is presented in Table 2. **…was observed in…** Newtonian nature was observed in…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move11: Stating results	**…higher than those of…** …were all a little higher than those of… …was significantly higher than those of… …were significantly higher than those of… **…is shown in…** …is shown in Table X. …is shown in Figure X. **…are shown in…** …are shown in Table X. …are shown in Figure X. **…greater than that of…** …was extremely greater than that of… …was 0.2 g greater than that of… **It could be…** It could be indicated from Table X that… It could be indicated from Figure X that… It could be illustrated by Table X that… It could be concluded from Table X that… **…is listed in Table X.** The result is listed in Table 2. Analysis of variance is listed in Table 1.	**…an increase in…** Feeding 1,200g linseed/day resulted in an increase in… We did, however, observe an increase in… None of the tested HTB caused an increase in… **…highly affected by…** The urinary N excretion was highly affected by… **…was (were) not affected by…** BW and apparent fecal CP digestibility were not affected by … Start of the experiment was not affected by… **…differences were detected…** The significant differences were detected between… Only significant differences were detected in… No significant differences were detected with… **…the results of the…** Table X provides the results of the… Figure X summarizes the results of the…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

<table>
<tr><th colspan="3">The Results Section</th></tr>
<tr><th>Move</th><th>Chinese Corpus</th><th>International Corpus</th></tr>
<tr><td>Move11: Stating results</td><td>…significant negative correlation with…
…had an extremely significant negative correlation with…
…shared a significant negative correlation with…

…significant positive correlations with…
…shared extremely significant positive correlations with…
…had extremely significant positive correlations with…
…had significant positive correlations with…

There was no…
There was no difference between…
There was no effect of…
There was no significant difference between…
There was no significant difference among…

…was shown in…
…was shown in Table X.
…was shown in Figure X.

Data in Figure X …
Data in Figure 1 demonstrates that…
Data in Figure 3 demonstrates the effects of…
Data in Figure 4 depicts the…</td><td>…showed that the…
The results showed that the…
AA sequences for lactadherin clearly showed that the…
We previously showed that the…

…shows that the…
The truncation pattern clearly shows that the…
Figure X shows that the…

…revealed that the…
The results revealed that the…
The analysis revealed that the…
N-Deglycosylation experiments on MFGM proteins from rare milk revealed that …

There were no…
There were no effects of …
There were no significant differences between…
There were no significant differences in…

A (a) significant reduction…
There was a significant reduction of…
The maltodextrin group also showed a significant reduction in…
A significant reduction of the initial number of lactic acid bacteria was achieved after…</td></tr>
</table>

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move11: Stating results	**…as seen in…** …as seen in Figure X. …as seen in Table X. **…significantly different from the…** …was significantly different from the… …were significantly different from the… **…are presented in…** …are presented in Table X. …are presented in Figure X. **It can (also) be discovered from…** It can be discovered form Table X that… It can also be discovered from Figure X that… **…is higher than…** …is higher than that of common wheat. …is higher than that in tomato. **…obtained from the…** …was obtained form the… …were obtained form the…	**…are displayed in…** …are displayed in Table X. …are display in Figure X. **…did not differ…** The number of lactic acid bacteria did not differ significantly from… The bulk allocation of 15N did not differ between… Pd in ISS period 2 did not differ from … **…did not show…** Sub-samples from the pork chunk did not show a trend towards… Its truncated forms did not show any change in… The cytoplasmic CHS mRNA levels did not show any reduction in… … did not show any statistically significant increase. **Positive (positive) correlation(s) between…** There was a positive correlation between… Positive correlation between SA and RWC was also found under… Interestingly, there were positive correlations between…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move11: Stating results	**It is indicated…** It is indicated form Table X that… It is indicated in Table X that… **The result showed that…** The result showed that the yield of these varieties had no significant…	**We found that…** We found that treatment with 40 ng/mL LPS caused a… **…were detectable in…** No IgE antibodies were detectable in… Three AO isoforms were detectable in… **…are reported in…** …are reported in Table X. …are reported in Figure X. **As shown in Figure X …** As shown in Figure 4, all three itb2 alleles showed… **…was caused by…** This pH-decrease was caused by… **…given in Table X.** …are given in Table 5. …is given in Table 1. **…in agreement with…** Various levels of resistance to dextranase are in agreement with… Three groups were also observed in agreement with… **It has to be…** It has to be mentioned that… It has to be underlined that…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move11: Stating results		**…was detected in …** No propionate was detected in … This pathogen was detected in … **There was a tendency for…** There was a tendency for an effect of… There was a tendency for these… **We also observed…** We also observed that… We also observed the anomeric signals corresponding to…
Move12: Commenting on the results	**It can (could) be concluded from Figure X that …** It can be concluded from Fig1 that… It could be concluded from Fig 2 that… **…indicated that the…** The results indicated that the… The result indicated that the… These indicated that the… **…reason may be that…** The reason may be that… The mainly reason may be that…	**…due to the…** It was not due to the… This may be due to the… This might be due to the… This was due to the… The continuous decline of the water content was probably due to the… Probably, this was due to the… **…results suggest that…** These results suggest that… The results suggest that… In addition, the results suggest that… **…consistent with the…** This expression pattern is consistent with the… These findings were consistent with the… This was consistent with the…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move12: Commenting on the results	**…impact on the…** …had larger impact on the… …had certain impact on the… **…be due to…** This may be due to the differences in the time of… This result might be due to that… **That means there…** That means there is no significant… That means there existed…	**This demonstrated that…** This demonstrated that there was a high risk to… **This result indicated that …** The result indicated that there was a negative response to… **This suggested that…** This suggested that there was a negative response to… **…data indicate that…** Our data indicate that there was a perfect correlation among… Our data indicate that there was a high risk to… These data indicate that… Taken together, our data indicate that… The data indicated that… **We found no significant difference between the…** We found no significant difference between the two wild…. **Taken together, these…** Taken together, these results indicate that… Taken together, these findings suggest that…

Table 4.15 List of Lexical Bundles and Their Contexts in the Results Section (Cont.)

The Results Section		
Move	**Chinese Corpus**	**International Corpus**
Move12: Commenting on the results		**…an important role…** The galloylmoiety at R1, R2, R3 or R4 played an important role in… In previous studies, we showed an important role in… **…is more likely related to…** However, the setback value is more likely related to the… **…large numbers of…** The presence of large numbers of CHS-specific siRNAs is clear evidence of… Thus, there are larger numbers of… **…was identical with…** The equine SPATA1 sequence deposited in NCBI was identical with… **…is in accordance with…** The higher number of signature occurrences is in accordance with… **We had previously…** We had previously identified… We had previously shown that… **...were observed due to…** No apparent adverse effects were observed due to…

4.2.4 The Discussion Section

The Discussion section moves the reader back from the specific information reported in the Methods section and the Results section to a more general view of how the findings should be interpreted (Weissberg & Buker, 1990). In this section, four moves were identified for each corpus, including Move 13 (Contextualizing the study), Move 14 (Consolidating results), Move 15 (Stating the limitations of the present study) and Move 16 (Suggestions for further research). Lexical bundles were found from these four moves for each corpus. In total, thirty-five lexical bundles were identified in the local corpus, while sixty-one lexical bundles were identified in the international one, as shown in Table 4.16.

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move13: Contextualizing the study	**…is (are) one of the…** …is one of the key indicators to measure the… …is one of the key factors in the… …are one of the most studied components… …are one of the key indicators reflecting the… **…an important role in the…** …plays an important role in the… …played an important role in the… **…be used to…** …can be used to evaluate the… …will be used to determine whether… **...have proved that…** We have proved that… XXX (2010) have proved that… **…have to be considered** The effects have to be considered, in addition to the role of… …have to be considered simultaneously.	**…the effect of…** Numerous studies have investigated the effect of… However, other researchers have conducted studies into the effect of… The main objective of the current experiment was to determine the effect of… Therefore, we examine the effect of… **…has been shown…** …has been shown to be very difficult due to the fact that… …has been shown to have a detrimental effect on… …has been shown to be involved in… **It (it) is important to…** Therefore, it is important to avoid… Therefore, it is important to balance… In this case, it is important to consider… **It is known that…** It is known that cattle have longer range LD.

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move13: Contextualizing the study	**Studies (studies) have shown that the…** Many studies have shown that the… Studies have shown that the… A large of studies have shown that the… Studies have shown that the… **…showed that the…** The results showed that the… This experiment showed that the…	**…aim of the…** The first aim of the study was to investigate whether… The third aim of the present study was to investigate to what extent… **…objective of the…** The main objective of the current experiment was to determine the effect of… The primary objective of the current study was to evaluate the impact of… **…allowed us to propose a…** Integration with high-resolution allowed us to propose a… **…been extensively studied…** The effects of linseed on beef breed steer performance have been extensively studied. The green tea and black tea polyphenols have been extensively studied with regard to… **…has been undertaken…** Limited research has been undertaken on effects on… **…is characterized by…** The Maillard is characterized by the formation of…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move13: Contextualizing the study		**…is the first…** This is the first study to compare… The current study is the first of its kind reporting genetic parameters on the relationships between… **It is not…** It is not clear whether… It is not difficult to envision that… **There (there) is a…** Thus, there is a need to investigate the… Therefore, there is a wide potential resource for… **In our previous study, …** In our previous study, we also found that…
Move14: Consolidating results	**…results showed that…** The results showed that… The test results showed that… **…than that of…** …were lower than that of the control. …was significantly lower than that of… …were 43.5 and 28.5 kg/hm^2 greater than that of… Further more the adversity of japonicasl rice is more than that of…	**…be attributed to…** …could be attributed to… …can be attributed to… These different results may be attributed to… **Results (results) of the current study…** Results of the current study also support the… The results of the current study indicated that… Results of the current study highlight the beneficial effects of…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results	**…according to the…** …according to the results of the test. …according to the results of the single-factor experiment. ….according to the studies. …according to the research of wheat. **…be due to…** This may be due to that… These results may be due to the… **…higher than that of…** …were significantly higher than that of… …was higher than that of… …was significantly higher than that of… **…study showed that…** The present study showed that… Moreover, this study showed that…	**…be due to…** This may be due to… This behavior might be due to… The lower efficacy observed in peach could be due to… **The (the) present study…** The present study included… The present study showed that… Thus, the present study shows the positive association between… The present study additionally showed a… In conclusion, the present study shows the potential for… The present study confirmed the findings of… The results obtained in the present study strongly support the assumption that… The present study thus adds value contribution to the… **The (the) results of the present study…** In conclusion, the results of the present study indicate that… The results of the present study have demonstrated that… The results of the present study revealed that…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results	**…consistent with the…** This is consistent with the results reported by… The effect of … are basically consistent with the previous results… …were completely consistent with the published… **…related to the…** …may be related to the establishments of… …may be closely related to the stress factor intensity… …might be related to the importance of… **This may be…** This may be due to that… This may be related to the… This may be attributed to the… **…also found in…** …were also found in this study. Similar result was also found in… **…is in agreement with…** …is in agreement with previous reports. …is in agreement with previous studies.	**…have shown that…** We have shown that… Previous studies have shown that… Accumulated data have shown that… Other studies have shown that… A number of studies have shown that… **…was mainly attributed to…** This reduction was mainly attributed to… **…involved in the…** Isotype IgG is mainly involved in the… This factor might be involved in the… The down-regulation of the MAPK signaling pathway was involved in the… **…is consistent with…** This is consistent with previous studies, in which… This is consistent with earlier findings. This is consistent with previous observations. …is consistent with the values earlier reported previously. This is consistent with previous research where… …is consistent with our previous study on… One explanation is consistent with…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results	**…may be that…** It may be that… The reason may be that… **The research indicated that…** The research indicated that the main phenolic acid substances are… **The (the) test results…** The test results showed that… The test results revealed that… **…was positively correlated…** …was positively correlated with… …was positively correlated to… **…appears to be…** …appears to be more related to… **…attributed to the..** This might be attributed to the role of… This may be attributed to the different ways of…	**This is in (close) agreement with..** This is in close agreement with… This is in agreement with previous studies. This is in agreement with previous findings. This is in agreement with the effect of… **This is in contrast with…** This is in contrast with the current study, in which… **…to be a…** …seemed to be a… …appear to be a… …are considered to be a… …proved to be a… **We were able to…** We were able to exclude… We were able to identify… We were able to find… **A possible explanation…** A possible explanation might be… A possible explanation for the difference is… A possible explanation for this is that the…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results	**…be applied in…** …should be applied in… …can be applied in… **… was (were) demonstrated to be…** …was demonstrated to be highly antigenic by measuring… …were demonstrated to be safe via… **It is speculated that…** It is speculated that the content of rose oil is influenced by… **The reason is that…** The reason is that the reproductive and nutritional growth occurs simultaneously in… **It (it) can be…** It can be concluded that… From this research, it can be known that… **…proved that the…** It proved that the… XXX [3] proved that the…	**…potentially account for…** These roles potentially account for… **…may (can/could) be explained by…** This may partly be explained by… This can be explained by… This behavior could be explained by… **…have been identified in…** A total of 47 core histone genes have been identified in… **…have demonstrated that…** Recent studies have demonstrated that… XXX (2008) have demonstrated that… **…found that the…** It is found that the… We also found that the… It was found that the… **…has been reported…** …has been reported in… …has been reported as… …has been reported to be positively correlated with… …has been reported to play a critical role in…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results	**…revealed that the…** This study by XXX [7] revealed that the… The results revealed that the… **…was significantly lower than…** …was significantly lower than that with… …was significantly lower than that of… **We (we) used the…** In the present study, we used the… So we used the… **…agrees with previous report.** The relationship of…agrees with previous report.	**…important for the…** It is economically important for the… This may be important for the… **The results of the (current) study indicated that…** The results of the study indicated that… The results of the current study indicated that… **It is well…** It is well established that… It is well known that… **Several (Some) lines of studies have…** Several lines of studies have indicated that … Some lines of studies have indicated that… **…possibility is that…** Another possibility is that… An interesting possibility is that… **The present study shows…** The present study shows the positive association between… The present study shows the significantly association between… The present study shows the potential for using… **It (it) should be noted that…** However, it should be noted that some red rice accessions were…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results		**These results suggest that…** Theses results suggest that the ability of the… **…was affected by the…** The heritability estimate was generally affected by the presence of… The CDP superiority was greatly affected by the… **An explanation for…** An explanation for this could be the fact that… An explanation for the lower prevalence may be… **Present (These) findings are consistent with…** Present findings are consistent with… These findings are consistent with… **…are in line with…** Current findings are in line with… The results revealed …, which are in line with… **…as indicated by…** These concentrations are not sufficient to explain…as indicated by…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results		**…is in accordance with…** It is in accordance with… Furthermore, a good correlation was found between…, which is in accordance with… This is in accordance with the results of … **It (it) is likely that…** As such, it is likely that cows have been previously exposed to LPS… **It is possible that…** It is possible that it may have been diluted by… **It (it) was reported…** Recently, it was reported that… It was reported by … that… It was reported earlier that… **It was shown that…** In conclusion, it was shown that production of homopolysaccharides is a…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move14: Consolidating results		**…was confirmed by…** This effect was confirmed by… This was confirmed by… **It (it)has been shown that…** In the previous study, it has been shown that… Moreover, it has been shown previously that… **…has been used…** …has been used widely. This strain has been used in many earlier allergy studies, including…
Move15: Stating the limitations of the present study		**…is available on the…** Limited evidence is available on the… Limited information is available on the… **We were not able to…** We were not able to select… We were not able to detect any other research report about… **…must be used with caution…** The detergent system must be used with caution to determine…

Table 4.16 List of Lexical Bundles and Their Contexts in the Discussion Section (Cont.)

The Discussion Section		
Move	**Chinese Corpus**	**International Corpus**
Move16: Suggestions for further research	**…be further studied…** …should be further studied. …is remained to be further studied in the future. …still needs to be further studied.	**Additional (additional) studies are needed to…** Further, additional studies are needed to elucidate… **Further studies will provide…** Further studies will provide additional information on… **We (we) will further…** In addition, we will further investigate the… We will further clarify these facts in the case of…

In conclusion, consistent to Amnuai's (2012) investigation, the international corpus revealed a great number of lexical bundles than the local one. That is, the number of lexical bundles identified from the international dataset was 250, whereas it was 133 for the local one. This difference in the number of lexical bundles could be due to the fact that the average length of the international papers (534 words) was longer than the local papers (265 words). In addition, these lexical bundles, with their contexts, can be used as a practical guide to teaching writing to RAs in tertiary education.

Since lexical bundles were found with each move, the move label can indicate the function of the lexical bundles. For this reason, the functional classification of lexical bundles identified in the present study was different from that found in previous studies, which mainly covered three major groups: stance markers, discourse organizations and referential expressions (e.g. Biber, Conrad & Cortes, 2004).

4.3 Summary

In this chapter, the results of move analysis and lexical bundles were presented. The move structures of forty-five RAs published in China and forty-five RAs published internationally were analyzed based on Kanoksilapatham's (2005) framework, yielding sixteen moves for each corpus. Meanwhile, lexical bundles were identified on the basis of the sixteen move boundaries found in each corpus. These selected lexical bundles were used to organize, construct or signal the structure of agricultural science RAs published in local and international journals. The similarities or differences between move structures for RAs from the two corpora will be discussed in Chapter 5.

CHAPTER 5

DISCUSSION

This chapter discusses the results reported in Chapter 4 in relation to the literature review. The first part deals with the results of move analysis between the two corpora. Subsequently, the second part discusses the lexical bundles identified in each move from the two sets of data.

5.1 Move Analysis

5.1.1 Comparison of Move Structures across Disciplines

The primary purpose of the present study was to capture the move structures of agricultural science RAs for both local and international publications. In order to compare move structures with those from previous studies, the frequency of a move/step from the two corpora will be combined by using the formula (A+B)÷90, where A = the occurrence of a move/step in the Chinese corpus; B= the occurrence of a move/step in the international corpus; 90 = 45 Chinese papers + 45 international papers. For example, Move 3, Step 4 (Presenting research findings) was found in three out of forty-five Chinese papers and ten out of forty-five international papers. Then, the frequency of this step is computed as: (3+10)÷90=14%. The results of comparison will be presented in order from the Introduction section to the Discussion section.

In the present study, the Introduction section generally conforms to findings from previous studies regarding the presence of the moves (Loi, 2010; Mahzari & Maftoon, 2007; Sheldon, 2011). Nevertheless, some variations have been detected in the choice of steps. The first discrepancy was found in Move 1, Step 3 (Review of previous studies). That is, this step was present in every agricultural science RAs, but it was not always used in computer science RAs analyzed by Posteguillo (1999). This could be due to the fact that computer science is a research field driven by emerging application domains and improving hardware and software which create new challenges and opportunities for computer science research (Hoonlor, Szymanski, & Zaki, 2013).

The second discrepancy is the application of Move 3, Step 4 (Presenting research findings). That is, in the present study, 14% of agricultural science RAs included this step. But it was found in 45% of civil engineering RAs (Kanoksilapatham, 2011), 70% of computer science RAs (Posteguillo, 1999) and 75% of software engineering RAs (Antony, 1999). In fact, this step was absent in educational psychology RAs (Loi, 2010) and applied linguistics RAs (Amnuai & Wannaruk, 2013a). Perhaps, we can reach a conclusion that hard science researchers tended to present findings in the Introduction section in order to encourage readers to read further. Nevertheless, soft science researchers preferred to reserve findings in the Results section.

Third, in the present study, Move 3, Step 5 (Stating the value of the present study) displays a discrepancy from the findings of Stoller and Robinson's (2013) investigation. That is, this step concluded the Introductions of 32% of agricultural science RAs, but it was absent in chemistry RAs. This result indicated that agricultural science researchers were likely to announce the contribution of the study early on in RAs.

The higher level of discrepancies occurred in the Methods section perhaps because this section is highly discipline-dependent and content-oriented. First, Move 4 (Listing materials), representing the first move of this section, was qualified as conventional in agricultural science. Peacock (2011) found that a move, labeled as *materials*, was frequently used in biology, chemistry and physics. Since hard science research typically involves experiments to establish causal relationships between variables, experimental materials are frequently used and are intrinsic to the methodology. In fact, this move was often absent in soft science disciplines, such as in management (Lim, 2006), applied linguistics and educational technology (Pho, 2008b), in which studies usually depended on non-experimental methods, for example, surveys and case studies, so as to establish correlations between variables.

Second, Move 5, Step 2 (Describing the location where the study was conducted) was identified in agricultural science RAs. However, this step was not found in biochemistry RAs (Kanoksilapatham, 2005). This clearly indicates the importance of location in such experiments, which take place mostly on farms instead of labs, and involve location-specific activities, such as raising animals or growing plants. This difference demonstrates that disciplinary variations play a key role when determining the move structure of RAs.

Third, information related to the apparatus used in a study, such as the name of the manufacturers, refers to Move 6 (Detailing equipment). However, a move, labeled as *Describe instrumentation* in chemistry RAs (Stoller & Robinson, 2013), included not only information of instruments but also description of experimental procedures. In agricultural science, *Describing experimental procedures* was a separate move from *Detailing equipment* and the latter occurred in 74% of corpus. This was probably due to the fact that the experiment might not be correctly replicated if researchers do not give detailed information related to equipment as well as procedures.

Fourth, Move 7 (Presenting equations describing the phenomena or models of the phenomena) was included in agricultural science RAs but was not found in biochemistry, chemistry, computer science and medical science RAs (Kanoksilapatham, 2005; Nwogu, 1997; Posteguillo, 1999; Stoller & Robinson, 2013). The reason for this is explained as follows: a mathematical model is an accurate description of a system, showing the idea of how things work in a way that researchers can predict. A model will then lead to a comparison between the predictions and the experimental data. Thus, it is usually necessary to include mathematical modeling procedures in agricultural research with the facilitation of computer technology (Thornley & France, 2007).

In the Methods section, the last interesting point is that Move 8 (Detailing statistical procedures) had a higher frequency in agricultural science RAs (64%) than that in biochemistry RAs (13.32%) (Kanoksilapatham, 2005). Perhaps, the difference was attributed to the nature of agricultural science research, which are heavily conditioned by uncertainty, for example, climate factors, and biological and ecological processes. To reduce this uncertainty, statistical tools have been applied to deal with the study of such uncertain phenomena and to test the hypothesis concerning the relationship of different variables involved in an experiment.

Move analysis of the Results section confirmed Swales' assertion (1990) that disciplinary variations in rhetorical organization of the Results section were likely. In particular, variations were observed in Move 10 (Justifying procedures or methodology), Move 11 (Stating results) and Move 12 (Commenting on results). First, Move 10 (Justifying procedures or methodology) can be claimed to represent unique feature of the Results section in agricultural science and biochemistry because it was not found in other disciplines, such as in social science (Brett, 1994), computer science (Posteguillo, 1999), medical science (Williams, 1999) or applied linguistics (Yang & Allison, 2003). As explained by Thompson (1993, cited in Kanoksilapatham, 2005), the occurrence of Move 10 indicates the degree of acceptability of the results by claiming that results are obtained from a justifiable methodology.

Move 11 (Stating results) emerged as a key element in this section as it was present in every Chinese and international paper. This result was in line with previous findings, in which statements of results were commonly classified as obligatory (e.g. Amnuai, 2012; Hopkins & Dudley-Evans, 1988; Kanoksilapatham, 2005, 2007b) or quasi-obligatory (Posteguillo, 1999). However, unlike previous studies (e.g. Brett, 1994; Posteguillo, 1999; William, 1999), writers of agricultural science RAs were observed only to report substantial findings, indicating that agricultural scientists do not present all the observations occurring in the experiments.

The comparison between Move 12 (Commenting on results) and the comment categories classified by Brett (1994) revealed two major differences. First, Brett's step of "Evaluation of findings re hypotheses" was not found in this corpus of agricultural science. Second, the additional step of "Stating limitations" was identified in this investigation and was used to remind readers of some factors potentially affecting the results of the data analysis, suggesting that future research could be improved by avoiding those potential limiting factors.

Turning to the last section, the Discussion section was distinguished from previous studies in several noteworthy ways. For example, Move 13 (Contextualizing the study) was present in 82% of agricultural science RAs. However, a move, labeled as *Background information* in applied linguistics by Amnuai and Wannaruk (2013b), was recognized in 46.66% of the Thai and 50% of the international corpora. The higher proportion in the present study demonstrates that researchers in agricultural science were more likely to find it necessary to present background information than researchers in applied linguistics.

As for Move 14 (Consolidating results), three steps (explaining, referring to previous literatures and interpreting results) were consistent with previous findings on this section in applied linguistics (Amnuai & Wannaruk, 2013b; Yang & Allison, 2003), educational technology (Pho, 2008b) and dentistry (Basturkmen, 2012). Therefore, it can be concluded that agricultural science researchers drew on the same types of steps to discuss results as researchers in different disciplines. Second, Step 2 (Stating the selected results) stood out clearly with the highest frequency percentage (93%) in Move 14 (Consolidating results) as the comments were developed in relation to specific results. This finding corresponds with previous findings dating back to 1988 (Hopkins & Dudley-Evans, 1988) and as recently as 2013 (Amnuai & Wannaruk, 2013 b).

Move 16 (Suggestions for further study) usually coexisted with limitations of the study (Move 15) or claims or generalizations of the findings (Move 14, Step 5). This move occurred in 39% of agricultural science RAs. At the same time, its frequency of occurrence varied in different disciplines, for example, 70% in applied linguistics corpus (Amnuai & Wannaruk, 2013b), 53.33% in biochemistry corpus (Kanoksilapatham, 2005) and 40% in medical science corpus (ElMalik & Nesi, 2008). Perhaps the reason for the various occurrence frequencies in different corpora was related to the level of competition for research space in different fields. Elimination of this move has been explained as a way to avoid scientific competition (Berkenkotter & Huckin, 1995, cited in Posteguillo, 1999).

In sum, move structure of agricultural science RAs has its own format. These variations particularly occurred in the sections of Methods and Results, confirming Swales' comments that "the major differences do not lie so much in Introductions and Discussions (where I believe most people would expect it) but rather in the Method and Results sections" (Swales, 1990, pp.175-176).

5.1.2 Comparison of Move Structures between the Chinese and International Corpora

Move analysis of the two corpora revealed a clear resemblance in the organizations of the Chinese and international papers. That is, either international or Chinese RAs were found to have sixteen similar moves: three for the Introduction section, five for the Methods section, four for the Results section and four for the Discussion section, reflecting that members belonging to the same academic discipline share a considerable amount of conventions and background knowledge (Yarmohammadi, 1995). However, due to a number of factors, discrepancies between the two corpora have given rise to the choices of steps or move/step frequency in each IMRD section.

For instance, in the international corpus, Move 1, Step 2 (Making topic generalizations) was conventional, while it was optional in the local corpus, suggesting that writing styles were varied according to writers' different cultural backgrounds. International researchers showed a greater preference for generalizing the knowledge of the current study (Move 1, Step 2), likely due to the fact that English writing is linear and direct in its paragraph development (Kaplan, 1966). In the international papers, researchers generalize the knowledge (Move 1, Step 2) and proceed to explain that central idea further in previous studies (Move 1, Step 3).

Second, in the Chinese corpus, Move 2 (Preparing for the present study) usually had Step 1 (Raising a research problem) and Step 2 (Indicating a research gap). Nevertheless, Step1 (Raising a research problem) was absent in the international dataset. A possible explanation for Chinese researchers to employ Step 1 (Raising a research problem) was that writers need to strengthen their justification not only by the insufficiency of previous research but also by needs in the real world (Samraj, 2002). At the same time, Step 2 (Indicating a research gap) was qualified as optional in the local dataset, but conventional in the international one. The lower frequency in the local corpus could be explained by cultural conventions of Chinese writers, who prefer non-threatening and face keeping techniques in their writing style more than their English counterparts do (Taylor & Tringguang, 1991).

Another discrepancy in the Introduction section was reflected in Move 2, Step 3 (Making a hypothesis) and Move 3, Step 2 (Presenting hypotheses). That is, these two steps were found only in the international corpus, demonstrating that international writers are more explicit about what they are investigating than their Chinese counterparts. The lack of explicitness in the Chinese papers can be interpreted as reflecting Chinese high-context communication. That is, in high-context communication, utterances are generally less explicit and less elaborate (Hall, 1976, cited in Loi & Evans, 2010). On the other hand, the higher degree of explicitness in the international papers might be considered as indicative of the low-context communication of most English-speaking countries (Loi & Evans, 2010).

In addition, international researchers are more likely using a "reader friendly" approach that makes their texts less demanding for their readers for the purpose of meeting the expectations of international discourse community (Sheldon, 2011).

Unlike the Introduction section, the Methods section appeared to be less diverse between the two corpora. The only striking differences were found in Move 5 (Describing experimental procedures). In particular, Step 1 (Describing experimental design), while absent in the international corpus, was identified in the local one with a sub-section titled "Trial design", "Experimental design", "Test design" or "Single-factor experimental design". At the same time, the statement of procedural background (Step 5) was found optional in the Chinese corpus as opposed to being conventional in the international one. The reason for Steps 1 and 5 being used in a different way was explained as follows. The Methods section can be used to convince readership of the validity of the means employed to obtain findings (Lim, 2006), but writers with different cultural backgrounds would use different means to achieve this purpose (Kramsch, 2000, cited in Huang & He, 2010).

The Results section is the third major section of the RAs, in which the researchers present the findings of the study and briefly comment on them. Before reporting and commenting on the findings (Moves 11 and 12), international writers preferred to remind readers of research aims and methodologies (Move 9) than their Chinese counterparts. That is, Move 9 (Stating research procedures) was found in 71% of the international corpus as opposed to 47% of the local one. As explained by

Kanoksilapatham (2007b), the study reported in the international corpus is more complex than the study reported in the local one. As a result, in the present study, Move 9 (Stating research procedures) might not be needed to remind Chinese readers of research aims and procedures of the study.

In addition, Move 12, Step 1 (Explaining reasons why these results occur) also displayed a discrepancy. That is, it was conventional in the international corpus but optional in the local one. Concerning competition for their international publication, international researchers need to strengthen the value of their research by devising novel explanations or theories for a phenomenon rather than just comparing their results with previous findings for the purpose of better promoting their research (Basturkmen, 2009). By providing novel explanations for a phenomenon, international writers were better able to extend the topic from the narrower focus on the actual research to a wider focus of general explanation and theory. On the other hand, Chinese writers might be less concerned about this issue because they are presumably appealing to a limited readership of the local publication, thus leading to Step 1 (Explaining reasons why these results occur) being employed infrequently in the Chinese corpus.

In the Discussion section, move analysis of the two corpora revealed a number of discrepancies between the local and international corpora. The first discrepancy was noted in Move 13, Step 2 (Detailing conclusions, claims, deductions or research gaps based on analysis from previous studies). That is, this step was optional in the local dataset as opposed to conventional in the international one. This result could be accounted for by the cultural perspectives towards critical rhetoric held by the two groups of writers. That is, in the Chinese context, researchers might not feel comfortable giving critical or negative comments on the work of previous authors and their research because they may think they need to be humble and modest (Taylor and Tringguang, 1991). In sharp contrast, critique culture is quite common in the international publication context because critical comments can "provide the driving forces for the progress of the discipline and enhance the recognition of individual achievement" (Kanoksilapatham, 2007b, p.199).

The second discrepancy is reflected in Move 13, Step 3 (Stating aims or hypotheses of the study). While this step was absent in the local dataset, it was present nineteen times in the international one. Again, this result seemed to indicate that international researchers were more explicit about what they were investigating, since they are more likely to give more information for their readers (Sheldon, 2011).

Move 14 (Consolidating results) displayed two other discrepancies between the two corpora. First, Step 1 (Restating the methodology) was employed frequently in the international but infrequently in the local corpora. Perhaps, the higher occurrence of Step 1 (Restating the methodology) in the international corpus (71% as opposed to 56%) can be explained by the possibility that international researchers need to assure readers that the results were obtained from carefully designed studies. Second, Step 4 (Explaining results or differences in findings) was included in 80% of the international but only in 44% of the Chinese corpora. This result seemed to indicate that international researchers were more likely to explain the results than their Chinese counterparts.

Finally, the lower occurrence of Move 15 (Stating the limitations of the present study) in the Chinese dataset (13% as opposed to 56%) may similarly reflect the different cultural attitudes of two groups of writers. Chinese researchers appeared to avoid talking about limitations because they may consider “limitations of study” as signals of weakness of their research and lowering of their status as researchers. On the other hand, international writers are part of a scientific culture that assumes that all studies inevitably have limitations, and that saying so strengthens scientific credibility. (Amirian, et al., 2008).

In sum, the two move structures were found to have sixteen similar moves, demonstrating that RAs in the same discipline share a considerable number of rhetorical conventions. However, they were varied at the step level, due to a number of factors. The discrepancies were noted in each IMRD section, particularly in the Introduction and Discussion sections.

5.1.3 Comparison of Move Sequence and Move Cyclicity between the Chinese and International Corpora

Regarding move sequence and move cyclicity, the similarities or differences between the two corpora were discussed in order from the Introduction to Discussion sections. In the Introduction section, three aspects will be discussed. First, the move sequence of the international Introduction section seemed more diverse than that of the Chinese one. That is, 73% of the international Introduction sections were expressed in four patters (e.g. M1-M2-M3, M1-M3, M1-M2-M1-M3, and M1-M2-M1-M2-M1-M3). In addition, the most diverse pattern of M1-M2-M1-M2-M1-M3 was found only in the international corpus. At the same time, 87% of the Chinese papers were expressed in four patterns (e.g.M1-M2-M3, M1-M3, M1-M2-M1-M3, and M1-M2-M1-M2-M3). Since the average length of the Introduction sections published internationally and locally were 534 and 265 words respectively, the longer the Introduction section, the more likely recycling will occur (Swales, 1990; Loi, 2010). To some extent, it can be said that the more likely recycling occurs, the more diverse the move sequence is.

Second, the local corpus, surprisingly, fits the linear ordering (M1-M2-M3) of the CARS model more closely than the international one. The sequence of M1-M2-M3 was found in 33% of the Chinese and 17% of the international datasets. This finding, however, was in contrast to Loi's (2010) study, in which she found the English Introduction sections followed the CARS model more closely than Chinese ones in educational psychology RAs. Perhaps the degree to which a writer follows the CARS model is a reflection of that writer's English academic background, which might help them better follow the conventional format in writing English Introductions (Amnuai & Wannaruk, 2013a).

Third, the lack of Move 2 (Preparing for the present study) resulted in the format of M1-M3, which was adopted fourteen times in the Chinese and six times in the international corpora. The absence of Move 2 (Preparing for the present study) could be explained as follows. First, as mentioned earlier, Chinese researchers might not feel comfortable to criticize someone else's work (Taylor & Tringguang, 1991). To avoid such extremes in writing, one would avoid using overly assertive and pejorative expressions in identifying research gaps (Loi & Evans, 2010). Second, researchers in a smaller discourse community, especially in developing countries, have less pressure to compete for research grant or publications (Fredrickson and Swales, 1994 cited in Samraj, 2002).

The Methods section between the two corpora mainly differed in two noteworthy ways. First, all forty-five Chinese papers opened with Move 4 (Listing materials), whereas thirty-seven and eight international papers began with Move 4 (Listing materials) and Move 5 (Detailing experimental procedure) respectively. The observation of the initial move to open the section adds support to Kanoksilapatham's (2003) finding that moves of material description and experimental procedure interchangeably opened the biochemistry Methods section.

Second, the pattern of M5-M6 was the most repeated by international researchers. This conclusion was reached through the observation that M4-M5-M6-M5-M6-M5-M6-M5-M8 was favored in 11% of the international corpus. At the same time, M5 seemed to be the most cyclical in the local corpus. That is, it was detected in the pattern of M4-M5-M8 (occurring six times) and repeated in the pattern of M4-M5-M6-M5 (occurring four times).

For the Results section, three aspects will be discussed. First, Move 11 (Reporting results) was combined with different steps of Move 12 (Commenting on results), particularly Step 1 (Explaining reasons why these results occur), Step 2 (Making generalizations or interpretation of the results) and Step 3 (Evaluating the current findings). Specifically, thirty-nine international papers were found to have a combination of Move 11 (Reporting results) and Move 12 (Commenting on results), whereas thirty-three Chinese papers were observed to comment on results (Move 12). The higher co-occurrence of Moves 11 and 12 in the international corpus demonstrated that international researchers were more likely to involve offering generalizations, subjective commentary, and interpretations (Move 12) when presenting results. This effect could be related to the needs of international writers to promote their research. Since "the larger the community is, the higher expectations are from the community members in terms of the quality of the research study" (Kanoksilapatham, 2007b, p.195), international writers need to highlight the contribution of the study because of high competition.

Second, the co-occurrence of Move 11 (Reporting results) and Move 12 (Commenting on results) was the core of a cycle in agricultural science RAs. This finding was different from previous studies. For example,

procedural-pointer-statement of finding and *procedural-pointer-evaluation of data* were reported to be the most repeated pattern in computer science RAs. Posteguillo (1999) attributed the frequent use of *procedural* move to the lack of an independent Methods section. But in applied linguistics, Move 7 (Preparing information) and Move 8 (Reporting results) were found as the most repeated pattern (Amnuai, 2012), showing that soft science writers devoted more attention on reminding readers of the background of the study than hard science writers. As a result, it can be tentatively concluded that the employment of cycling patterns are varied across disciplines.

In congruence with previous studies (Amnuai & Wannaruk, 2013b; Basturkmen, 2012; Dudley-Evans, 1998; Hopkins & Dudley-Evans 1988; Kanoksilapatham, 2003; Peacock, 2002), the Discussion section usually displayed a cyclical nature. That is, Move 13 (Contextualizing the study) and Move 14 (Consolidating results) seemed interwoven, thus yielding an organization of *background information* (Move 13) – *results* (Move 14, Step 2) – *comments on result* (Move 14). Further examination revealed that the agricultural science Discussion section contained more cycles than that in the soft science fields. For example, applied linguistic Discussion sections included cycles of *results* - *comments* (e.g. Amnuai & Wannaruk, 2013b; Yang & Allison, 2003). This finding is in agreement with the Holmes' (1997) study, in which hard science Discussion sections are more complex than soft science ones.

The last interesting point is that Move 16 (Suggestions for further research) appeared much less frequently, but if presented, it usually closed the section. This result adds support to the previously mentioned observations of closing move (e.g. Amnuai & Wannaruk, 2013b; Holmes, 1997; Kanoksilapatham, 2003), showing that researchers in different disciplines have a strong tendency to end the writing of their study by giving reasonable suggestions for further studies.

5.2 Lexical Bundles

After move identification, the corpus program of AntConc allows researchers to retrieve lexical bundles from each identified move, yielding 133 lexical bundles in the local and 249 lexical bundles in the international corpora. Fewer lexical bundles were found in the Chinese corpus probably due to the fact that the average length of the Chinese RAs (265 words) was shorter than the one of the international papers (534 words). Lexical bundles will be discussed in three aspects, including the length of lexical bundles, the tense use and the use of the pronoun *we*.

First of all, lexical bundles from the international dataset contained more words than those from the local one. In other words, the length of lexical bundles in the international corpus ranged from three to seven words. On the other hand, the length of lexical bundles in the local one ranged from three to six words. In fact, the longer lexical bundles are, the more information can be provided to benefit writers (Cortes, 2013). For instance, in the international corpus, *Little work has been done on* is more informative than *only a few* in the local one despite the fact that both lexical bundles indicated the function of identifying a research gap (Move 2, Step 1).

Second, the tense use in the local corpus is quite similar to that in the international one. This can be seen in each IMRD section, confirming that members belonging to the same discipline share a considerable number of conventions (Yarmohammadi, 1995). To be specific, in the two sub-corpora of the Introduction section, the majority of the lexical bundles from Move 1 (Stating why the topic is important) and Move 2 (Preparing for the present study) were expressed in present simple tense and present perfect tense. Since the Introduction section often contains the section of reviews of previous studies (Chen, 2009), present simple tense can signal specific findings of previous studies but present perfect tense can claim generalizations from previous studies (Shi, 2011). Nevertheless, the tense use was not diverse in Move 3 (Introducing the present study). That is, past simple tense was found to be the most distinct tense choice, when either Chinese or international writers present their current research (Move 3), as shown in the following Examples. To facilitate understanding, the lexical bundles are shown in sentences and highlighted in bold.

Examples:

1) ***The aim was to*** *survey whether soaking seed in fulvic acid can improve the rice competitiveness at early growth stage, as well as its effect on the photosynthetic physiology and yield of direct seeding rice.* (IP4)

2) *In this study,* ***we attempted to*** *address the question about the evolutionary relationship of the two camels based on sequence variations*. (IA2)

This might reflect Weissberg and Buker's (1990) suggestion that research purpose should be described in past simple tense in scientific English writing. More importantly, this was because present simple tense indicates a greater immediacy and certainty to science and present perfect tense signals generality to science, but using these tenses would be at the expense of "humbleness" (Li & Ge, 2009).

At the same time, tense choice in the Methods section seemed more uniform, which are in line with previous studies (e.g. Li & Ge, 2009; Nwogu, 1997; Swales, 1990). In other words, the majority of lexical bundles from the two corpora were expressed in past simple tense for methodology description. In addition, in order to place the emphasis on the procedure, passive voice was also conventionally used. That is, in the Methods section of both local and international corpora, the majority of lexical bundles were realized in passive voice together with past simple tense.

Examples:

1) *Approximately, 8 mL of blood **was collected for** analysis of blood metabolites and hormones.* (Move 5: Describing experimental procedures, CA8)

2) *DNA **was isolated from** a leaf from each individual plant.* (Move 5: Describing experimental procedures, IP4)

Similar to the Methods section, the tense use in the Results section was uniform as well. That is, in the two corpora, the majority of lexical bundles identified from Move 9 (Stating research procedures) and Move 11 (Stating results) were expressed in past simple tense. These results are in agreement with Li and Ge's (2009) study that past simple tense can be used to refer to a process occurring in an experiment or report findings of the study. As for Move 10 (Justifying procedures or methodologies), lexical bundles were identified only in the international corpus, including *have shown that* and *A (recent) report suggested that*.

Examples:

1) *VCW* ***was used to*** *test average hardness indices of Zhongpu Black 1, Purple 1 and Green 1 and common wheat as per electric current, instead of peeling rate.* (Move 9: Stating research procedures, CF10)

2) *Here,* ***we focused on*** *the protein encoded by At lg32930.* (Move 9: Stating research procedures, IP3)

3) *The highest positive standard heterosis value* ***was found in*** *the cross of Qianyou8A;*A3265. (Move 11: Stating results, CP7)

4) ***There were no*** *significant differences between the control and PEG-treated samples during the study period.* (Move 11: Stating result, IP7)

In addition to past simple tense, present simple tense was also commonly used in Move 12 (Commenting on results). These two tenses were observed in the two corpora as well. Since the present simple tense can be used to enhance and emphasize the generality of the finding when interpreting research results, writers prefer to use this tense for the purpose of making discussions more convincing (Li & Ge, 2009).

Examples:

1) ***The results indicated that*** *the growth of soybean is under the influence of climatic conditions and sowing date*. (Move 12: Commenting on the results, CP12)

2) ***These results suggest that*** *over expression of ITB2/ALA3 per se is not harmful to the cells.* (Move 12: Commenting on the results, IP4)

Turning to the Discussion section, the tense preferences were diverse as well. That is, three tenses were favored in Move 13 (Contextualizing the study) in the two corpora. One slight inter-corpora difference was that, in Move 14 (Consolidating results), three tenses were noted in the international corpus, but only present simple and past simple tenses were observed in the local one. In Move 15 (Stating the limitations of the present study), lexical bundles were found only in the international corpus. They were expressed in present simple and past simple tenses, such as, *were not able to* and *We are not aware of*. As for Move 16 (Suggestions for further research), present simple tense and future tenses were used to make suggestions, for example, *Additional studies are needed to* and *Further studies will provide*.

Concerning the first person pronoun, Chinese writers clearly lacked the awareness of using the pronoun *we* in RA writing. That is, only one lexical bundle containing the word *we* was observed in the Chinese corpus. On the other hand, sixteen lexical bundles containing *we* were loaded on six moves in the international one, particularly on Move 9 (Stating research procedures), for example, *We speculated that, We focused on,* and *We hypothesized that*. This difference could be accounted for by the fact that Chinese writers' unawareness of using the word *we* might be influenced by Chinese culture. That is, an attempt to get others to recognize the merits of one's own work is not acceptable in traditional Chinese society because this indicates an absence of humility, which is highly valued in Chinese culture (Loi & Evans, 2010).

5.3 Summary

This chapter mainly discussed the results of the two research questions in comparison with previous studies. First, the comparison of move structures across disciplines indicated that move structure of agricultural science RAs has its own format. This diversity can be particularly observed in the Methods and Results sections. Second, differences between the two move structures mainly lie in the choices of steps, particularly being observed in the Introduction and Discussion sections. Third, comparison of lexical bundles between the two corpora revealed that 1) the length of lexical bundles in the international corpus was longer than that in the local one; 2) the tense use was quite similar; and 3) international writers were more likely to use the pronoun *we* than their Chinese counterparts. Taken together, these results suggested that move structures and lexical bundles should be explicitly taught because they may help novice researchers or learners write agricultural science RAs more effectively. These will be elaborated in Chapter 6.

CHAPTER 6

CONCLUSION

In this chapter, the main findings of the study are summarized according to the results of the two research questions. Next, implications of the current research are presented. Finally, suggestions for further studies are described based on the limitations of the study.

6.1 Summary of the Findings

The objectives of the present study were 1) to compare the move structures of English agricultural science RAs published in China and internationally; 2) to compare the lexical bundles identified from the two move structures with the greatest degree of variance. The findings in relation to the move structures and lexical bundles were summarized in the following sections.

6.1.1 Move Structure

The results confirmed that both international and Chinese RAs were similar in their move structures, consisting of sixteen moves for each corpus: three for the Introduction, five for the Methods, four for the Results and four for the Discussion. However, two move structures were varied in the choice of steps. For instance, two steps were found only in the local corpus, including Move 2, Step 1 (Raising a research problem) and Move 5, Step 1 (Detailing experimental design). On the other hand, six steps were identified only in the international corpus. They included Move 2, Step 3 (Making a hypothesis), Move 3, Step 2 (Presenting hypotheses), Move 9, Step 2 (Making hypotheses), Move 13, Step 3 (Stating aims or hypotheses of the study) and Move 15, Step 3 (Limitations of the claims made).

At the same time, the status of some moves between the two corpora was varied. That is, Move 8 (Detailing statistical procedure) and Move 9 (Stating research procedures) were optional in the Chinese corpus, but conventional in the international one. In a similar vein, other steps were optional in the local but conventional in the international corpora. They included Move 1, Step 2 (Making topic generalizations), Move 2, Step 2 (Indicating a research gap), Move 5, Step 5 (Providing the background of the procedures), Move 12, Step 1 (Explaining reasons why these results occur), Move 13, Step 2 (Detailing conclusion, claims, deductions or research gaps based on analysis from previous studies), Move 14, Step 1 (Restating the methodology) and Move 14, Step 4 (Explaining results or differences in findings).

These discrepancies could be explained by different factors. First of all, Move 2, Step 1 (Raising a research problem) was found only in the local corpus, which can be explained by the different means to strengthen justification in Chinese academic writing. Second, Chinese writers have a cultural preference for face keeping techniques in their writing (Taylor & Tringguang, 1991). However, their international counterparts are more likely to give critical comments on previous authors' research (Kanoksilapatham, 2007b). This fact can be seen in Move 2, Step 2 (Indicating a research gap) and Move 13, Step 2 (Detailing conclusions, claims, deductions or research gaps based on analysis from previous studies). Third, international researchers were more writer-responsible in their writing styles to make their texts less demanding for their readers than their Chinese counterparts (Loi & Evans, 2010). This can be found in Move 2, Step 3 (Making a hypothesis), Move 3, Step 2 (Presenting hypotheses) and Move 13, Step 3 (Stating aims or hypotheses of the study). Fourth, due to the different cultural background, Move 5, Step 1 (Describing experimental design) and Move 5, Step 5 (Providing the background of the procedure) were used differently in the two corpora. Fifth, since international writers are more likely to remind readers of research aims and methodologies, Move 9 (Stating research procedures) was conventional in the international while it was optional in the local corpora. Sixth, due to the competition for international publication, international researchers employed Move 12, Step 1 (Explaining reasons why these results occur) and Move 14, Step 4 (Explaining results or differences in findings) more frequently than their Chinese counterparts. Seventh, since international researchers are more aware of assuring readers that results were obtained from carefully designed studies, Move 14, Step 1 (Restating methodology) was conventional in the international corpus, but it was optional in the local one. Eighth, due to different cultural attitudes toward publicly admitting the limitations of the study, international writers employed Move 15 (Stating the limitations of the present study) more frequently than their Chinese counterparts.

Concerning move sequences, M1-M2-M3 seemed to be predominant in the Introductions of the local dataset, while M1-M2-M1-M3 was the most favored pattern in the international one. In particular, M1 was the most cyclical in the two datasets. Unlike the Introduction section, neither Chinese nor international academics employed the chronological pattern of M4-M5-M6-M7-M8. The pattern of M4-M5-M8 was found in 13% of the Chinese corpus, while the pattern of M4-M5-M6-M5-M6-M5-M6-M5-M8 was favored in 11% of the international corpus. Particularly, M5 and M5-M6 were observed to be the most cyclic in both corpora. Similar to the Methods section, no chronological patterns were found in the Results and Discussion sections. In the Results section, M11 occurred in 22% of the local corpus, while M11-M12-M11-M12-M11 was present in 16% of the international corpus. As for the Discussion section, M13-M14 emerged from the Chinese corpus as the most frequent sequence. On the other hand, four patterns in the international corpus shared equally frequent occurrences, including M13-M14, M14-13-M14, M14-M15-M13 and M14-M13-M14-M13-M14-M13-M14. For the cyclical pattern, M13-M14 was the most repeated cycling in the two corpora.

In conclusion, move structure in the Chinese corpus was different from that of the international one, regarding the presence of moves/steps, the status of certain steps, and move sequences. As a result, two different move structures emerged from the present study, as shown in Table 6.1.

Table 6.1 Moves and Steps in the Chinese and International Corpora

Section	Moves	
	Chinese Corpus	**International Corpus**
Introduction	**M1: Stating why the topic is important**	**M1: Stating why the topic is important**
	S1: Commenting on the importance of the topic ** **S2:**Making topic generalizations * **S3:**Reviewing previous research **	**S1:**Commenting on the importance of the topic ** **S2:**Making topic generalizations ** **S3:**Reviewing previous research **
	M2:Preparting for the present study	**M2:Preparting for the present study**
	S1:*Raising a research problem* * **S2:**Indicating a research gap *	**S1:**Indicating a research gap ** **S2:***Making a hypothesis* *
	M3: Introducing the present study	**M3: Introducing the present study**
	S1:Stating research purpose(s) ** **S2:**Describing research procedures * **S3:**Presenting research findings * **S4**:Stating the value of the present study *	**S1**:Stating research purpose(s) ** **S2:***Presenting the hypotheses* * **S3:**Describing research procedures * **S4**:Presenting research findings * **S5**:Stating the value of the present study *
Methods	**M4:Describing materials**	**M4:Describing materials**
	S1: Listing materials ** **S2**:Detailing the source of the materials * **S3**:Providing the background of the materials *	**S1:**Listing materials ** **S2**:Detailing the source of the materials * **S3**:Providing the background of the materials *

Table 6.1 Moves and Steps in the Chinese and International Corpora (Cont.)

Section	Moves	
	Chinese Corpus	**International Corpus**
Methods	**M5:Describing experimental procedures**	**M5:Describing experimental procedures**
	S1:*Describing experimental design* * **S2**:Documenting established procedures ** **S3**:Describing the location where the study was conducted * **S4**:Detailing experimental procedures ** **S5**:Providing the background of the procedures *	**S1**:Documenting established procedures ** **S2**:Describing the location where the study was conducted * **S3**:Detailing experimental procedures ** **S4**:Providing the background of the procedures **
	M6:Detailing equipment **	**M6:Detailing equipment** **
	M7:Presenting equations describing the phenomena or models of the phenomena *	**M7:Presenting equations describing the phenomena or models of the phenomena** *
	M8:Detailing statistical procedures *	**M8:Detailing statistical procedures** **
Results	**M9:Stating research procedures**	**M9:Stating research procedures**
	S1:Describing aims and purpose(s) * **S2**: Listing research procedures *	**S1**:Describing aims and purpose(s) * **S2**:Making hypotheses * **S3:** *Listing research procedures* *
	M10:Justifying procedures or methodology	**M10:Justifying procedures or methodology**
	S1:Detailing methods that people used before * **S2**:Commenting on whether the method yielded successful results *	**S1**:Detailing methods that people used before * **S2**:Commenting on whether the method yielded successful results *
	M11:Stating results **	**M11:Stating results** **

Table 6.1 Moves and Steps in the Chinese and International Corpora (Cont.)

Section	Moves	
	Chinese Corpus	**International Corpus**
Results	**M12:Commenting on the results**	**M12:Commenting on the results**
	S1:Explaining reasons why these results occur * **S2**:Making generalizations or interpretations of the results ** **S3**:Evaluating the current findings against those from previous studies or with regard to the hypotheses * **S4**:Stating limitations * **S5**:Summarizing *	**S1**:Explaining reasons why these results occur ** **S2**:Making generalizations or interpretations of the results ** **S3**:Evaluating the current findings against those from previous studies or with regard to the hypotheses * **S4**:Stating limitations * **S5**:Summarizing *
Discussion	**M13:Contextualizing the study**	**M13:Contextualizing the study**
	S1:Stating what is already known from previous studies ** **S2**:Detailing conclusions, claims, deductions or research gaps based on analysis from previous studies *	**S1**:Stating what is already known from previous studies ** **S2**: Detailing conclusions, claims, deductions or research gaps based on analysis from previous studies ** **S3**:*Stating aims or hypotheses of the study**
	M14:Consolidating results	**M14:Consolidating results**
	S1: Restating the methodology * **S2**:Highlighting the selected findings ** **S3**:Referring to previous literature ** **S4**:Explaining results or differences in findings * **S5**:Making overt claims or generalizations ** **S6**:Stating the value of the study *	**S1**:Restating the methodology ** **S2**:Highlighting the selected findings ** **S3**:Referring to previous literature ** **S4**:Explaining results or differences in findings ** **S5**:Making overt claims or generalizations ** **S6**:*Exemplifying* * **S7**Stating the value of the study *

Table 6.1 Moves and Steps in the Chinese and International Corpora (Cont.)

Section	Moves	
	Chinese Corpus	**International Corpus**
Discussion	**M15: Stating the limitations of the present study**	**M15: Stating the limitations of the present study**
	S1:Limitations of the findings * **S2**:Limitations of the methodology *	**S1**:Limitations of the findings * **S2**:Limitations of the methodology * **S3**:*Limitations of the claims made* *
	M16:Suggestions for further research *	**M16:Suggestions for further research** *

Note: ** =conventional, * =optional

6.1.2 Lexical Bundles

The software program AntConc yielded a wide variety of lexical bundles, which met the pre-established criteria of appearing in at least three different texts (Amnuai, 2012). The findings are summarized as follows. First of all, in the present study, the length of lexical bundles ranged from three to seven words. This was different from that in previous studies, which were mainly limited to four-word lexical bundles (Biber & Barbieri, 2007; Biber, et al., 2004; Cortes, 2004; Hyland, 2008a). As the number of words in the lexical bundles increased, the frequency of lexical bundles decreased. For example, in the case of lexical bundles identified from Move 1 (Stating why the topic is important), *It has been*, *is one of the*, *There has been an increasing demand for* occurred in eight, five and three different texts respectively. This adds support to Cortes' (2013) observation that four-word lexical bundles are more frequent than five-word or longer lexical bundles.

Secondly, lexical bundles were analyzed in relation to the tense use and the first person plural pronoun *we*. Specifically, three tense uses were found in the Introduction and Discussion sections, including present simple tense, past simple tense and present perfect tense. On the other hand, in the Methods and Results sections, tense choice seemed uniform. That is, a majority of lexical bundles were realized in past simple tense.

Thirdly, Chinese writers made less use of lexical bundles than their international counterparts. That is, some lexical bundles, often used by international academics, were rarely or never used by Chinese academics perhaps because Chinese academics relied on more familiar lexical bundles. For example, *According to the (a)* and *as described by*, realizing the function of Move 5 (Describing experimental procedures), were found thirty-two times and fourteen times in the international corpus respectively. However, the occurrences of these two lexical bundles were quite different in the local one. That is, *according to the (a)* was present only seven times and *as described by* was not found in the local dataset. For this reason, Chinese academics would benefit from more exposure to a larger variety of lexical bundles.

6.2 Pedagogical Implications

The knowledge gained from the present study provides some pedagogical implications for RA writing in two aspects: the macroscopic level of move structure and the microscopic level of lexico-grammatical choices.

6.2.1 Move Structure

First, the move structures captured by move analysis can be introduced to enable students to understand what to expect while reading, and what purposes the writers have while writing an article. By presenting an analysis of the organization of RAs, teachers can expect to 1) help students understand the communicative function of each IMRD section; 2) enable students to know how these communicative functions are achieved in each IMRD section, through a set of moves in logical sequence; 3) guide students to analyze the move structure of the sample RAs to acquire strategies in writing academic papers.

Second, since the two versions are accepted for publication in renowned journals, Chinese students in agricultural science need to learn the move structures for the two sets of RAs to make sure that their writing follows the conventions in the local Chinese and international publication contexts. Yet, such information is rarely included in writers' manuals or writing handbooks. When students are made aware of the differences between Chinese and international RAs, they will follow the conventions to write their RAs more effectively to be acceptable for international publication.

For example, in the Introduction section, three differences were observed. First, due to the fact that international researchers showed a greater preference for generalizing the knowledge of the current study than their Chinese counterparts, Move 1, Step 2 (Making topic generalizations) was conventional in the international but optional in the Chinese datasets. Second, Chinese writers used research problem (Move 2, Step 1) or research gap (Move 2, Step 2) to create a rationale before introducing the current study. However, international researchers strengthened their justification by presenting research gap (Move 2, Step 2) or hypothesis (Move 2, Step 3). Third, apart from statement of research purpose(s) (Move 3, Step 1), international academics presented hypotheses (Move 3, Step 2) as well.

In the Methods section, three considerable differences were found. First, Chinese writers preferred to describe experimental design (Move 5, Step 1) exclusively under one sub-section. However, international writers did not use this step in this section. Second, international researchers had a strong tendency to describe the established procedures (Move 5, Step 2), which was identified in forty-one out of forty-five international papers. However, this step was used only in twenty-seven out of forty-five Chinese papers. Third, international writers were more likely to state the background of the procedures (Move 5, Step 5) than their Chinese academics.

In the Results section, the results of this paper lead to a suggestion that Chinese students should follow two conventions for international publication. First, the higher frequency of Move 9 (Stating research procedures) in the international corpus suggests that learners should remind readers of the background information of the study (Move 9) in their RAs. Second, thirty-nine out of forty-five international articles included Move 11 (Stating results) and Move 12 (Commenting on the results), indicating that writers should discuss their results in the section of Results. When discussing results, two steps in Move 12 (Commenting on results) were commonly used in international publications, including Step 1 (Explaining reasons why these results occur) and Step 2 (Making generalizations or interpretations of the results).

In the Discussion section, discrepancies were found in Move 13, Step 3 and Move 15. First, international researchers had a tendency to employ Move 13, Step 3 (Stating aims or hypotheses of the study) in their RAs while this step was not found in the local corpus. Second, Chinese researchers tended to avoid talking about limitations of the study (Move 15) (13%) while it was common (56%) for international researchers to apply Move 15 (Stating the limitations of the present study) in writing RA.

Third, a suggested move structure with salient linguistic features for international publication emerged from the present study, as shown in Table 6.2.

Table 6.2 Move Structure for the International Publication

Section	Move	Linguistic Features
Introduction	**M1: Stating why the topic is important**	
	S1: Commenting on the importance of the topic	present simple tense * present perfect tense past simple tense
	S2: Making topic generalizations	present simple tense * present perfect tense past simple tense
	S3: Reviewing previous research	present simple tense * present perfect tense past simple tense
	M2: Preparing for the present study	
	S1: Indicating a research gap	present simple tense with active voice * past simple tense with active voice * present perfect tense with passive voice *
	S2: Making a hypothesis	past simple tense * the word *we* + verb in past simple tense or present simple tense *
	M3: Introducing the present study	
	S1: Stating research purpose(s)	past simple tense * present simple tense the word *we* + verb in past simple tense
	S2: Presenting the hypotheses	past simple tense * present simple tense

Table 6.2 Move Structure for the International Publication (Cont.)

Section	Move	Linguistic Features
Introduction	**M3: Introducing the present study**	
	S3: Describing research procedures	past simple tense with passive voice * the word *we* + verb in past simple tense
	S4: Presenting research findings	past simple tense with passive voice * the word *we* + verb in past simple tense
	S5:Stating the value of the present study	present simple tense
Methods	**M4: Describing materials**	
	S1: Listing materials	past simple tense with passive voice
	S2: Detailing the source of the materials	past simple tense with passive voice
	S3: Providing the background of the materials	past simple tense with passive voice
	M5: Describing experimental procedures	
	S1: Documenting established procedures	past simple tense with passive voice
	S2: Describing the location where the study was conducted	past simple tense
	S3: Detailing experimental procedures	past simple tense with passive voice * the word *we* + verb in past simple tense
	S4: Providing the background of the procedures	past simple tense * present simple tense
	M6: Detailing equipment	past simple tense with passive voice

Table 6.2 Move Structure for the International Publication (Cont.)

Section	Move	Linguistic Features
Methods	**M7: Presenting equations describing the phenomena or models of the phenomena**	present simple tense * past simple tense *
	M8: Detailing statistical procedures	past simple tense with passive voice * the word *we* + verb in past simple tense
Results	**M9: Stating research procedures**	
	S1: Describing aim(s)and purpose(s)	past simple tense with passive voice * the word *we* + verb in past simple tense
	S2: Making hypotheses	present simple tense with passive voice * the word *we* + verb in past simple tense or present simple tense *
	S3: Listing research procedures	past simple tense with passive voice * the word *we* + verb in past simple tense
	M10:Justifying procedures or methodology	
	S1:Detailing methods that people used before	present simple tense * past simple tense present perfect tense
	S2: Commenting on whether the method yielded successful results	present simple tense * past simple tense present perfect tense the word we + verb in past simple tense

Table 6.2 Move Structure for the International Publication (Cont.)

Section	Move	Linguistic Features
Results	**M11:Stating results**	past simple tense with passive voice * the word *we* + verb in past simple tense
	M12: Commenting on the results	
	S1: Explaining reasons why these results occur	past simple tense * present simple tense * the word *we* + verb in present simple tense or past simple tense hedging devices
	S2: Making generalizations or interpretations of the results	present simple tense * past simple tense hedging devices the word *we* + verb in present simple tense or past simple tense
	S3: Evaluating the current findings against those from previous studies or with regard to the hypotheses	present simple tense * past simple tense * present perfect tense the word *we* + verb in past simple tense
	S4: Stating limitations	past simple tense * the word *we* + verb in past simple tense
	S5: Summarizing	present simple tense * past simple tense the word *we* + verb in present simple tense or past simple tense

Table 6.2 Move Structure for the International Publication (Cont.)

Section	Moves	Linguistic Features
Discussion	**M13: Contextualizing the study**	
	S1: Stating what is already known from previous studies	present simple tense * past simple tense present perfect tense the word *we* + verb in past simple tense hedging devices
	S2: Detailing conclusions, claims, deductions or research gap based on analysis from previous studies	present simple tense * past simple tense present perfect tense the word we + verb in past simple tense hedging devices
	S3: Stating aims or hypotheses of the study	present simple tense * past simple tense * the word we + verb in present simple / past simple tense
	M14: Consolidating results	
	S1: Restating the methodology	past simple tense with passive voice * the word *we* + verb past simple tense
	S2: Highlighting the selected findings	past simple tense * the word *we* + verb in past simple tense
	S3: Referring to previous literatures	present simple tense * past simple tense * present perfect tense *

Table 6.2 Move Structure for the International Publication (Cont.)

Section	Move	Linguistic Features
Discussion	**M14: Consolidating results**	
	S4: Explaining results or differences in findings	present simple tense * past simple tense the word *we* + present simple tense hedging devices
	S5: Making over claims or generalizations	present simple tense * past simple tense the word *we* + verb in present simple tense or past simple tense
	S6: Exemplifying	present simple tense * past simple tense *
	S7: Stating the value of the study	present simple tense
	M15: Stating the limitations of the present study	
	S1: Limitations of the findings	present simple tense * past simple tense present perfect tense the word *we* + verb in past simple tense
	S2: Limitations of the methodology	present simple tense * past simple tense present perfect tense the word *we* + verb in present simple tense/ past simple tense/ present perfect tense

Table 6.2 Move Structure for the International Publication (Cont.)

Section	Move	Linguistic Features
Discussion	**M15: Stating the limitations of the present study**	
	S3: Limitations of the claims made	present simple tense * the word we +verb in present simple tense hedging devices
	M16: Suggestions for the further research	present simple tense * future tense the word *we* + verb in present simple tense or future tense hedging devices

Note: * indicating the most frequent use

6.2.2 Lexical Bundles

The pedagogical implications of lexical bundles are listed as follows: First, the list of identified lexical bundles will provide ESP / EAP practitioners with useful information for material development. Chinese students, as EFL learners, typically learn English from textbooks. If they are provided with exposure to large numbers of authentic writings with native-like lexical bundles, learners can save a lot of effort for further processing, thus improving learners' ability to write effectively and professionally (Levy, 2003).

Second, some lexical bundles commonly used by international academics were rarely or never used by Chinese ones, reflecting that learners perhaps are reluctant to risk the chance of making mistakes by using unfamiliar expressions which might convey different functions (Cortes, 2004). Students, as potential researchers in their future careers, are likely to be involved in their international publication. For this reason, the list of lexical bundles, frequently used by international researchers but under-used by Chinese counterparts, might help them in their competition for international publication, as shown in Table 6.3.

Table 6.3 List of Selected Lexical Bundles from the International Corpus

Move	**The Introduction Section**	
Move 1: Stating why the topic is important	… role in the … There has been an increasing demand for … … been (increasingly) reported to… … has been extensively … … thought to be … … used as a … ... have indicated that … … is strongly influenced by … … are likely involved in … … insight into the …	There is growing concern that … … is essentially caused by … … is mainly caused by … ... have been discussed by various authors … … been commonly used in … … show opposite influence on … … have been analyzed recently … … has been found …

Table 6.3 List of Selected Lexical Bundles from the International Corpus (Cont.)

Move	**The Introduction Section**	
Move 2: Preparing for the present study	Little (little) information is … … still remains unknown. Few studies have … … has been done on … Few (few) researches suggested … It (it) is not yet known …	Little (little) work has been done on … Little is known … … not well understood. … not yet understood well. There is a lack of studies on … There is little (limited) information about the …
Move 3: Introducing the present study	The (main) aim of this … The (aim) of the … Here, we present … The present study was …	We focused our … This study was carried out to …
Move	**The Methods Section**	
Move 4: Describing Materials	… were grown in … … are listed in Table …	… was donated by …

Table 6.3 List of Selected Lexical Bundles from the International Corpus (Cont.)

Move	The Methods Section	
Move 5: Describing experimental procedures	According (according) to the …	… was transformed into …
	… as described previously …	… were applied to …
	… as described by …	… were assigned to …
	… by the method of …	… were immersed in …
	… following the method of …	… were suspended in …
	… were incubated for …	The reaction was carried out …
	… were expressed as …	Samples were taken for …
	… was performed in …	... was digested with …
	… was determined as …	… was evaluated at …
	… was removed from …	… was heated at …
	… was taken from …	… was measured by …
	… were used for …	… was monitored by …
	Samples were analyzed for …	… was neutralized with …
	The experiment was …	… were housed in …
	… was estimated using …	… were immersed in water …
	… was measured in …	… were recorded using …
	… was transferred into …	… with slight modification.
		… were prepared in …

Table 6.3 List of Selected Lexical Bundles from the International Corpus (Cont.)

Move	The Methods Section	
Move 6: Detailing equipment	… was equipped with … … was measured using … … was recorded using … … was performed using … …according to the manufacture’s… … was amplified by PCR using…	… was used for … … was provided with … … was performed with … … was extracted with … … was measured by …
Move7: Presenting equations describing the phenomena /models of the phenomena	… can be calculated as … … was calculated as follows. … assured to be … … was equal to …	
Move 8: Detailing statistical procedures	… analyzed were performed … … analysis of variance … … were performed using the … … evaluated using the … The data were … … were analyzed by … … were subjected to …	… were estimated by means of … … was calculated from the … Data were analyzed with … Differences were considered significant…

Table 6.3 List of Selected Lexical Bundles from the International Corpus (Cont.)

Move	The Results Section	
Move 9: Stating research procedures	… the effect of … We (we) focused on … We (we) investigated the … We (we) hypothesized that … To identify the …, … To examine the…, …	To investigate the …, … To test whether …, … We constructed a … To determine the …, … To determine if …, … We tested the …
Move 10: Justifying procedures or methodologies	… have shown that … A (recent) report suggested that …	
Move 11: Stating results	As shown in … …was detected in … There was a … …positively correlated with… … was negatively correlated with … … was observed in … … an increase in … … highly affected by … …was (were) not affected by... … differences were detected…	… the results of the … … revealed that the … A (a) significant reduction … … are displayed in … … did not differ … … did not show … Positive (positive) correlation(s) between … We found that … … were detectable in … … are reported in ...

Table 6.3 List of Selected Lexical Bundles from the International Corpus (Cont.)

Move	The Results Section	
Move 11: Stating results	As shown in Figure … … was caused by … … given in Table … … in agreement with …	It has to be … There was a tendency for … We also observed …
Move 12: Commenting on the results	… results suggest that … … consistent with the … This suggested that… This result indicated that… This demonstrated that… … data indicate that … We found no significant difference between the …	Taken together, these … … an important role … … is more likely related to … … large numbers of … … was identical with … … is in accordance with … We had previously… … were observed due to …
Move 13: Contextualizing the study	… the effect of … … has been shown … It (it) is important to … It is known that … In our previous study, … …aim of the … … objective of the …	… allowed us to propose a … … been extensively studied … … has been undertaken … … is characterized by … … is the first … It is not … There (there) is a …

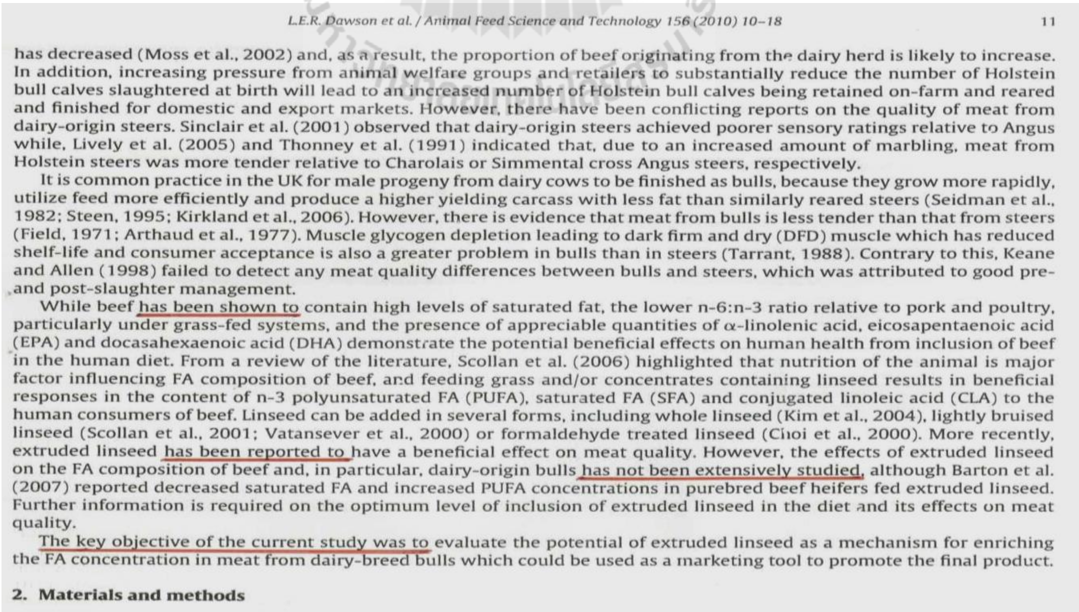
Table 6.3 List of Selected Lexical Bundles from the International Corpus (Cont.)

Move	The Discussion Section	
Move 14: Consolidating results	Results (results) of the current study … The (the) present study … The (the) results of the present study… … have shown that … … was mainly attributed to … … involved in the … This is in (close) agreement with.. This is in accordance with … This is in contrast with … .. was confirmed by … We were able to … A possible explanation … … potentially account for… … may (can/could) be explained by … … have been identified in … … have demonstrated that … … found that the … … has been reported …	… important for the … The results of the (current) study indicated that … It is well … Several (Some) lines of studies have indicated that … … possibility is that … The present study shows … It should be noted that … These results suggest that … … was affected by the … An explanation for … Present (These) findings are consistent with … … as indicated by … It (it) is likely that … It is possible that … It (it) was reported … It was shown that … It (it) has been shown that … … has been used …
Move 15: Stating the limitations of the present study	… is available on the … … were not able to …	… must be used with caution …

Table 6.3 List of Selected Lexical Bundles from the International Corpus (Cont.)

Move	The Discussion Section	
Move 16: Suggestions for further research	Additional (additional) studies are needed to… Further studies will provide …	We (we) will further …

Third, the variability of lexical bundles can be increased through classroom activities, for example, a cloze exercise and writing exercise. First, the students can be asked to fill in the blanks of a cloze with spotted lexical bundles so as to know whether they understand the function of lexical bundles. For example, in the Introduction section, lexical bundles are underlined in red, as shown in Figure 6.1. They include *has been shown to, has been reported to, has not been extensively studied* and *The key objective of the current study was to*.



L.E.R. Dawson et al. / Animal Feed Science and Technology 156 (2010) 10–18 11

has decreased (Moss et al., 2002) and, as a result, the proportion of beef originating from the dairy herd is likely to increase. In addition, increasing pressure from animal welfare groups and retailers to substantially reduce the number of Holstein bull calves slaughtered at birth will lead to an increased number of Holstein bull calves being retained on-farm and reared and finished for domestic and export markets. However, there have been conflicting reports on the quality of meat from dairy-origin steers. Sinclair et al. (2001) observed that dairy-origin steers achieved poorer sensory ratings relative to Angus while, Lively et al. (2005) and Thonney et al. (1991) indicated that, due to an increased amount of marbling, meat from Holstein steers was more tender relative to Charolais or Simmental cross Angus steers, respectively.

It is common practice in the UK for male progeny from dairy cows to be finished as bulls, because they grow more rapidly, utilize feed more efficiently and produce a higher yielding carcass with less fat than similarly reared steers (Seidman et al., 1982; Steen, 1995; Kirkland et al., 2006). However, there is evidence that meat from bulls is less tender than that from steers (Field, 1971; Arthaud et al., 1977). Muscle glycogen depletion leading to dark firm and dry (DFD) muscle which has reduced shelf-life and consumer acceptance is also a greater problem in bulls than in steers (Tarrant, 1988). Contrary to this, Keane and Allen (1998) failed to detect any meat quality differences between bulls and steers, which was attributed to good pre- and post-slaughter management.

While beef has been shown to contain high levels of saturated fat, the lower n-6:n-3 ratio relative to pork and poultry, particularly under grass-fed systems, and the presence of appreciable quantities of α-linolenic acid, eicosapentaenoic acid (EPA) and docasahexaenoic acid (DHA) demonstrate the potential beneficial effects on human health from inclusion of beef in the human diet. From a review of the literature, Scollan et al. (2006) highlighted that nutrition of the animal is major factor influencing FA composition of beef, and feeding grass and/or concentrates containing linseed results in beneficial responses in the content of n-3 polyunsaturated FA (PUFA), saturated FA (SFA) and conjugated linoleic acid (CLA) to the human consumers of beef. Linseed can be added in several forms, including whole linseed (Kim et al., 2004), lightly bruised linseed (Scollan et al., 2001; Vatansever et al., 2000) or formaldehyde treated linseed (Choi et al., 2000). More recently, extruded linseed has been reported to have a beneficial effect on meat quality. However, the effects of extruded linseed on the FA composition of beef and, in particular, dairy-origin bulls has not been extensively studied, although Barton et al. (2007) reported decreased saturated FA and increased PUFA concentrations in purebred beef heifers fed extruded linseed. Further information is required on the optimum level of inclusion of extruded linseed in the diet and its effects on meat quality.

The key objective of the current study was to evaluate the potential of extruded linseed as a mechanism for enriching the FA concentration in meat from dairy-breed bulls which could be used as a marketing tool to promote the final product.

2. Materials and methods

Figure 6.1 Sample of Research Article Introduction Section

Then, the students are provided with a cloze of this Introduction section and are asked to fill in the blanks with lexical bundles, as displayed in the following example.

Example:

Please read the passage below and fill in the blanks with the given phrases: (a). The key objective of the current study was to; (b). has been reported to; (c). has not been extensively studied; (d) has been shown to.

While beef _____(1)_________ contain high level of saturated fat, the lower n-6: n-3 ratio relative to pork and poultry, particularly under grass-fed systems, and the presence of appreciable quantities of a-linolenic acid, eicosapentaenoic acid (EPA) and docasahexaenoic acid (DHA) demonstrate the potential beneficial effects on human health from inclusion of beef in the human diet. From a review of the literature, Scollan et al. (2006) highlighted that nutrition of the animal is major factor influencing FA composition of beef, and feeding grass and/ or concentrates containing linseed results in beneficial responses in the content of n-3 polyunsaturated FA (PUFA), saturated FA (SFA) and conjugated linoleic acid (CLA) to the human consumers of beef. Linseed can be added in several forms, including whole linseed (Kim et al., 2004), lightly bruised linseed (Sollan et al., 2001; Vatansever et al., 2000) or formaldehyde treated linseed (Choi et al., 2000). More recently, extruded linseed ____(2)_________ have a beneficial effect on meat quality. However, the effects of extruded linseed on the FA compositions of beef and, in *particular, dairy-origin bulls_______(3)_________, although Barton et al. (2007) reported decreased saturated FA and increased PUFA concentrations in purebred beef heifers fed extruded linseed. Further information is required on the optimum level of inclusion of extruded linseed in the diet and its effects on meat quality.*

_________(4)______________ evaluate the potential of extruded linseed as a mechanism for enriching the FA concentration in meat from dairy-breed bulls which could be used as a marketing tool to promote the final product.

Second, writing is also a good practice for students to use lexical bundles in production. In this case, teachers can present the organization of RA and let students list various lexical bundles that are used to perform the function of each IMRD sections. Through these methods, students can share various lexical bundles in as many contexts as possible to avoid over-using favored ones. Therefore, these exercises can help students store and retrieve lexical bundles as a whole.

6.3 Suggestions for Further Research

Due to the limitations of the present study, some factors need to be considered for further research. First, the lack of follow-up interviews with agricultural science researchers is a major limitation to the study because interviewing can help the analyst construct a better understanding of the writers' intentions and the conventional move structure of papers in specific disciplines (Flowerdew & Wan, 2010). Thus, further research can conduct an interview with Chinese researchers in agricultural science, who published in English journals, in order to increase reliability of results.

Second, future study may need to expand the size of the corpus to be as large as possible in order to increase its representativeness and the number of identified lexical bundles. Therefore, learners will have a greater choice in selecting and using certain lexical bundles from a large corpus. With a full understanding of the move structure and lexical bundles, learners should be able to write their RAs more effectively and appropriately.

Finally, the present study revealed that the move structures and use of lexical bundles might differ between Chinese and international publication contexts. Further analyses can be extended to compare move structures between languages, such as Chinese and English. Such comparative studies may yield interesting results because the move structure of agricultural science RAs will become more visible to Chinese writers due to a greater awareness of the difference.

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Zhang, Y., & Hu, J. (2010). A Genre-based study of medical research article introductions: A contrastive analysis between Chinese and English. *The Asian ESP Journal, 6*(1), 72-96.

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APPENDIX A

KANOKSILAPATHAM'S (2005) FRAMEWORK

Move/step	Frequency of occurrence
Introduction	**(%)**
Move 1: Announcing the importance of the field	**100.00**
By Step 1: Claiming the centrality of the topic	
By Step 2: Making topic generalizations	
By Step 3: Reviewing previous research	
Move 2: Preparing for the present study	**66.66**
By Step 1: Indicating a gap	
By Step 2: Raising a question	
Move 3: Introducing the present study	**100.00**
By Step 1: Stating purpose(s)	
By Step 2: Describing procedures	
By Step 3: Presenting findings	
Methods	
Move 4: Describing materials	**100.00**
By Step 1: Listing materials	
By Step 2: Detailing the source of the materials	
By Step 3: Providing the background of the materials	
Move 5: Describing experimental procedures	**100.00**
By Step 1: Documenting established procedures	
By Step 2: Detailing procedures	
By Step 3: Providing the background of the procedures	
Move 6: Detailing equipment (optional)	**10.00**
Move 7: Describing statistical procedures (optional)	**13.22**

Move/step	Frequency of occurrence (%)
Results	
Move 8: Stating procedures	**95.07**
By Step 1: Describing aims and purposes	
By Step 2: Stating research questions	
By Step 3: Making hypotheses	
By Step 4: Listing procedures or methodological techniques	
Move 9: Justifying procedures or methodology	**71.59**
By Step 1: Citing established knowledge of the procedure	
By Step 2: Referring to previous research	
Move 10: Stating results	**100.00**
By Step 1: Substantiating results	
By Step 2: Invalidating results	
Move 11: Stating comments on the results	**91.01**
By Step 1: Explaining the results	
By Step 2: Making generalizations or interpretations of the	
Discussion	
Move 12: Contextualizing the study	**89.94**
By Step 1: Describing established knowledge	
By Step 2: Presenting generalizations, claims, deductions, or research gaps	
Move 13: Consolidating results	**100.00**
By Step 1: Restating methodology (purposes, research questions, hypotheses restated, and procedures)	
By Step 2: Stating selected findings	
By Step 3: Referring to previous literature	
By Step 4: Explaining differences in findings	
By Step 5: Making overt claims or generalizations	
By Step 6: Exemplifying	

KANOKSILAPATHAM'S (2005) FRAMEWORK(CONTINUED)

KANOKSILAPATHAM'S (2005) FRAMEWORK(CONTINUED)

Move/step	Frequency of occurrence (%)
Discussion	
Move 14: Stating limitations of the study	**80.00**
By Step 1: Limitations about the findings	
By Step 2: Limitations about the methodology	
By Step 3: Limitations about the claims made	
Move 15: Suggesting further research (optional)	**53.33**

APPENDIX B

Research Articles in the International Corpus

IA1

Wijga, S., Bovenhuis, H., Bastiaansen, J. W. M., Arendonk, J. A. M. V., Ploegaert, T. C. W., Tijhaar, E., et al. (2013). Genetic parameters for natural antibody isotype titers in milk of Dutch Holstein-Friesians. *Animal Genetics, 44*, 485-492.

IA2

Ji, R., Cui, P., Ding. F, Geng, J., Gao, H., Zhang, H., et al. (2009). Monophyletic origin of domestic bactrian camel (camelus bactrianus) and its evolutionary relationship with the extant wild camel (camelus bactrianus ferus). *Animal Genetics, 40*, 377-382.

IA3

Giesecke, K., Hamann, H., Stock, K. F., Woehlke, A., Sieme, H., & Distl, O. (2009). Evaluation of SPATA1-associated markers for stallion fertility. *Animal Genetics, 40*, 359-365.

IA4

Donadeu, F. X., & Schauer, S. N. (2013). Differential miRNA expression between equine ovulatory and anovulatory follicles. *Domestic Animal Endocrinology 45*, 122-125.

IA5

Voge, J. L., Parker, J. B., & Wheatona, J. E. (2009). Effects of immunization against a-inhibin using two adjuvants on daily sperm production and hormone concentrations in ram lambs. *Domestic Animal Endocrinology, 37*, 206-213.

IA6

Fields, S. D., Perry, B. L., & Perry, G. A. (2009). Effects of GnRH treatment on initiation of pulses of LH, LH release, and subsequent concentrations of progesterone. *Domestic Animal Endocrinology, 37*, 189-195.

IA7

Litvak, N., Rakhshandeh, A., Htoo, J. K., & Lange, C. F. M. D.(2013). Immune system stimulation increases the optimal dietary methionine to methionine plus cysteine ratio in growing pigs. *Journal of Animal Science, 91*, 4188-4196.

IA8

Melucci, L. M., Birchmeier, A. N., Cappa, E. P., & Cantet, R. J. C. (2009). Bayesian analysis of selection for greater weaning weight while maintaining birth weight in beef cattle. *Journal of Animal Science, 87*, 3089-3096.

IA9

Hoque, M. A., Katoh, K., & Suzuki, K. (2009). Genetic associations of residual feed intake with serum insulin-like growth factor-I and leptin concentrations, meat quality, and carcass cross sectional fat area ratios in Duroc pigs. *Journal of Animal Science, 87*, 3069-3075.

IA10

Olafadehan, O. A. (2013). Feeding value of Pterocarpus erinaceus for growing goats. *Animal Feed Science and Technology, 185*, 1-8.

IA11

Dawson, L. E. R., Fearon, A. M., Moss, B. W., & Woods, V. B. (2010). Effects of substitution of a proportion of the concentrate in grass silage/concentrate-based diets with extruded linseed on performance and meat quality of dairy bulls. *Animal Feed Science and Technology, 156*, 10-18.

IA12

Oliveira, S. G. d., Berchielli, T. T., Reis, R. A., Vechetini, M. E., & Pedreira, M. D. S. (2009). Fermentative characteristics and aerobic stability of sorghum silages containing different tannin levels. *Animal Feed Science and Technology, 154*, 1-8.

IA13

Ferencˇakovic, M., Hamzic, E., Gredler, B., Solberg, T. R., Klemetsdal, G., Curik, I., et al. (2012). Estimates of autozygosity derived from runs of homozygosity empirical evidence from selected cattle populations. *Journal of Animal Breeding and Genetics, 130*, 286-293.

IA14

Reiner, G., Willems, H., Pesch, S., & Ohlinger, V. F. (2009). Variation in resistance to the porcine reproductive and respiratory syndrome virus (PRRSV) in Pietrain and Miniature pigs. *Journal of Animal Breeding and Genetics, 127,* 100-106.

IA15

Nishio, M., Kahi, A. K., & Hirooka, H. (2010). Optimization of mate selection based on genotypic information with overlapping generations. *Journal of Animal Breeding and Genetics, 127,* 34-41.

IF1

Kumar, J. S., & Mandal, M. (2009). Rheology and thermal properties of marketed Indian honey. *Nutrition and Food Science, 39*(2), 111-117.

IF2

Sanibal, E. A. A., & Damasceno, N. G. R. T. (2009). Influence of a-tocopherol on the levels of serum anti-oxLDL antibodies. *Nutrition and Food Science, 39*(1), 50-58.

IF3

Kim, Y.-H., Jeong, S.-G., Back, K.-H., & Park, K.-H. (2013). Effect of various conditions on inactivation of Escherichia coli O157:H7,Salmonella Typhimurium, and Listeria monocytogenes in fresh-cut lettuce using ultraviolet radiation. *International Journal of Food Microbiology, 166,* 349-355

IF4

Fredriksson-Ahomaa, M., Wacheck, S., Koenig, M., Stolle, A., & Stephan, R. (2009). Prevalence of pathogenic Yersinia enterocolitica and Yersinia pseudo tuberculosis in wild boars in Switzerland. *International Journal of Food Microbiology, 135,* 199-202.

IF5

Barbé, F., Ménard, O., Gouar, Y. L., Buffière, C., Famelart, M.-H., Laroche, B., et al. (2014). Acid and rennet gels exhibit strong differences in the kinetics of milk protein digestion and amino acid bioavailability. *Food Chemistry, 143*, 1-8.

IF6

Horacek, M., Eisinger, E., & Papesch, W. (2010). Reliability of stable isotope values from meat juice for the determination of the meat origin. *Food Chemistry, 118,* 910-914.

IF7

Hou, D.-X., Masuzaki, S., Tanigawa, S., Hashimoto, F., Chen, J., Sogo, T., et al. (2010). Oolong tea theasinensins attenuate cyclooxygenase-2 expression in lipopolysaccharide (LPS)-activated mouse macrophages: Structure-activity relationship and molecular mechanisms. Journal of Agricultural and Food Chemistry, 58, 12735–12743.

IF8

Bounaix, M.-S., Gabariel, V., Morel, S., Robert, H., Rabier, P., Remaud-Simeon, M., et al. (2009). Biodiversity of exopolysaccharides produced from sucrose by sourdough lactic acid bacteria. *Journal of Agricultural and Food Chemistry, 57*(22), 10889-10897.

IF9

Surel, C., Foucquier, J., Perrot, N., Mackie, A., Garnier, C., Riaublanc, A., et al. (2014). Composition and structure of interface impacts texture of O/W emulsions. *Food Hydrocolloids, 34*, 3-9.

IF10

Huang, Q., Fu, X., He, X., Luo, F., Yu, S., & Li, L. (2010). The effect of enzymatic pretreatments on subsequent octenyl succinic anhydride modifications of cornstarch. *Food Hydrocolloids, 24*, 60-65.

IF11

Gonipeta, B., Parvataneni, S., Tempelman, R. J., & Gangur, V. (2009). An adjuvant-free mouse model to evaluate the allergenicity of milk whey protein. *Journal of Dairy Science, 92*, 4738-4744.

IF12

Cebo, C., Rebours, E., Henry, C., Makhzami, S., Cosette, P., & Martin, P. (2012). Identification of major milk fat globule membrane proteins from pony mare milk highlights the molecular diversity of lactadherin across species. *Journal of Dairy Science, 95*(3), 1085-1098.

IF13

Stanic, D., Radosavljevic, J., Polovic, N., Jadranin, M., Popovic, M., Vuckovic, O., et al. (2009). Removal of N-terminal peptides from B-lactoglobulin by proteolytic contaminants in a commercial phenol oxidase preparation. *International Dairy Journal 19*, 746-752.

IF14

Lollo, P. C. B., Amaya-Farfan, J., Faria, I. C., Salgado, J. V. V., Chacon-Mikahil, M. P. T., Cruz, A. G., et al. (2014). Hydrolysed whey protein reduces muscle damage markers in Brazilian elite soccer players compared with whey protein and maltodextrin. A twelve-week in-championship intervention. *International Dairy Journal, 34*, 19-24.

IF15

Shen, Y., Jin, L., Xiao, P., Lu, Y., & Bao, J. (2009). Total phenolics, flavonoids, antioxidant capacity in rice grain and their relations to grain color, size and weight. *Journal of Cereal Science 49*, 106-111.

IC1

Tuteja, J. H., Zabala, G., Varala, K., Hudson, M., & Vodkin1, L. O. (2009). Endogenous, tissue-specific short insterfering RNAs silence the chalcone synthase gene family in glycine max seed coats. *The Plant Cell, 2*, 1-15.

IC2

Tenea, G. N., Spantze, J., Lee, L., Zhu, Y., Lin, K., Johnson, S. J., et al.(2009) Overexpression of several arabidopsis histone genes increases agrobacterium-mediated transformation and transgene expression in plants. *The Plant Cell, 21*, 3350-3367.

IC3

Geshi, N., Johansen, J. N., Dilokpimol, A., Rolland, A., Belcram, K., Verger, S., et al. (2013). A galactosyltransferase acting on arabinogalactan protein glycans is essential for embryo development in Arabidopsis. *The Plant Journal 76*, 128-137.

IC4

Zhang, X., & Oppenheimer, D. G. (2009). IRREGULAR TRICHOME BRANCH 2 (ITB2) encodes a putative aminophospholipid translocase that regulates trichome branch elongation in Arabidopsis. *The Plant Journal, 60*, 195-206.

IC5

Ring, L., Yeh, S.-Y., Hücherig, S., Hoffmann, T., Blanco-Portales, R., Fouche, M., et al. (2013). Metabolic Interaction between anthocyanin and lignin biosynthesis is associated with peroxidase FaPRX27 in strawberry fruit. *Plant Physiology, 163*, 43-60.

IC6

Mayer, K. F. X., Taudien, S., Martis, M., Sˇimkova, H., Sucha´nkova, P., Gundlach, H., et al. (2009). Gene content and virtual gene order of barley chromosome 1H[1[C][W][OA]]. *Plant Physiology, 151,* 496-505.

IC7

Gallé, Á., Csiszár, J., Benyó, D., Laskay, G., Leviczky, T., Erdei, L., et al. (2013). Isohydric and anisohydric strategies of wheat genotypes under osmotic stress:Biosynthesis and function of ABA in stress responses. *Journal of Plant Physiology, 170,* 1389-1399.

IC8

Ferna´ndez-Marı´na, B., Balaguer, L., Esteban, R., Becerril, J. M. a., & Garcı´a-Plazaola, J. I. (2009). Dark induction of the photo protective xanthophyll cycle in response to dehydration. *Journal of Plant Physiology, 166*, 1734-1744.

IC9

Sisquellaa, M., Vi˜nas, I., Picouetb, P., Torres, R., & Usallc, J. (2014). Effect of host and *Monilinia* spp. variables on the efficacy of radiofrequency treatment on peaches. *Postharvest Biology and Technology, 87*, 6-12.

IC10

Vandekinderen, I., Devliegherea, F., Camp, J. V., Denon, Q., Alarcon, S. S., Ragaert, P., et al. (2009). Impact of a decontamination step with peroxyacetic acid on the shelf-life, sensory quality and nutrient content of grated carrots packed under equilibrium modified atmosphere and stored at 7^{oC}. *Postharvest Biology and Technology, 54,* 141-152.

IC11

Rasmussen, J., Kusliene, G., Jacobsen, O. S., Kuzyakov, Y., & Eriksen, J. (2013). Bicarbonate as tracer for assimilated C and homogeneity of ^{14}C and ^{15}N distribution in plants by alternative labeling approaches. *Plant Soil, 371,* 191-198.

IC12

Winkler, J. B., Lang, H., Graf, W., Reth, S., & Munch, J. C. (2009). Experimental setup of field lysimeters for studying effects of elevated ozone and below-ground pathogen infection on a plant-soil-system of juvenile beech (Fagus sylvatica L.). *Plant Soil, 323*, 7-19.

IC13

Kuriakose, B., Arun, V., Gnanamanickam, S. S., & Thomas, G. (2009). Tissue-specific expression in transgenic rice and Arabidopsis thaliana plants of GUS gene driven by the regulatory sequences of an anther specific rice gene YY2. *Plant Science, 177*, 390-397.

IC14

Cha, J.-Y., Jung, M. H., Ermawati, N., Su'udi, M., Rho, G.-J., Han, C.-d., et al. (2009). Functional characterization of orchardgrass endoplasmic reticulum-resident Hsp90 (DgHsp90) as a chaperone and an ATPase. *Plant Physiology and Biochemistry, 47*, 859-866.

IC15

Farooq, M., Basra, M. A., Wahid, A., Ahmad, N., & Saleem, B. A. (2009). Improving the drought tolerance in rice (Oryza sativa L.) by exogenous application of salicylic acid. *Journal of Agronomy and Crop Science, 195*, 237-246.

APPENDIX C

Research Articles in the Chinese Corpus

LA1

Guo, X., Shao, W., Li, Y., & Yu., X. (2013). Effects of different diuretics on water drinking amount, urination volume and related blood indices of sheep fed with cottonseed hulls. *Agricultural Science & Technology*, *14*(2), 345-353.

LA2

Wang, L., Li, N., Han, B., Li, H., & Huang, J. (2013). Factors influencing the superovulation and artificial insemination of sheep. *Agricultural Science & Technology*, *14*(2), 329-332.

LA3

Xie, K., Li, A., Sun, Y., Chen, X., Huang, Y., Zhang, X., et al. (2013). Characteristics of deposition of Inosine Monophosphate (IMP) and Intramuscular Fat (IMF) in muscles of Jinghai yellow chicken and its crossbreeds. *Agricultural Science & Technology, 14* (1), 144-154.

LA4

Cao, Yu., Chen, Q., & Sun, J. (2012). Construction of eukaryotic expression vector for pig Ghrelin gene. *Agricultural Science and Technology, 13*(6), 1184-1197.

LA5

Li, Y., Yang, X., Ni, Y., Decuypere, E., Buyse, J., Everaert, N., et al. (2012). Early-age feed restriction affects viability and gene expression of satellite cells isolated from the gastrocnemius muscle of broiler chicks. *Journal of Animal Science and Biotechnology, 3*(21), 49-57.

LA6

Yuan, X., Zhang, B., Li, L., Xiao, C., Fan, J., Geng, M., et al. (2012). Effects of soybean isoflavones on reproductive parameters in Chinese mini-pig boars. *Journal of Animal science and Biotechnology, 3*(21), 213-220.

LA7

Haffer, K. N. (2012). Effects of novel vaccines on weight loss in diet-induced-obese (DIO) mice. *Journal of Animal Science and Biotechnology, 3* (21), 136-142.

LA8

Xue, L., Piao, X., Li, D., Li, P., Zhang, R., Kim, S. W., et al. (2012). The effect of the ratio of standardized ileal digestible lysine to metabolizable energy on growth performance, blood metabolites and hormones of lactating sows. *Journal of Animal Science and Biotechnology, 3*(11), 143-154.

LA9

Geng, A., Wang, L., Zhou, Y., Zeng, M., & Liu, H. (2013). Effects of different facilities on laying performance, egg quality and air quality for layers under free range system. *Animal Husbandry and Feed Science, 5*(2), 87-91.

LA10

Zhang, X., Li, Y., Zhang, L., Fan, J., Zhong, S., Li, Q., et al. (2013). Effect of dietary mulberry leaves on productive performance, egg quality and blood biochemistry in laying hens. *Animal Husbandry and Feed Science*, *5*(2), 79-84.

LA11

Zhang, G., Ma, X., Liu, Y., Li, R., & Guo, Z. (2013). Effects of Qishen ultrafine powder on immune efficacy in chickens. *Animal Husbandry and Feed Science*, *5*(2), 60-64.

LA12

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LA13

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