

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the methodology used in the present study. It presents the compilation of the corpus, the framework for the move analysis, the software program for lexical bundles identification, the data analysis procedure, the pilot study, the main study and the reliability of move identification and lexical bundles identification.

3.1 Compilation of the Corpus

A corpus of Agricultural Science Articles (CASA) was compiled as a research project at Suranaree University of Technology, consisting of Food, Crop & Plant and Animal Science RAs that have been published in international peer-reviewed journals in the field of Agricultural Science. All articles included in the CASA have identifiable Introduction, Method, Results and Discussion sections.

While compiling the CASA, the articles were collected in their electronic version with their reference lists, appendices, footnotes and acknowledgements removed. In addition, the journals in the CASA have a high impact factor, the highest being 9.296, the lowest being 0.520 and the average impact factor being 2.540. Table 3.1 below illustrates the journals in CASA:

Table 3.1 Corpus of Agricultural Science Articles

| Food Technology | Impact Factor | Crop&Plant | Impact Factor | Animal | Impact Factor |
|--|----------------------|---------------------------------------|----------------------|---------------------------------------|----------------------|
| 1. Nutrition and Food Science | 4.154 | 1.The Plant Cell | 9.296 | 1.Animal Genetics | 2.459 |
| 2.Trends in Food Science&Technology | 3.850 | 2.The Plant Journal | 6.493 | 2.Domestic Animal Endocrinology | 2.165 |
| 3.International Journal of Food Microbiology | 2.753 | 3.Plant Physiology | 6.110 | 3.Journal of Animal Science | 2.102 |
| 4.Food Chemistry | 2.695 | 4.Journal of Plant Physiology | 2.437 | 4.Animal Feed Science and Technology | 1.882 |
| 5.Journal of Agricultural and Food Chemistry | 2.562 | 5.Postharvest Biology and Technology | 2.128 | 5.British Poultry Science | 1.134 |
| 6. Food Hydrocolloids | 2.511 | 6.Plant & Soil | 1.998 | 6.Journal of Animal Breeding Genetics | 1.077 |
| 7.Journal of Dairy Science | 2.486 | 7.Plant Science | 1.974 | 7.Animal Biotechnology | 0.759 |
| 8.International Dairy Journal | 2.421 | 8.Plant Physiology & Biochemistry | 1.905 | | |
| 9. British Food Journal | 0.520 | 9.Agronomy Journal | 1.532 | | |
| | | 10.Journal of Agronomy & Crop Science | 1.515 | | |
| | | 11.Crop Science | 0.648 | | |

3.2 Framework of Move Analysis

Kanoksilapatham's (2005) study is on the basis of Swales' (1990) framework which has been successfully extended to other sections of RAs in various academic disciplines. Based on her findings, a two-level rhetorical structure (moves and steps) is proposed. This structure consists of 15 distinct moves: 3 moves for the Introduction section, 4 for the Methods section, 4 for the Results section and 4 for the Discussion section. But two moves in the Method section and one move in the Discussion section are optional as they are of limited frequency. Her framework is illustrated in Appendix A.

Although there are several other frameworks, this study adopted Kanoksilapatham's (2005) framework for move analysis. Following Kanoksilapatham's (2005) framework of the move, textual boundaries between moves were identified based on content and linguistic criteria. The reasons why her framework was applied in the present study are explained as follows. First, it is a complete move analysis framework which examines the pattern of IMRD compared with Posteguillo's (1999) framework. The latter presented the schematic organization of RAs in the field of Computer Science, but the findings indicated that there were no clearly identifiable Methods section in computing RAs. Secondly, CASA consists of Agricultural Science RAs and accordingly the main study focuses on move-based analyses of RAs in the field of Agricultural Science, but Yang and Allison's (2003) framework focused on the structures of RAs in the field of Applied Linguistics which

is not relevant to the science field. Furthermore, their framework focused on the sections of Results, Discussion, Conclusion and Pedagogic Implications, but not on the Introduction and Methods sections. Finally, based on the findings of Kanoksilapatham's (2005) work, a two-level rhetorical (moves and steps) was proposed, which is very detailed for the present study compared with Nwogu's (1997) study. Both of them used the Swales' (1990) model in their study. Kanoksilapatham (2005) analyzed 60 RAs and found 15 moves, whereas Nwogu (1997) analyzed 15 RAs and identified 11 moves. It means that her work is more detailed. In addition, an expert in biochemistry was used as an intercoder for the reliability of Kanoksilapatham's (2005) work, but no steps to ensure were taken in Nwogu's (1997) work.

3.3 Software Program for Lexical Bundles Identification

The present study was a corpus-based analysis of lexical bundles. In this study, lexical bundles of more than 3 words were focused on. The software program used to analyze the lexical bundles was Monoconc Pro, which can provide an alphabetical list of every word in a text and its surrounding context.

Monoconc Pro is a fast concordance (text researching) program with an excellent user-friendly interface. It is used in many corpus linguistics courses and is also widely used in ESL/EFL for vocabulary learning and language learning in general. As well as providing Key Word In Context (KWIC) concordance results, the software also produces wordlists and collocation information. The following is an illustration of how to use Monoconc Pro software:

1. Before conducting the analysis, some files must be loaded from disk, or from a URL. Any text file can be loaded as a corpus.

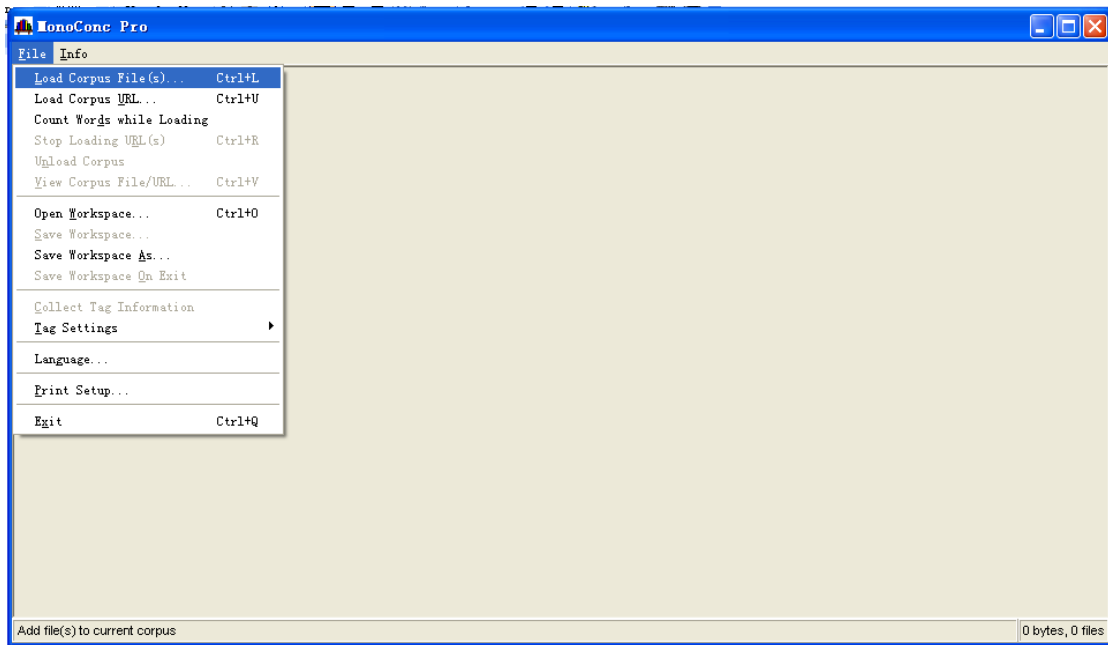


Figure 3.1 Step of Loading Corpus Files

2. When the files are loaded, the “Corpus Text”, “Concordance”, “Frequency” and “Window” menus appear between “File” and “Info”. But it is the “Concordance” menu that is used to analyze lexical bundles. There are three options under the Concordance: Search, Advanced Search and Search Options.

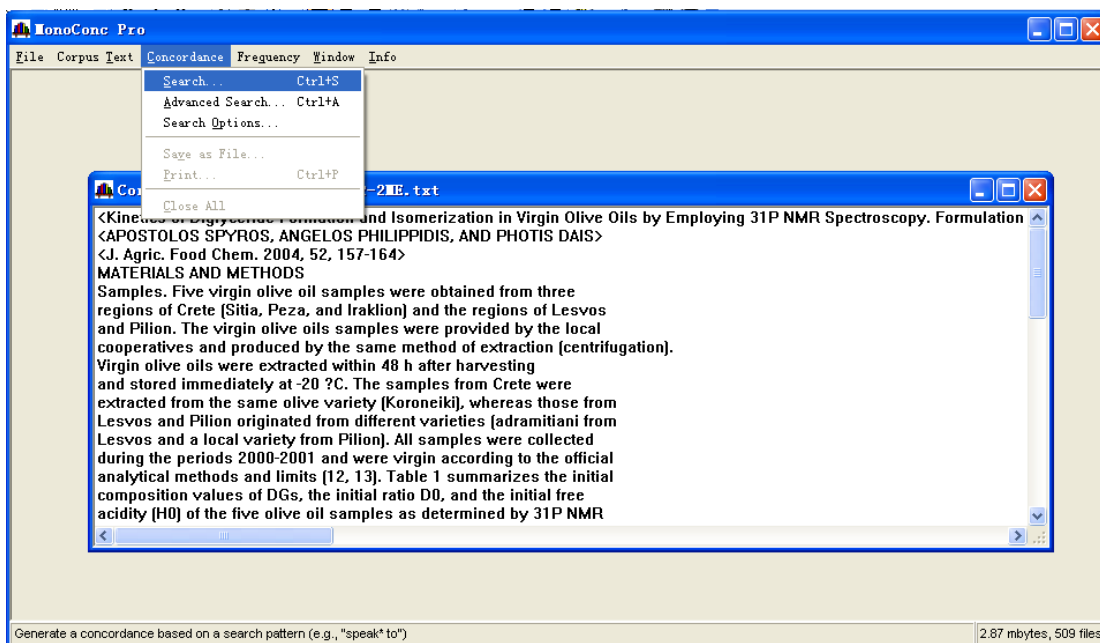


Figure 3.2 Step of Searching Key Words

3. The key words are put in the dialog box of “search”, then, the concordance is generated and displayed in KWIC format in a separate window: the lower one contains the concordance, while the upper one displays the context of the selected line in the concordance as it is selected. If the context of a line in KWIC does not appear, it is necessary to click it again and the context shows up in the upper window.

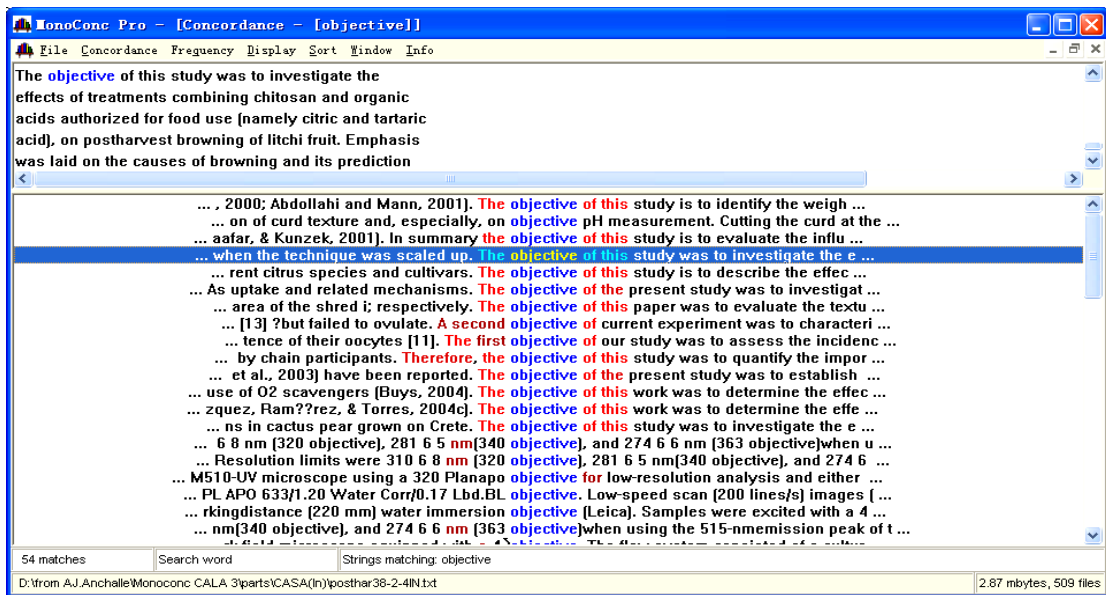


Figure 3.3 Example of Concordance Output for the Word “objective”

4. To get better-organized lists, the user has to click on “Sort” in the menu and the program sorts the concordance of the keywords or the first or second word to the right or left of them, so that similar contexts will appear grouped together.

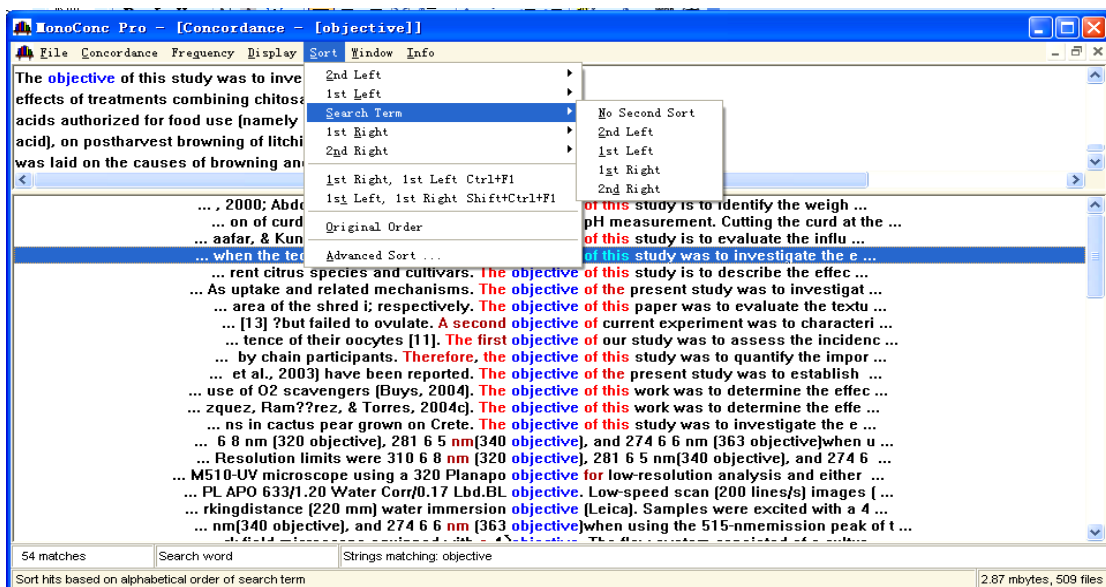


Figure 3.4 Step of Sorting

To sum up, Monoconc Pro 2.2 was used for the identification of lexical bundles in the CASA. First of all, it was used to generate bundle lists for the texts in each IMRD section, and then to concord examples to show their contexts. Finally, the lexical bundles were identified in each IMRD section.

3.4 Data Analysis Procedure

A brief illustration will be presented concerning the data analysis procedure: Firstly, identification of the move boundaries in each IMRD section on the basis of Kanoksilapatham's (2005) framework. Next, identification of the keyword in each realization of move or step. Then, using Concordance to search CASA for the keyword and concordance examples to show the context of keywords. Finally, identification of the moves and their lexical bundles is shown in each IMRD section. The following is the analysis of Move 3, Step 1:

1. Identification of the move boundary of Move 3, Step 1 (Stating Purpose) in RAs.

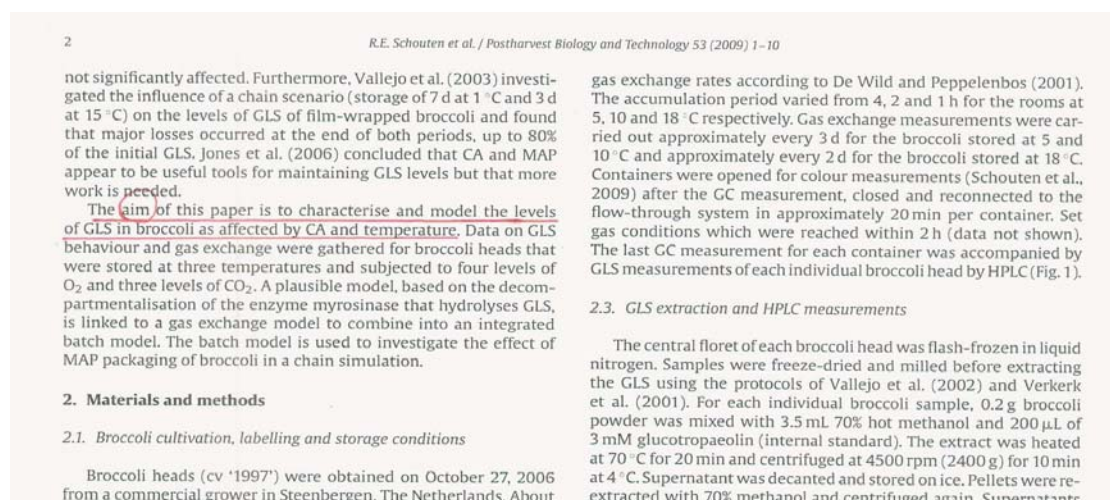


Figure 3.5 Example of Identifying Move Boundary

The aim of this paper is to characterize and model the levels of GLS in broccoli as affected by CA and temperature.

2. Identification of the keyword from the realization of Move 3, Step 1: Aim

3. Concord the Context of Keywords from CASA

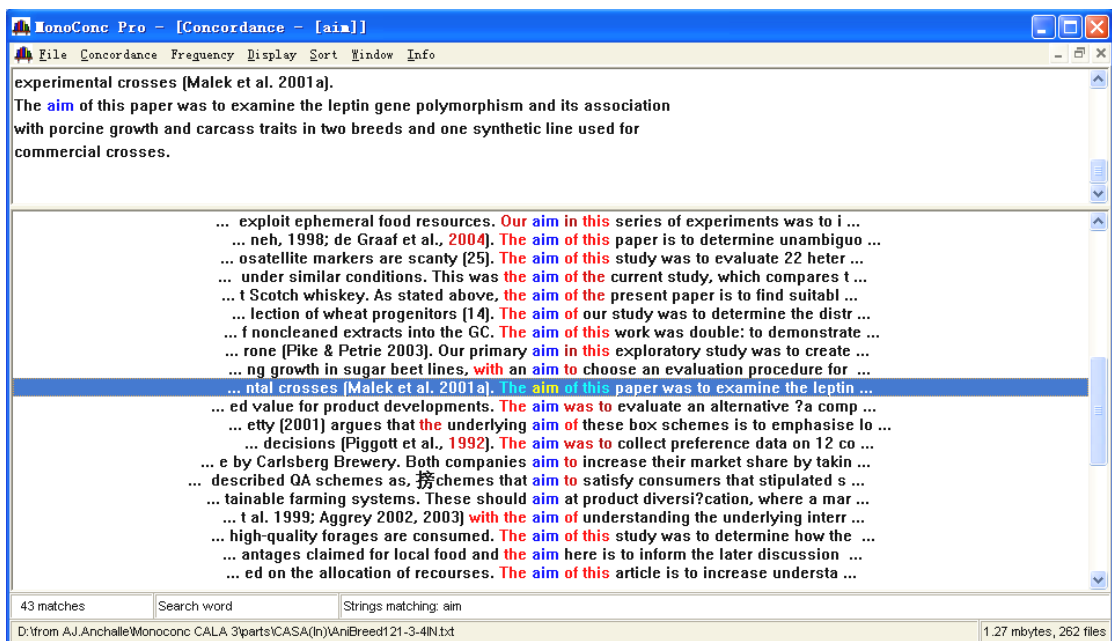


Figure 3.6 Example of Concordance Output for the Word “aim”

4. Identification of the lexical bundles

The aim of this paper was to examine...

The aim of our study was to determine...

The aim of this study was to determine...

The aim of this work is to describe...

The aim of this article is to increase...

3.5 Pilot Study

In the pilot study, five articles with complete IMRD sections were used. They were randomly selected from international peer-reviewed journals, 2 from the field of Food Technology Science, 2 from the field of Crop and Plant Science and 1 from the field of Animal Science. The moves and their lexical bundles were completely identified in each section of the research articles.

However, a few findings in the pilot study were different from Kanoksilapatham's (2005) findings. For instance, Move 6: *Detailing equipment* and Move 7: *Describing statistical procedures* were optional in Kanoksilapatham's (2005) investigation, but these two moves were not optional in the pilot study. In addition, the move analysis needed an expert to insure its reliability because incorrect move identifications led to the identification of confusing lexical bundles in the pilot study. The reliability assurance by an expert would be added in the main study.

3.6 Main Study

Based on the implications from the pilot study, the main study was conducted more carefully in terms of sampling procedure, application of the framework, the move analysis procedure and the reliability of move identification.

3.6.1 Samples and Sampling Procedure

The goal of the present study was to develop a good writing reference for novice researchers and learners; therefore, the impact factor was an important criteria in the selection of a sample. Based on the impact factor information, 22 international

peer-reviewed journals were selected from 3 major fields of agricultural science. Next, 30 RAs were chosen from 22 journals, 10 from each field. In the selection process, theoretical articles and articles published in special issues were excluded. The selected articles were restricted to empirical studies published in 2009 and 2010. Finally, all 30 RAs were coded (See Appendix B). Each research article in three major fields was referred to by the abbreviation A (Animal Science), F (Food, Crop & Plant) or C (Crop & Plant), followed by a number (1-10) which corresponds to the article. So, for example, the ninth article in the field of Animal Science is referred to as A9.

Table 3.2 List of Journals and the Number of Articles Selected

| Food Technology | <i>No. of Article Chosen</i> | Crop & Plant | <i>No. of Article Chosen</i> | Animal Science | <i>No. of Article Chosen</i> |
|---|------------------------------|--------------------------------------|------------------------------|---------------------------------------|------------------------------|
| 1.Nutrition and Food Science | F1, F2 | 1.The Plant Cell | C1, C2 | 1.Animal Genetics | A1, A2 |
| 2. International Journal of Food Microbiology | F3, F4 | 2.The Plant Journal | C3 | 2.Domestic Animal Endocrinology | A3, A4 |
| 3.Food Chemistry | F5 | 3.Plant Physiology | C4 | 3.Journal of Animal Science | A5, A6 |
| 4.Journal of Agricultural and Food Chemistry | F6 | 4.Journal of Plant Physiology | C5 | 4.Animal Feed Science and Technology | A7, A8 |
| 5. Food Hydrocolloids | F7 | 5.Postharvest Biology and Technology | C6 | 5.Journal of Animal Breeding Genetics | A9, A10 |
| 6.Journal of Dairy Science | F8 | 6.Plant & Soil | C7 | | |
| 7.International Dairy Journal | F9 | 7.PlantScience | C8 | | |
| 8. British Food Journal | F10 | 8.Plant Physiology & Biochemistry | C9 | | |
| | | 9.Journal of Agronomy & Crop Science | C10 | | |

3.6.2 Move Identification

The rhetorical moves of 30 RAs were analyzed in this study. The purpose of analyzing the structure of Agricultural Science RAs was to help novice researchers, NNES researchers or student writers in the field of Agriculture to read and write science RAs effectively. However, analysis of research genre lacks the uniform realization criteria for move identification. Nwogu (1997) identified moves by marker-based signals. For instance, he distinguished Move 4: *Describing Data Collection Procedure* by making explicit lexical items which signal 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* (Nwogu1997, p.122). Hopkins and Dudley-Evans (1988), on the other hand, defined moves in terms of functions only. In analyzing the discussion section, Holmes (1997) used the sentence as his basic unit of coding. As a result, it was impossible to code complex sentences which might have more than one function. Lim (2006) appeared to combine linguistic clues and obvious markers to identify moves in the Methods section of management RAs. In the present study, coding was conducted using a function-linguistic feature approach. A functional approach is in line with the theoretical assumption of a move; that is, each move has a local purpose and also contributes to the overall rhetorical purpose of the text (Kwan, 2006). In this study, the function of each text segment was first examined according to its local purpose, such as to highlight major research studies, then according to its contribution to the ultimate goal of justifying the writer's research.

3.6.3 Lexical Bundles Identification

CASA was used for identifying lexical bundles. Firstly, all the move boundaries from 30 RAs were identified clearly, in terms of the IMRD sections respectively. Then, each key word was identified from each move or step and searched for using Concordance. Finally, lexical bundles were identified. The following tables show examples of lexical bundles identification in IMRD sections.

3.6.3.1 Lexical Bundles Identified in the Introduction Section

Table 3.3 Move 1: Stating why the topic is important

| Step | Lexical Bundles | Examples |
|---|--|---|
| Step 1: Commenting on the importance of topic | ...an attempt is needed to study... ...is now considered to be responsible for... | However, during periods of surplus and good harvest where there is the need to store the cocoa pods, as a result of an inability to process all the harvested pods due to lack of facilities, <u>an attempt is needed to study</u> the effect of cocoa pod storage on the corresponding commercial qualities of cocoa bean. Adipose tissue, which has been previously regarded simply as a passive organ for energy homeostasis, <u>is now considered to be responsible for</u> peripheral lipid metabolism by secreting adipocytokines. |
| Step 2: Making topic generalizations | ... can be caused bycan be assessed with... | Syneresis and spontaneous rupture are macroscopic phenomena which <u>can be caused by</u> three types of microscopic processes that are linked to the basic building blocks of proteingels. The efficiency of growth under various environmental or nutritional conditions <u>can be assessed with</u> the relative growth rate. |

Table 3.3 Move 1: Stating why the topic is important (Cont.)

| Step | Lexical Bundles | Examples |
|--|---|---|
| Step 3: Reviewing previous research | <p>Several studies have reported that</p> <p>It has been reported that</p> <p>We have previously reported that...</p> <p>...has been extensively studied in...</p> <p>have been shown to +v.</p> <p>have been shown to improve...</p> | <p><u>Several studies have reported that</u> delaying harvesting of pea, cereals, and pea cereal mixtures past the flowering or heading stage may result in significantly greater forage DM yields (Gervais 1984, Acosta et al. 1991, Todd and Spaner 2003).</p> <p><u>It has been reported that</u> if less than 50% of the flock utilizes the outdoor area on a fine and sunny day, the risk of feather pecking will increase (Green et al., 2000).</p> <p><u>We have previously reported that</u> C6-aldehydes-induced resistance against a necrotrophic fungal pathogen, <i>Botrytis cinerea</i>, in <i>A. thaliana</i> [10].</p> <p>TraR <u>has been extensively studied in</u> bacterial systems as described above, as well as in mammalian cells (Neddermann et al., 2003).</p> <p>HPP treatments at nondenaturing temperatures (below 10 C) <u>have been shown to improve</u> the mechanical properties of fish gels (Borderas, Perez-Mateos, & Solas, 1997; Fernandez- Martn, Perez-Mateos, & Montero, 1998; Uresti, Lopez-Arias, Gonzalez-Cabriales, Ramirez, & Vazquez, 2003).</p> |

Table 3.4 Move 2: Preparing for the present study

| Step | Lexical Bundles | Examples |
|-------------|--|--|
| | ...but little is known about... We know little about... | The knowledge obtained so far has been of great importance in furthering our understanding of obesity, <u>but little is known about</u> the regulating mechanism of resistin. <u>We know little about</u> the detailed effects of protein displacement by small emulsifiers on the properties of the emulsion surface and its interaction |

Table 3.5 Move 3: Introducing the present study

| Step | Lexical Bundles | Examples |
|-------------------------------|--|--|
| Step 1: Stating purpose(s) | The aim of this paper is to determine... The aim of this study was to evaluate... | <u>The aim of this paper is to determine</u> unambiguous patterns in spawning segregation among upstream migrating riverine spawning Barbus species of Lake Tana by a more systematical study throughout the spawning area and season. <u>The aim of this study was to evaluate</u> 22 heterologous microsatellite loci for differentiation studies and their ability in identification of individuals in two goat breeds of India. |
| Step 2: Describing procedures | ...have been applied to... | Accordingly, discrimination and authentication procedures <u>have been applied to</u> spirituous beverages by taking into account their elaborate features. |
| Step 3: Presenting findings | This article describes the ... | <u>This article describes the</u> exploratory qualitative research conducted to inform the content of an intervention designed to address this low food skills base among low income communities. |

3.6.3.2 Lexical Bundles Identified in the Methods Section

Table 3.6 Move 4: Describing materials

| Step | Lexical Bundles | Examples |
|---|---|--|
| Step 1: Listing materials | <p>...were used as ...</p> <p>The first consisted of...</p> | <p>The sample injection volume was set at 50 L. Acidified H₂O (0.05% HOAc) and MeOH were used as the elution solvents A and B, respectively.</p> <p>The first consisted of 4202 birds, hatched in 6 different weeks in 1994 and 1995.</p> |
| Step 2: Detailing the source of the materials | <p>... were obtained from...</p> <p>...were purchased from ...</p> | <p>A total of 24 cocoa pods were obtained from the cocoa plantation of the Cocoa Research Institute of Nigeria experimental station, Ibadan, Oyo State Nigeria.</p> <p>A 500 ml capacity glass and polyethylene terephthalate (PET) bottles were purchased from a retail market in Lagos, while low density polyethylene film (LDPF) was a kind gift from a plastic manufacturing company NIPOL at Ibadan.</p> |
| Step 3: Providing the background of the material | <p>...were selected based on...</p> | <p>Porcine gene or EST sequences were selected based on their potential orthology with genes on HSA1, 16, 18 and 19, as predicted by BLASTN.</p> |
| Step 4: Describing location where the study was conducted | <p>The experimental site is located on...</p> <p>The field was located in ...</p> | <p>The experimental site is located on a sandy glacial outwash plain in the Cedar Creek Natural History Area, Minnesota, USA.</p> <p>The field was located in an area cultivated organically for more than 10 years.</p> |

Table 3.7 Move 5: Describing experimental procedures

| Step | Lexical Bundles | Examples |
|--|--|---|
| Step 1: Documenting established procedures | <p>... according to previously established methods and procedures ...</p> <p>...was performed according to the method of ...</p> | <p>Odorant stimuli were generated using our standard flow-dilution olfactometer <u>according to previously established methods and procedures</u> (e.g. Youngentob et al., 1997; Youngentob and Margolis, 1999).</p> <p>The adhesion test <u>was performed according to the method of</u> Yu and Tsen (1993) and Pedersen and Tannock (1989).</p> |
| Step 2: Detailing procedures | <p>...were randomly assigned to ...</p> <p>...were randomly sampled from...</p> | <p>On arrival at 18 weeks of age, they <u>were randomly assigned to</u> two groups of 50 hens (two replicates).</p> <p>Pieces of leaf <u>were randomly sampled from</u> the infected area.</p> |
| Step 3: Providing the background of the procedures | <p>... in order to get ...</p> <p>...were compiled based on ...</p> | <p>A sheet of filter paper was processed in the same way as the samples <u>in order to get</u> a blank.</p> <p>The showcards <u>were compiled based on</u> discussions with the study team responsible for designing the intervention.</p> |

Table 3.8 Move 6: Detailing equipment

| Step | Lexical Bundles | Examples |
|------|--|--|
| | <p>...were performed with ...</p> <p>...were measured with ...</p> | <p>Color readings of the spears <u>were performed with</u> a chromameter (Minolta CR-200, Minolta, Osaka, Japan), equipped with an 8-mm measuring head and a C illuminant (6774 K).</p> <p>Subsequently, rates of photosynthesis, stomatal conductance and transpiration <u>were measured with</u> an ADC-LCA3 infrared CO₂ analyzer.</p> |

Table 3.9 Move 7: Describing statistical procedures

| Step | Lexical Bundles | Examples |
|------|---|--|
| | <p>All statistical analyses were processed with...</p> <p>Other statistical analyses were done using...</p> <p>... were compared using chi-square statistical tests ...</p> | <p><u>All statistical analyses were processed with</u> MINITAB 13 statistical software (Minitab, 2000).</p> <p><u>Other statistical analyses were done using</u> Microsoft Excel.</p> <p>The proportions of females showing a song preference and showing a place preference within each group <u>were compared using chi-square statistical tests.</u></p> |

3.6.3.3 Lexical Bundles Identified in the Results Section

Table 3.11 Move 9: Stating procedures

| Step | Lexical Bundles | Examples |
|---|--|--|
| Step 1: Describing aims and purpose(s) | <p>...in order to ensure...</p> <p>The experiment aimed to...</p> | <p>This water restriction procedure was done <u>in order to ensure</u> rapid fluid consumption during aversion conditioning on the eighth day.</p> <p><u>The experiment aimed to</u> perform a cross-modal comparison of the predictive validity of FOK judgments.</p> |
| Step 2: Making hypotheses | <p>It was hypothesized that...</p> <p>It is reasonable to assume that...</p> | <p><u>It was hypothesized that</u> odor-elicited TOT experiences should be unusual and more unusual following failures to name odors than persons.</p> <p><u>It is reasonable to assume that</u> there may be also an effect on the protein level.</p> |
| Step 3: Listing procedures or methodological techniques | <p>...were commonly transferred to...</p> <p>... was calculated by using the ...</p> | <p>Rooted shoots <u>were commonly transferred to</u> soil after 10 days on RM.</p> <p>Therefore, the response surface model <u>was calculated by using the</u> REG procedure (Table 4).</p> |

Table 3.12 Move 10: Justifying procedures or methodology

| Step | Lexical Bundles | Examples |
|---|--|--|
| <p>Step 1 Detailing what methods (similar to these) that people used before</p> | <p>It was known that...</p> <p>...is commonly used in...</p> <p>This approach revealed differential expression of...</p> | <p><u>It was known that</u> reestablishing ion homeostasis is of critical importance for plant adaptation to salt stress [16].</p> <p>This might be a result of the lower milk production of the B breed compared with other milking type tropical indigenous cattle, such as the Sahiwal, which <u>is commonly used in</u> several other crossbreeding studies (Cunningham and Syrstad 1987; Mackinnon et al. 1996; Kahi et al. 2000).</p> <p>In most cases, <u>this approach revealed differential expression of</u> additional genes within each family during microgametogenesis, regardless of whether they were expressed highly in sporophyte.</p> |
| <p>Step 2: Commenting on whether the method yielded successful results</p> | <p>The method described in this paper can be used for the...</p> <p>The method is suitable for ...</p> | <p><u>The method described in this paper can be used for the</u> determination of organophosphorus pesticides in different vegetables.</p> <p><u>The method is suitable for</u> use in laboratories where homogeneous material is required for subsequent physiological and molecular biological investigations or for selecting grapes after harvest.</p> |

Table 3.13 Move 11: Stating results

| Step | Lexical Bundles | Examples |
|------|--|---|
| | <p>...are presented in Table 1...</p> <p>It was observed that...</p> <p>As illustrated in Fig3...</p> <p>As can be seen in Table2...</p> | <p>Quantities of each analyte in each level <u>are presented in Table 1.</u></p> <p><u>It was observed that</u> the data did not differ significantly from a homogeneous and normal distribution of independent data.</p> <p><u>As illustrated in Figure 3,</u> the model segregated the two groups of mice into distinctly different population distributions.</p> <p><u>As can be seen in Table 2,</u> the proportions of non-TOTs, strong and very strong TOT experiences (section B) were very low for the odors, and the number of strong to very strong FOK judgements (section C) was very low for the pictures.</p> |

Table 3.14 Move 12: Commenting on the results

| Step | Lexical Bundles | Examples |
|---|--|---|
| Step 1: Explaining reasons why these results occur | <p>This difference could be due to ...</p> <p>These results coincide with the fact that ...</p> <p>This explanation is in agreement with...</p> <p>This was probably due to a major effect of...</p> | <p><u>This difference could be due to</u> the greater emphasis of the Science curriculum on sources of nutrients as compared to the Home Economics curriculum.</p> <p><u>These results coincide with the fact that</u> the 1065 bp sequences of CALTPIII promoter do not contain cis-acting elements, such as ABRE and DRE motifs necessary for activation of gene expression by ABA, NaCl, and drought stress.</p> <p><u>This explanation is in agreement with</u> our findings and supports the theory that the movement of tryptophan residues to a more hydrophobic environment occurs as emulsion strength is increased.</p> <p><u>This was probably due to a major effect of</u> ripening time on overall</p> |
| Step 2: Making conclusions from the results | <p>These results confirm that...</p> <p>These results suggested that...</p> | <p><u>These results confirm that</u> models without pH terms were not able to accurately predict t_{cut} at different acidification rates.</p> <p><u>These results suggested that</u> the activity of CA in soil was correlated highly with the characteristics of karst soil.</p> |

Table 3.14 Move 12: Commenting on the results (Cont.)

| Step | Lexical Bundles | Examples |
|--|--|--|
| Step 3: Evaluating the current findings against those from previous studies or with regard to the hypotheses, | <p>These results are in agreement with findings of ...</p> <p>These findings confirm the results reported...</p> | <p><u>These results are in agreement with findings of</u> Kulmyrzaev and Schubert (2004), who concluded that the range of pH values where whey protein stabilised droplets tend to aggregate is situated between 4.5 and 5.5.</p> <p><u>These findings confirm the results reported</u> for ranking of sires in the simulation study by Donoghue et al. (2004).</p> |
| Step 4: Stating limitations | <p>...was not sufficient to control...</p> <p>...did not provide sufficient information for...</p> | <p>In low-fat dairy gels, the addition of thickeners such as pectin contained in the syrup, <u>was not sufficient to control</u> the release.</p> <p>Thus, although information was still present from ground disturbance as the individual walked the trail, this cue <u>did not provide sufficient information for</u> the dogs to determine direction in this task.</p> |
| Step 5: Summarizing | Together, these data indicated that... | <u>Together, these data indicated that</u> the phenotype conferred by set09078 is attributable to a single recessive embryo-lethal mutation. |

3.6.3.4 Lexical Bundles Identified in the Discussion Section

Table 3.15 Move13: Contextualizing the study

| Step | Lexical Bundles | Examples |
|--|--|--|
| <p>Step 1: Stating what is already known from previous studies</p> | <p>It has been shown that...</p> <p>It is well documented in the literature that...</p> | <p>Furthermore, <u>it has been shown that</u> a Hsp70 protein resides in the intermembrane space (Marshall et al., 1990) and might be involved in protein import into chloroplasts (Becker et al., 2004).</p> <p><u>It is well documented in the literature that</u> application of exogenous JA- and/or MeJA can induce sets of defence genes and synthesis of defence compounds that are also activated by pathogen infection (Terras et al., 1995; Epple et al., 1997).</p> |
| <p>Step 2: Detailing conclusions based on analyses from previous studies</p> | <p>...are currently unknown to...</p> <p>It is unclear whether...</p> | <p>Several of the GWSS-specific genes have not yet been characterized in detail, or <u>are currently unknown to</u> the public protein databases.</p> <p>A particular feature of loquat ripening and senescence is the increase in fruit firmness, but <u>it is unclear whether</u> this is a postharvest phenomenon or occurring over a wider period of maturation.</p> |
| <p>Step 3: Restating aims of the study</p> | <p>The aim of this work was to study...</p> <p>The intended purpose was to develop ...</p> | <p><u>The aim of this work was to study</u> the recovery kinetics of PSII activity after heat stress in plantar.</p> <p><u>The intended purpose was to develop</u> a wide range of a-inhibin Ab titers to answer the question of whether DSP/g is influenced by the titer of Ab developed.</p> |

Table 3.16 Move 14: Consolidating results

| Step | Lexical Bundles | Examples |
|---|--|---|
| Step 1: Restating methodology (purposes, research questions, hypotheses and procedures) | <p>... in order to distinguish ...</p> <p>The aim of this work was to study...</p> | <p>The 935-bp PCR product can be digested with three different restriction enzymes (HindIII, HaeIII, and MaeII) <u>in order to distinguish</u> the A, B, C, E, and G alleles.</p> <p><u>The aim of this work was to study</u> the recovery kinetics of PSII activity after heat stress in planta.</p> |
| Step 2: Stating selected findings | <p>Our analysis showed that ...</p> <p>We also observed that...</p> | <p><u>Our analysis showed that</u> several singletons are expressed at all stages of pollen development.</p> <p><u>We also observed that</u> the ion levels (Fig. 5) were closely related to the root proton exportation capacity (Fig. 3) in transgenics.</p> |
| Step 3: Referring to previous literature | <p>It has been reported that...</p> <p>...according to previous findings...</p> | <p>In other populations of slow worm, <u>it has been reported that</u> the majority of adult females do not produce young every year (Patterson, 1983; Stumpel, 1985; Smith, 1990; Capula et al., 1992)</p> <p>Heat-induced co-aggregates of bLG with unpelleted k-casein were suspected, <u>according to previous findings</u> (Law, 1996)</p> |

Table 3.16 Move 14: Consolidating results (Cont.)

| Step | Lexical Bundles | Examples |
|---|---|---|
| Step 4: Explaining differences in findings | <p>These differences may be attributed to ...</p> <p>These differences could be due to...</p> | <p><u>These differences may be attributed to</u> variations in metal concentrations, in the duration of metal treatment, and in the accessibility of metals to PCS.</p> <p><u>These differences could be due to</u> leaky transcription stops, or in the case of large increases in expression within a cluster, additional transcription starts.</p> |
| Step 5: Making overt claims or generalizations | <p>The results of this study indicate...</p> <p>...has a strong effect on ...</p> | <p><u>The results of this study indicate</u> the economical utility of exploring the genetic diversity in root traits of lentil genotypes/landraces.</p> <p>Additionally it <u>has a strong effect on</u> the spear appearance, due to shrinkage.</p> |
| Step 6: Exemplifying | <p>An example is ...</p> | <p><u>An example is</u> the At5g56890.1 protein, which is a typical Tran membrane protein kinase, containing eight praline residues that conform to the consensus motif, in its predicted extra cellular domain.</p> |

Table 3.17 Move 15: Stating the limitations of the present study

| Step | Lexical Bundles | Examples |
|--|--|--|
| Step 1: Limitations of the findings | It cannot completely be excluded that... This may not necessarily reflect... | Furthermore, <u>it cannot completely be excluded that</u> the products of these genes may be involved in heavy metal tolerance at plant growth states other than that presently analyzed. <u>This may not necessarily reflect</u> higher concentrations of either drug in serum but rather more adequate proportions of TMP with respect to SCP. |
| Step 2: Limitations of the methodology | ...was not available for... | The flo1 mutant <u>was not available for</u> our experiments, so we were unable to determine whether flo1 and flo4 are allelic. |
| Step 3: Limitations of the claims made | ...may not have been sufficient to... ...do not necessarily confirm... | First, the 5 min exercise test, being a sub-maximal workload, <u>may not have been sufficient to</u> cause an exercise-mediated plasma K ⁺ peak. These observations <u>do not necessarily confirm</u> an immediate role for the SNAREs in K channel anchoring, nor do they imply direct protein interaction between the SNARE and K channel. |
| Step 4: Limitations of previous studies | Few articles were found... The authors are not aware of any published studies on... | <u>Few articles were found</u> dealing with the pharmacokinetics of SCP in poultry. <u>The authors are not aware of any published studies on</u> the importance and contamination potential of the location of L. monocytogenes contamination in live or freshly caught fish. |

Table 3.18 Move 16: Suggestions for further research

| Step | Lexical Bundles | Examples |
|------|---|---|
| | <p>Further research is needed to...</p> <p>More research is needed to ...</p> <p>Future studies are needed to ...</p> <p>Further work is needed to ...</p> <p>Additional studies are needed to...</p> | <p><u>Further research is needed to</u> determine whether greater concentrations of combined dietary supplementation with CLA and oleic acid than those used in this study would permit the production of eggs with greater yolk CLA concentrations and good consumer acceptance.</p> <p>To conclude, <u>more research is needed to</u> evaluate the role of cue (i.e. odor) familiarity as an underlying basis for FOKs about odor names and a different methodology might be needed to clarify the issue.</p> <p><u>Future studies are needed to</u> clearly define this potential effect of bLf in mammary cells and its implications in vivo.</p> <p><u>Further work is needed to</u> verify the function of the two receptors.</p> <p><u>Additional studies are needed to</u> examine the patterns of expression of oMT promoter-regulated genes in transgenic rabbits.</p> |

3.7 Reliability of Move Identification and Lexical Bundles

Identification

An inter-coder reliability check was conducted to demonstrate that the moves can be identified at a sufficiently high level of agreement. To insure the reliability of move identification and lexical bundles identification, two native speakers were employed respectively.

3.7.1 Reliability of Move Identification

During the coding, two problems occurred. One was the vague function descriptions of some moves or steps. The other problem was that Kanoksilapatham's (2005) framework could not be fitted conclusively. The reliability of the analysis was assured by means of inter-rater reliability check. Two coders participated in the present study. One was an expert and the other one was a researcher. The expert was a native speaker with a Ph.D degree in science and had many RAs published in high ranking journals. He was considered an academic specialist with appropriate qualifications, knowledge and competence to provide reliable feedback on agricultural research articles. In total, 10 out 30 RAs were randomly selected for checking the reliability of move identifications.

Crookers (1986) indicated that some implicit factors might play a role in reliability assurance of move analysis. Firstly, the framework or move model used in the study might not perfectly account for the functions of all the texts in a corpus. Secondly, coders might not have sufficient training. Thirdly, some texts in a corpus

may not fit into the framework or move model perfectly. Fourthly, the function description of each move or a step in the framework might not be clear enough. Fifthly, move identification can not always be consistent and unanimous. Lastly, lexicogrammatical signals in the study might not lead to correct move identification. According to Crookers, an expert and a researcher should have sufficient training in order to achieve high agreement percentage. That is, coders should become acquainted with Kanoksilapatham's (2005) framework used in this study and be familiar with the uniform criteria for move identification before coding.

The coding procedure was illustrated as follows: First of all, 10 out of 30 RAs were coded by two coders independently and completely. Next, the results from two coders were compared section by section. Both the expert and the researcher went through the text to identify any coding disagreements. Differences in coding led to defining new moves or reflection of Kanoksilapatham's (2005) framework. Finally, the researcher independently coded the remaining 20 RAs and recorded occurrence frequency of moves or steps. Table 3.19 summarizes results of inter-coder analysis of the four sections from 30 RAs.

Table 3.19 Inter-coder Analysis of the Four Sections of Agricultural Science RAs

| Section | Move Boundaries | Agreement | Disagreement | Percentage |
|-----------------------------|------------------------|------------------|---------------------|-------------------|
| Introduction Section | | | | |
| Move 1 | 68 | 55 | 13 | 80.88% |
| Move 2 | 9 | 9 | 0 | 100% |
| Move 3 | 17 | 14 | 3 | 82.35% |
| Subtotal | 94 | 78 | 16 | 82.98% |
| Methods Section | | | | |
| Move 4 | 98 | 78 | 20 | 79.59% |
| Move 5 | 165 | 151 | 14 | 91.52% |
| Move 6 | 42 | 31 | 11 | 73.81% |
| Move 7 | 8 | 8 | 0 | 100% |
| Move 8 | 7 | 3 | 4 | 42.86% |
| Subtotal | 320 | 271 | 49 | 84.69% |
| Results Section | | | | |
| Move 9 | 39 | 36 | 3 | 92.31% |
| Move 10 | 4 | 3 | 1 | 75% |
| Move 11 | 78 | 70 | 8 | 89.74% |
| Move 12 | 39 | 32 | 7 | 82.05% |
| Subtotal | 160 | 141 | 19 | 88.13% |
| Discussion Section | | | | |
| Move 13 | 37 | 18 | 19 | 48.65% |
| Move 14 | 228 | 206 | 22 | 90.35% |
| Move 15 | 20 | 12 | 8 | 60% |
| Move 16 | 8 | 6 | 2 | 75% |
| Subtotal | 293 | 242 | 51 | 82.59% |
| Total | 867 | 732 | 135 | 84.43% |

Table 3.19 compares the distribution of agreement percentage in IMRD sections before the discussion between the coders. The total number of move boundaries, the number of move boundaries in agreement/disagreement and agreement percentage were displayed. The percentage of agreement of IMRD sections is 82.98%, 84.69%, 88.13% and 82.59% respectively. Among them, the agreement percentage of the Methods and Results sections is much higher than the Introduction and Discussion sections. This might be due to the fact that the Methods

section is the easiest part to write because this section presents the experimental procedure, whereas the Results section is the most original part to report the findings of the study. These results are also in agreement with Flowerdew's (1999) observation that the Introduction section and Discussion section are particularly difficult to write. Therefore, the sections of Methods and Results are relatively easy to comprehend and write. In conclusion, the total number of move boundaries was 867, among which 732 were in agreement, and 135 were in disagreement, while the overall agreement percentage was 84.43%. Any disagreement was discussed and negotiated between the coders in order to reach a hundred percent agreement. After discussion, there was no disagreement.

3.7.2 Reliability of Lexical Bundles Identification

Another native speaker was employed to check the reliability of lexical bundles identified by the researcher. He was an experienced teacher with a degree in Linguistics. Before checking the reliability, a two-hour training session was provided so that he became familiar with Kanoksilapatham's (2005) framework and lexical bundles identification. The use of the lexical bundles in their corresponding contexts was analyzed in order to identify the functions these lexical bundles performed in their relevant move boundaries.

The total number of lexical bundles identified was 867. Normally, Move 1, Step 3, Move 10, Step 1, Move 12, Step 3, Move 13, Steps 1-2 and Move 14, Step 3 are difficult to identify. Therefore, lexical bundles identified in these moves were

carefully checked by the second native speaker. The proofread percentage was 19.61%, including Move 1, Step 3: *Reviewing previous research*, Move 10, Step 1: *Detailing what methods (similar these) that people used before* and Move 10, Step 2: *Commenting on whether the method yielded successful results*, Move 12, Step 3: *Evaluating the current findings against those from previous studies or with regard to they hypothesis*, Move 13, Step 1: *Stating what is already known from previous studies* and Move 13, Step 2: *Detailing conclusions based on analyses of previous studies* and Move 14, Step 3: *Referring to previous literature*. In general, these steps function to depict previous studies or compare the current findings with previous studies.

1. Introduction

High temperature is one of the major abiotic stresses limiting plant growth and productivity [1]. In living cells, heat stress can cause denaturation of functional and structural proteins. Heat stress also activates protective cell signaling pathways and cellular responses, inducing the production of stress proteins, antioxidants, osmolytes, ion transporters, and heat shock proteins (Hsps) [2,3]. Hsps are well conserved in living organisms and are classified by structural and functional relationships into the Hsp100, Hsp90, Hsp70, Hsp60 and small Hsp families [3,4]. They function as molecular chaperones to prevent protein denaturation, and stabilize and promote protein folding in different organelles [3,5].

Hsp90 is an abundant and highly conserved molecular chaperone in both eukaryotes and prokaryotes [3,6,7]. Although Hsp90

functions primarily as a molecular chaperone in protein folding, it also plays a key role in signal transduction networks to regulate cellular processes, such as cell cycling, growth, apoptosis, stress responses, and development, by interacting with various sets of co-chaperones and client proteins [8,9]. Hsp90 family proteins share three identical domains consisting of a nucleotide binding domain, substrate binding domain, and dimerization domain in N-terminal region, central region, and C-terminal region of the protein, respectively. Each domain carries out an independent role, but these domains are closely related and cooperate in the chaperoning process [6]. The function of Hsp90 is also coupled to ATP binding and hydrolysis through association with several ATPase regulating co-chaperones such as Aha (Activator of Hsp90 ATPase) as a stimulator and Hop (Hsp-organizing protein) as a suppressor [9]. ATP hydrolysis by Hsp90 regulates the binding or release of substrates during molecular chaperone activity [10]. Compared to *Escherichia coli*, which has a single Hsp90 homolog (HtpG), Hsp90 proteins in eukaryotes are distributed in distinct organelles, cytoplasm, chloroplast, mitochondrion, and endoplasmic reticulum (ER) [5,7].

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 [11]. When folding or assembly of proteins in the ER is disordered, unfolded proteins accumulate in the ER and expression of ER-resident chaperones and

Abbreviations: BIP, 78 kDa binding protein; CS, citrate synthase; ER, endoplasmic reticulum; GA, geldanamycin; Gp, glucose-regulated protein; GST, glutathione S-transferase; Hsp6, high temperature protein C; MDH, malate dehydrogenase; PEI, polyethyleneimine.

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Figure 3.7 Sample Move Analysis of a Research Article Introduction

3.8 Summary

This chapter mainly describes the whole research design. The present study is a corpus-based study to identify rhetorical moves and their lexical bundles in research articles in the field of Agricultural Science. Thirty RAs in three major fields of Agricultural Science, including Crop Production Technology, Food Technology and Animal Production Technology, were analyzed based on Kanoksilapatham's (2005) framework. Then, frequent lexical bundles were identified and classified based on the move analysis of 30 RAs. The reliability of the move analysis and lexical bundles identification were carefully checked by two experts based on the results of the pilot study. The results and discussion will be dealt with in the following chapters.