

Textual Metadiscourse Resources in Research Articles*

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Abstract

This study was motivated by three factors, which also contribute to its significance for today's academic writing. First, research articles are the significant means of communication between the writers all over the world. Second, persuasion and organization are crucial notions in academic writing where the authors have to consider the academic audiences and their needs. Third, some writers are not the native speakers of English and write their research articles in English. Despite their importance in academic writing, we know little about how textual metadiscourse resources (TMRs) are used in different disciplines and genres. This study examines the use of TMRs in research articles of three disciplines of Mechanical Engineering (ME), Medicine (MED), and Applied Linguistics (AL). It also explores distribution of TMRs by native and non-native writers of English in the research articles of three disciplines. Based on a corpus of thirty research articles, the frequency of TMRs was calculated per 1,000 words. The findings of the study indicate a significant difference in the distribution of TMRs in three disciplines and also between the writings of native and non-native writers. In addition, these findings may have some implications for teaching disciplinary communication especially to foreign language learners of English.

Key Words: Textual Metadiscourse Resources, Research Articles, Academic Disciplines.

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Traditional academic writing has considered that researchers should be objective and have an impersonal style when reporting their studies. This thought mainly shows preferences and general tendencies in academic writing. This prevailing view of academic writing has been criticized by a number of researchers (e.g. Swales, 1990; Tang & John, 1999; Hyland, 2001a; Vassileva, 2001; Harwood, 2005). Researchers (Thetela, 1997; Hoey, 2001; Hyland, 2005) argue that interaction in written texts can be conducted as that in the spoken text, though with different effects as a result of the different medium. This view has gradually reflected a perception of academic writing as social engagement, involving interaction between writers and readers.

These proliferation of studies on academic written discourse in general and English for academic purposes in particular about interaction has entailed increased research activity into what language and communication tools the researchers and the students must acquire to become fully socialized into their research community. In such contexts, the process of gaining entry into these communities is seen as being dependent on awareness of, and competence in, the writing practices of the relevant discourse community (Hyland, 2004).

Scientific and academic contributions or the way researchers share their findings with the research community they belong to, are influenced by the disciplinary culture they have been socialized into through their academic studies. The choices of tools among metadiscourse resources help to establish the interaction between writer and reader in academic texts. Academic writers do not simply produce texts that discuss social or natural realities but use language to acknowledge, construct and negotiate social relations (Hyland, 1998). The interpersonal resources organize texts coherently and to convey credibility and reader sensitivity.

A great deal of recent research (e.g. Hyland, 2004; Dahl, 2004; Ifantidou, 2005; Hempel & Degand, 2008) has shown a growing tendency toward the interaction aspects of research articles in different disciplines that is created by textual metadiscourse resources (TMRs). Their focus is on the range of metadiscursive resources that are at an author's disposal for a clearer structuring of the propositional content of his/her message.

In order to improve knowledge of the interactive characteristics in the research articles, it seems necessary to have a systematic account

of using metadiscourse resources, which researchers across disciplines deploy to achieve their intended effects. The present study attempts to contribute to the investigation of metadiscourse resources in research articles that belong to three academic disciplines of Applied Linguistics (AL), Medicine (MED), and Mechanical Engineering (ME). It further examines the use of these resources by native and Iranian non-native writers of English in research articles of these three disciplines. To achieve these purposes, this study addresses the following research questions:

1. What are the differences among ME, MED, and AL research articles in the use of TMRs in three rhetorical sections namely, Abstract, Introduction, and Result & Discussion?
2. What are the differences between native and non-native writers of English in the use of TMRs in three rhetorical sections of Abstract, Introduction, and Result & Discussion in ME research articles?
3. What are the differences between native and non-native writers of English in the use of TMRs in three rhetorical sections of Abstract, Introduction, and Result & Discussion in MED research articles?
4. What are the differences between native and non-native writers of English in the use of TMRs in three rhetorical sections of Abstract, Introduction, and Result & Discussion in AL research articles?

What is Metadiscourse?

The term metadiscourse – also called *metatext* or *metalanguage* – is generally understood as text about text, or discourse about discourse (e.g. Mauranen, 1993, p. 4; Rahman, 2004, p. 32). According to Mauranen (1993, p. 9), “[t]hrough metatext, the writer steps in explicitly to make his or her presence felt in the text, to give guidance to the readers with respect to how the text is organized, to what functions different parts of it have, and to what the author’s attitudes to the propositions are.” In other words, Mauranen (1993) argues that metatext helps the writer organize and comment on the propositional content of his or her text.

Metadiscourse has recently been defined as “the cover term for the self-reflective expressions used to negotiate interactional meanings in

a text, assisting the writer (or speaker) to express a viewpoint and engage with readers as members of a particular community” (Hyland, 2005, p. 37).

Key Principles of Metadiscourse

Hyland (2005) proposes a functional model of metadiscourse. A model or theory which is based on the assumption that the rhetorical features of metadiscourse can be understood more clearly when they are used or identified in contexts in which they occur. Hence the analyses of metadiscourse have to be conducted as part of that particular context or as part of that particular community practices, values and ideas. The functional theoretical framework of metadiscourse defines writers as the conductors of interaction with the readers. The notion of the writer-reader interactions has underpinnings on the following three key principles of metadiscourse that was suggested by Hyland & Tse:

- "Metadiscourse is distinct from propositional aspects of discourse.
- Metadiscourse refers to aspects of the text that embody writer-reader interactions.
- Metadiscourse refers to relations only that are internal to the discourse"(2004, p.159).

In the definitions that are proposed by Vande Kopple (1985) and Crismore, Markanen, and Steffensen (1993) (both cited in Hyland & Tse, 2004) there is a clear distinction between metadiscourse and propositional content with the eminent role of proposition. According to Hyland and Tse "the point that we are making here is that a propositional content-metadiscourse distinction is required as a starting point for exploring metadiscourse in academic writing, but it is unwise to push this distinction too far." (2004, p. 160)

Concerning the second principle, Metadiscourse is a language device or a tool that enhances interaction for successful communication. Hyland (2005) and Hyland and Tse (2004) argue that if metadiscourse is about interaction therefore it only involves the interpersonal function, not the textual function. This indicates that metadiscourse takes into account the readers' knowledge, textual experiences and processing needs while it also equips the writer with

necessary rhetorical functions in order to achieve its purpose. This second principle of model rejects the strict duality of textual and interpersonal functions found in much of the metadiscourse literature (e.g. Vande Kopple, 1985; Crismore and Farnsworth, 1990; Crismore et al., 1993 (all cited in Hyland, 1998); Hyland, 1998). It is therefore clear that the textual function of metadiscourse is engrossed to language and coherence of the text rather than propositional and interpersonal meanings that are non-linguistic oriented. Hyland (2005) notes that textual devices can function dual roles interactively not independently to each other. Hence textual resources organize texts as propositions by relating statements about the world and metadiscourse by relating statement to the readers.

Concerning external and internal relations Halliday (1994) provides an unambiguous statement of this difference when discussing temporal connectors:

Many temporal conjunctives have an 'internal' as well as an 'external' interpretation; that is, the time they refer to is the temporal unfolding of the discourse itself, not the temporal sequence of the processes referred to. In terms of the functional components of semantics, it is interpersonal not experiential time. (Halliday, 1994, p.325)

Bunton (1999) also distinguishes between research acts and text acts. The former concerns those research acts which would have been committed irrespective of the way in which the research was eventually written up. Research acts are thus part of the subject matter of research thesis. The text acts are done only for the text. They refer to the decisions the writer makes in fashioning an argument for a particular readership. So it is the distinction between internal and external reference that requires differentiating two writer's role that are distinguished by Bunton (1999).

Different Classifications of Metadiscourse Resources

Hyland and Tse's metadiscourse model entails two sub-divisions: Interactive resources and interactional resource. The interactional resources consist of five categories: Hedges, Boosters, Attitude markers, Self-mentions, Engagement markers. Interactive resources consist of the five subcategories:

Transition markers: constitute conjunctions and adverbial phrases, which help readers to interpret pragmatic connections between steps in an argument.

Frame markers: signal schematic text structure, and functions to sequence, label, predict and to shifts arguments or to sequence parts of the text.

Endophorics markers: are expressions that refer to other parts of the text.

Evidentials: are metalinguistic representations of idea or ideas from another source.

Code glosses: provide additional information by rephrasing, explaining or elaborating what has been said.

Dahl (2004) elaborates on those categories of meta-elements which have a primarily textual function. She proposes a taxonomy consisting of two categories of metatextual elements. The first, called *locational metatext*, comprises linguistic elements which refer to the text itself or to parts of it. Dahl's (2004) second category has been termed *rhetorical metatext*. It includes meta-elements which assist the reader in the processing of the text by making explicit the rhetorical acts performed by the writer in the argumentation process.

Rahman (2004) proposes the following classification that takes the broad concept of metalanguages as a basic heading. This classification corresponds to Hyland and Tse's (2004) interactive (textual) classification. The first subcategory is called *metatext* that consists of the following elements: Discourse entities, Discourse acts, and Discourse labels. The second subcategory that is called *metadiscourse* consists of the following resources: Illocutionary acts, Topic shifting, Code glossing, Interactive acts, and Text connectives.

In other words, Rahman (2004) labeled the function of endophoric markers as discourse entities. It seems that he divides Hyland and Tse's (2004) frame markers into four parts: discourse acts, discourse labels, illocutionary acts, and topic shifting.

Dafouz-Milne (2008) in her modification of textual metadiscourse include evidentials in the interpersonal category and instead of using endophorics benefits from two somewhat similar concepts of reminders and announcements. Under the headings of textual metadiscourse, seven categories have been included. Logical markers, sequencers, reminders (refer back to previous sections in the text),

topicalizers, code glosses, illocutionary markers, and announcements (refer forwards to future sections in the text). She further divides the category of logical markers up to four subcategories: additive, adversative, consecutive, and conclusive. Code glosses are also having four categories of parentheses, punctuation devices, reformulators, and exemplifiers.

Metadiscourse and Disciplinary Differences

It is difficult to imagine English for Academic Purposes (EAP) without some notion of community. It is central to our understanding of the ways individuals acquire and deploy the specialized discourse competencies that allow them to legitimate their professional identities and to effectively participate as group members. Disciplinary variation, from the early days of ESP/EAP scholarship, has remained a controversy from both theoretical and empirical perspectives. However, there appears to be some controversy in scholars' views on academic discourse. For instance, Raimes (1991) doubts whether there is fixed and stable construct of academic writings even in one discipline and whether there is such a notion as 'academic discourse' to teach and to learn. In agreement with Raimes, Trimble (1985) offers a universal nature of scientific and/or academic discourse that is subject- and language-independent, still others (e.g. Halliday, 1994) believe in linguistic variations resulting from functional variations inherent in different disciplines. As each discipline has its own theoretical framework(s) from which it grounds its field, each discipline's discourse has developed its own rhetorical framework. Hyland (2001b) rejects the unitary discourse of the academy by asserting that "Disciplines have different views of knowledge, different research practices, and different ways of seeing the world, and as a result, investigating the practices of those disciplines will inevitably take us to greater specificity" (p.10)

This stresses that disciplines and professions are largely created and maintained through the distinctive ways that members jointly construct a view of the world through their discourses. As we find ourselves exposed to new discourse communities and consider new rhetorical situations, we have to examine what Hyland (1998) states are "communicative intentions." so writing is not just another aspect

of what goes on in the professions or disciplines, it is seen as actually producing them.

Moreover, some research evidence indicates that these disciplinary conventions significantly constrain writing style and that sometimes these conventions may have an even greater effect on the writer's choices than national or "big" cultures (Breivega *et al*, 2002; Hyland, 1998, 2002). Dahl (2004) considers two cultures as the most influential factors when writers produce their scientific contributions: disciplinary culture and native language writing culture. The former is formed when we have been socialized into through our academic studies and the latter is formed by the native language writing culture we have been brought up.

Hyland (2004) in his study of distribution of metadiscourse in a corpus of 240 doctoral and masters dissertations suggests how academic writers use language to offer credible representation of their work in different disciplines. He aims to show how metadiscourse can reveal the rhetorical and social distinctiveness of disciplinary communities. It is considered that the use of metadiscourse resources in academic writing consists of disciplinary variations. In his study, applied linguistics, public administration and business studies have been categorized as soft field and computer sciences, electrical engineering and biology as hard fields. The result of Hyland's (1998) study indicates that metadiscourse can be seen as a universal phenomenon in academic rhetoric, with about the same overall density of metadiscourse resources (including textual and interpersonal resources) in the four disciplines (microbiology, marketing, astrophysics and applied linguistics) studied. However, there were also differences in their use. The main reason of this difference may be in preferred uses of metadiscourse that might reflect broad areas of intellectual inquiry, knowledge structures and their associated forms of discourse.

Metadiscourse and Genre

Hyland (2005) defines the concept 'genre' as a term for grouping text together, representing how writers typically use language to respond to recurring situations. In other words, genre is a term that refers to the community or social activity reflected and written about the texts. Reflecting on the notion of genre, Mauranen (1993)

maintains that universal aspects of academic writing tend to be conditioned by genre. According to her, genre is a social activity of a specific discourse community realized in language. In the same way, generic constraints on scientific articles, for example, reflect social rather than linguistic regulations set by the community on its members. Therefore, genre is about community experiences and is an analytical construct suited for inquiry into the effects of social milieu on the production and reception of texts. The role of language in genre can not be underestimated as it plays a vital role in social realities. In the most cited and still most comprehensive working definition of genre that was elaborated by Swales (1990), the linguistic features characterizing it are its internal structure; that is, the rationale for the genre that is constituted by "communicative purposes" shapes the schematic structure of the discourse and influences and constrains choice of content and style." (p. 58).

It is the role of reader that has determining effect on using linguistic choices in genre studies. Hyland (2005) addressed the concern expressed by writers about how genres are distinguished by clusters of specific rhetorical features. He points out that metadiscourse is a key feature for genre analysis. Metadiscourse is defined as a device that can show how language choices can function in various ways.

The presence and function of metadiscourse resources have been examined in a number of different genres and contexts, including textbooks (Hyland, 1999), science popularizations (Varttala, 1998), advertisements (Fuertes-Olivera et al., 2001), newspaper discourse (Le, 2004; Hempel and Degand, 2008), academic talks and lectures (Pérez and Macià, 2002; Thompson, 2003; Eslami and Eslami-Rasekh, 2007) and research articles (Mauranen, 1993; Dahl, 2004; Moreno, 1997; Hyland, 1998, 2001a, 2002, 2007; Mur Duenñas, 2007; Zarei and Mansoori, 2007).

Method

Data and Data Selection Criteria

The data for this study comprise a total of thirty research articles from three disciplines, ten articles belonging to Mechanical Engineering, ten articles belonging to Applied Linguistics, and ten articles belonging to Medicine. Among ten articles in each discipline,

five articles belong to native writers and five articles belong to non-native writers. The articles are all taken from leading international and Iranian journals during the last decade, most of them during the recent five years. Articles whose authors were native speakers of English and Persian were selected for the analysis.

This study focused on three rhetorical sections of research articles, namely Abstract, Introduction, and Results & Discussion. These sections were chosen because of their more challenging nature. They have the determining role in motivating the study and in persuading its readers. In these sections due to different rhetorical functions, writers mainly establish the significance of the study and make generalization regarding the main findings. For the purpose of the study, only the body part of each article has been included in the search. This means that no headings, footnotes, quotes, equations, bibliographies, linguistic examples, tables and figures which appeared in the research articles are included the data. In the study the words such as *example*, *table*, *figure* and *equations* are excluded from those sections of data that potentially can be placed in the endophorics category. They are an integral part of the articles and according to Dahl (2004, p. 1817), "... they may easily skew the results for this category, as one or a few articles may yield a very high total number of such item."

The choice of research articles in each discipline was based on a number of criteria: The first criterion was having experimental design. We tried to choose those research articles in three disciplines that their design is experimental in order to have homogeneous data because research articles in ME and MED mainly deal with experimental research. The second criterion was having Abstract, Introduction, and Result & Discussion sections. Since this study was focusing on three rhetorical sections of Abstract, Introduction and Result & Discussion, it was important to have them among the rhetorical sections of research articles. The date of research articles publication was the next criterion. The English research articles were all limited to those published during 2001-2008 with the assumption that time influences the style of the writers and with this time limit this factor has been taken into account (see Appendix 1).

Once the research articles were selected, they were analyzed in terms of TMRs. The method and procedures used for analyzing the data are discussed in the next section.

Procedures of Data Analysis

One of the main objectives of this study is to examine the occurrence of TMRs across the three disciplines of ME, AL, and MED and the three rhetorical sections of research articles: Abstract, Introduction, and Results & Discussion. Another aim is to identify the differences between native and non-native writers in the use of TMRs across these three disciplines and three rhetorical sections of research articles. In order to meet these goals, three rhetorical sections of thirty research articles consisting of 58,705 words were analyzed. To determine the frequency of TMRs, a list of such items was compiled from Dahl (2004), Rahman (2004), Hyland (2005), Hempel & Degand (2008), and Dafouz-Milne (2008) (see Appendix 2). Then they were classified into seven categories of analysis mentioned above. Some other items found in the research articles were also included.

The articles were then examined to determine the frequency of these words. However, it should be mentioned that it is very difficult to determine all TMRs used by an author in a research article. These polysemous TMRs can function in different ways according to the meaning conveyed and a type of relations in the discourse. As a result, the functions of all the items were examined qualitatively based on their actual occurrences in context. A single linguistic form such as *above*, for example, can express meaning in the real world and for research activities not for navigating readers in the research articles. Such an ambiguity leads to the difficulty of identifying which of the linguistic forms are TMRs and which are not. Therefore, particular attention was paid to the context in which TMRs were used and counting of items was conducted manually.

After determining the frequency of TMRs in three rhetorical sections of the research articles and classifying them into seven categories of analysis, the total words used in each section were also counted. Since the size of the research articles in each discipline and across three rhetorical sections varied, we decided to calculate the frequency of TMRs per 1,000 words. Therefore, in order to show the distribution of TMRs across three disciplines and three rhetorical sections of research articles, the frequency of occurrence of TMRs was calculated per 1,000 words in each rhetorical section of these three disciplines.

To find out the difference in the category distribution of TMRs among these three disciplines, the frequency of occurrence of each category of TMRs per 1,000 words and their percentage were also computed in each discipline.

The same procedures of analysis were then carried out to find out the overall distribution and category distribution of TMRs in research articles written by native and non-native writers in three disciplines. Finally, the Chi-Square test was again used to determine the significance of the difference among the frequency.

Results and Discussion

We will present and discuss the results of the present research as follows:

1. Those related to the distribution of TMRs in ME, MED, and AL research articles
2. Those related to the distribution of TMRs in ME articles of native and non-native writers
3. Those related to the distribution of TMRs in MED articles of native and non-native writers
4. Those related to the distribution of TMRs in AL articles of native and non-native writers

Distribution TMRs in ME, MED, and AL Research Articles

Overall Distribution

In order to find out the differences among ME, MED, and AL articles in the distribution of TMRs, first, we calculated the distribution of TMRs in three rhetorical sections of the research articles and their overall distribution in the three disciplines. The results of the analysis showed that the frequency of TMRs across three rhetorical sections of MED articles (60.68 per 1,000 words) was higher than AL articles (57.65 per 1,000 words) and ME articles (54.17 per 1,000 words). The result of the Chi-Square test indicates that differences among ME, MED, and AL research articles in the use of TMRs across three rhetorical sections are statistically significant.

These differences can be explained by resorting to object and nature of disciplines. The field of Mechanical Engineering and

Medicine can be categorized under "hard" sciences in which the setting of the experiments is more controlled and the material and procedures can be closely measured. However, "soft" sciences, such as Applied Linguistics have not firm theoretical foundation and this tentative nature and subjective evaluation result from the conditions under which the research made are not fully in the control of researchers. According to Hyland (1998), in the soft fields, there is less control of variables and more diversity of research outcomes. This discipline may require more persuading resources such as TMRs to structure the text.

Rhetorical Distribution

The frequency of TMRs was calculated per 1,000 words in three rhetorical sections of ME, MED, and AL articles: Abstract, Introduction, and Result & Discussion. Table1 presents the total number of words, the frequency of TMRs in three sections of ME articles, and their total frequencies. As it is shown in the table, a total of 757 TMRs used in the three sections of ME research articles; this represents a frequency rate of 54.17 TMRs per 1,000 words. According to frequency rate 57.99 TMRs are found in the Introduction section per 1,000 words whereas in the Result & Discussion section the rate is lower, 53.49 TMRs per 1,000 words and in the Abstract section the rate is 41.80 per 1,000 words.

Table1. Frequency of TMRs across Three Rhetorical Sections of ME Research Articles

| ME Research Articles | | | | |
|-----------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | 1507 | 6035 | 6431 | 13973 |
| Total devices of TMRs | 63 | 350 | 344 | 757 |
| F per 1,000 | 41.80 | 57.99 | 53.49 | 54.17 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

Table2 below presents the total number of words, the total frequency of TMRs, and their frequency in three sections of MED

research articles. As it is shown in the table, the total use of TMRs in MED research articles is 1086 with frequency rate of 60.68 per 1,000 words. It also illustrates that the highest frequency of TMRs occurs in the Introduction section (65.98 per 1,000 words) followed by Result & Discussion section (61.80 per 1,000 words) and Abstract section (47.62 per 1,000 words).

Table 2. Frequency of TMRs across Three Rhetorical Sections of MED Research Articles

| MED Research Articles | | | | |
|-----------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | | 2394 | 3319 | 12185 |
| Total devices of TMRs | 114 | 219 | 753 | 1086 |
| F per 1,000 | 47.62 | 65.98 | 61.80 | 60.68 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

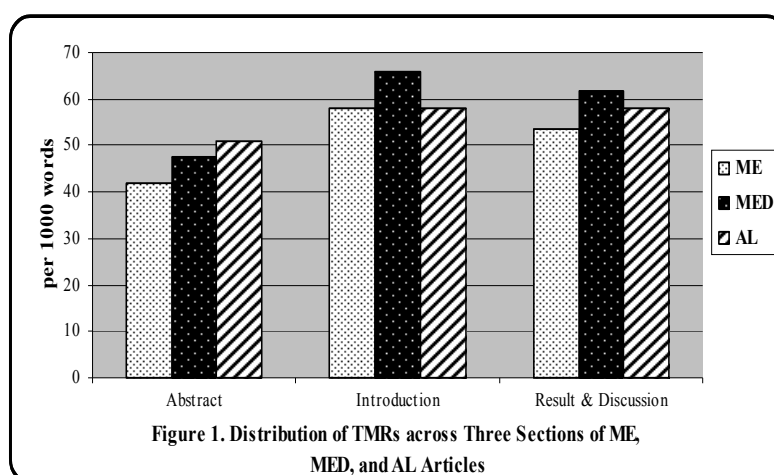
In Table 3 the total number of words, the total frequency of TMRs, and their frequency in three sections of AL research articles are represented. We can see in the Table 3 that the total use of TMRs in AL research articles reaches 1,547 occurrences, representing the frequency rate of 57.65 TMRs per 1,000 words. According to the table 3, the Introduction section in AL articles has the highest incidence of TMRs (58.18 per 1,000 words) followed by Result & Discussion (58.04 per 1,000 words) and Abstract sections (50.89 per 1,000 words).

Table 3. Frequency of TMRs across Three Rhetorical Sections of AL Research Articles

| AL Research Articles | | | | |
|-----------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | | 1572 | 5569 | 19693 |
| Total devices of TMRs | 80 | 324 | 1143 | 1547 |
| F per 1,000 | 50.89 | 58.18 | 58.04 | 57.65 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

This study showed that the distribution of TMRs is not evenly distributed across different rhetorical sections of Abstract, Introduction, and Result & Discussion. In three ME, MED, and AL research articles, the Introduction sections generally contained more TMRs than the Abstract and Result & Discussion sections. This similarity suggests that writers in three disciplines consider the Introduction section as a major section for establishing the purpose of articles. To better illustrate these findings the results are shown in Figure 1 below.



The variations within the sections of a research articles can be explained by the different rhetorical purposes served by these sections. The purpose of an Abstract is to summarize the articles (Brown, 1988). Included in this summary are the problems under study, characteristics of the subject and materials, the procedures used, the findings of the study, and the conclusion reached by the researcher. Thus, in presenting the summary of the result in the Abstract section, the researcher may use some TMRs as observed in the corpus of this study.

Introductions can be considered as integral parts of research articles. Swales (1990) in his CARS model for research article Introductions states that the main concerns of the Introduction section of a research article are to contextualize a research study being presented in the relevant literature, claim its novelty, and present main features of the study. In order to meet this end, the writers try to show

the problem or gap by reviewing the previous works and emphasize the significance of their own work. These critical characteristics and purposes urged research article's writer to make best use of his / her TMRs in the Introduction section in order to present the writer's acceptable academic picture in his/her disciplinary community. In this study the Introduction section contained more TMRs compared to the Abstract and Result & Discussion sections.

The Result & Discussion sections were second in the use of TMRs in three disciplines. This is not surprising, since according to Swales (1990, p.133), the Discussion section "mirror-images the Introduction by moving from specific findings to wider implications". The main rhetorical function of the Discussion is to contextualize the reported study and relate it to previous work in the field, reflecting a sense of membership in the larger scientific community.

Categorical Distribution

In order to find out the differences in the distribution of seven categories of TMRs in ME, AL, and MED articles, the frequency of TMRs in each category per 1,000 words and their percents were computed in these three disciplines. Table 4 presents the distribution of these seven categories of TMRs in ME research articles. According to this Table, in ME research articles transitions (40.95%), code glosses (21.93%) and evidentials (18.23%) are the mostly used categories in ME research articles and topicalizers category (3.70%) have the lowest frequency rate.

Table 4. Distribution of Different Categories of TMRs in ME Research Articles

| ME Research Articles | | | |
|-------------------------|---------------|------------|------------|
| Categories of TMRs | F Per 1,000 W | Percent | Raw number |
| Topicalizers | 2 | 3.70 | 28 |
| Sequencers | 2.58 | 4.75 | 36 |
| Illocutionary resources | 3 | 5.55 | 42 |
| Code glosses | 11.88 | 21.93 | 166 |
| Transitions | 22.18 | 40.95 | 310 |
| Evidentials | 9.88 | 18.23 | 138 |
| Endophorics | 2.65 | 4.89 | 37 |
| Total | 54.17 | 100 | 757 |

Note: F = Frequency, TMRs = Textual Metadiscourse Resources, W = Words

Table 5 shows the distribution of seven categories of TMRs in MED research articles. In the Table 5, the three categories of code glosses (34.16%), transitions (33.33%) and evidentials (19.61%) are the mostly used resources. Similarly the lowest frequency belongs to topicalizers (0.55%). In MED research articles, the order of the mostly used TMRs categories are not fully identical to those ME research articles that is, code glosses is the leading category.

Table 5. Distribution of Different Categories of TMRs in MED Research Articles

| MED Research Articles | | | |
|-------------------------|---------------|------------|-------------|
| Categories of TMRs | F Per 1,000 W | Percent | Raw number |
| Topicalizers | 0.33 | 0.55 | 6 |
| Sequencers | 2.35 | 3.87 | 42 |
| Illocutionary resources | 3.07 | 5.06 | 55 |
| Code glosses | 20.73 | 34.16 | 371 |
| Transitions | 20.22 | 33.33 | 362 |
| Evidentials | 11.90 | 19.61 | 213 |
| Endophorics | 2.07 | 3.41 | 37 |
| Total | 60.68 | 100 | 1086 |

Note: F = Frequency, TMRs = Textual Metadiscourse Resources, W = Words

Table 6 presents the distribution of seven categories of TMRs in AL research articles. It shows that transitions (41.37%) and code glosses (30.90%) are the mostly used categories as TMRs in AL research articles. Topicalizers exhibit the lowest occurrence of TMRs in AL research articles (1.81%).

Table 6. Distribution of Different Categories of TMRs in AL Research Articles

| AL Research Articles | | | |
|-------------------------|---------------|------------|-------------|
| Categories of TMRs | F Per 1,000 W | Percent | Raw number |
| Topicalizers | 1.04 | 1.81 | 28 |
| Sequencers | 2.20 | 3.81 | 59 |
| Illocutionary resources | 3.80 | 6.59 | 102 |
| Code glosses | 17.81 | 30.90 | 478 |
| Transitions | 23.85 | 41.37 | 640 |
| Evidentials | 5.92 | 10.28 | 159 |
| Endophorics | 3.02 | 5.23 | 81 |
| Total | 57.65 | 100 | 1547 |

Note: F = Frequency, TMRs = Textual Metadiscourse Resources, W = Words

In terms of categorical distribution, the result showed a broad agreement in the use of transitions, code glosses, and evidentials as the main categories of TMRs in three disciplines, demonstrating that the principal concern of writers is to present information clearly, explicitly and persuasively. But there were variations in their use from one discipline to the other. Topicalizers, on the other hand, appeared in much lower frequencies across all the disciplines studied. These similarities could, of course, be seen as indicators of more widespread tendencies within these disciplines.

In the case of endophorics, illocutionary resources, and transitions, AL research articles were in the first place in terms of their frequency, perhaps reflecting the more discursive nature of this discipline and the writer's need to rely more on these TMRs to create a more coherent and persuasive discourse. Dahl (2004) believes that the high number of endophorics and illocutionary resources (rhetorical metatext) in AL articles can be related to its more heterogeneous organization that in turn imply that writer must signal which discourse act is being performed. Perhaps the more standardized format of MED research articles alleviates the writers' needs for endophoric, illocutionary resources, and transitions.

Evidentials in the MED and ME research articles were higher than AL research articles. The interpretation is that the hard disciplines tend to employ more citations, with AL with considerable low frequency. Scientists cite numerous studies in order to build an argument to support their main work and to make new claims more acceptable to discourse community members. Our analysis revealed that the writers of MED and ME research articles tried to determine the detailed picture of the relationship between their own research and previously done researches.

Topicalizers category in three disciplines had the lowest frequencies of TMRs. This reduced amount of topicalizers found suggests that writers prefer to introduce their topics and subtopics in the articles without using overt resources. Dafouz-Milne (2008) believes that titles function as a main topic and clearly express the main idea. But in comparing of these three disciplines in terms of topicalizers frequency, this is ME article that contained more resources than AL and MED articles.

The high number of sequencers that their main duty is to organize the text were seen in the ME articles while MED articles had slightly more sequencers than AL articles. ME and MED as hard sciences are the most structured disciplines regarding sequencing devices.

Distribution of TMRs in ME Articles of Native and Non-Native Writers

Overall Distribution

The results of the analysis showed that the overall occurrence of TMRs across three sections of the articles of native writers (55.80 per 1,000 words) was higher than the articles of non-native writers (51.99 per 1,000 words) in ME. The results of the Chi-Square tests indicated that there was not a significant difference in the distribution of TMRs in ME articles of native and non-native writers.

Being the native or non-native writers of English even in the same discipline may cause potential differences because the forms of transmitting knowledge in academic settings vary not only across disciplines, but also across cultures. For instance, although academic research articles due to genre requirements are considered to be relatively uniform, there is a "significant intercultural variation in the rhetorical preference of writers" (Mauranen, 1993, p.1). For example, in the Anglo-American writing traditions, written texts are expected to display fixed organizational pattern and rhetorical qualities; and writers are expected to communicate their knowledge and voice their opinions. According to Dahl (2004) in this tradition the author wants to be clearly visible. Silva (1993) has established that whole text organization is the area, which can create most problems for L2 writers in academic contexts since writers from different cultures prefer certain forms.

Rhetorical Distribution

The frequency of TMRs was computed per 1,000 words in the Abstract, Introduction, and Result & Discussion sections of ME articles written by native and non-native writers. Table 7 presents the total number of words, the distribution of TMRs across three sections of ME articles written by native writers, and their total frequencies. As it is shown in the table, there are 447 TMRs occurrences in the articles

of native writers; this represents the total frequency of 55.80 per 1,000 words. The Table also indicates that the highest incidence of TMRs is in the Introduction section (60 per 1,000 words) followed by Result & Discussion (55.08 per 1,000 words) and Abstract sections (40.90 per 1,000 words).

Table 7. Frequency of TMRs across Three Sections of ME Articles Written By Native Writers

| ME Research Articles (Native) | | | | |
|-------------------------------|----------|--------------|----------|-------|
| Total words | Abstract | Introduction | Result & | Total |
| | | 758 | 3350 | 3903 |
| Total devices of TMRs | 31 | 201 | 215 | 447 |
| F per 1,000 | 40.90 | 60 | 55.08 | 55.80 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

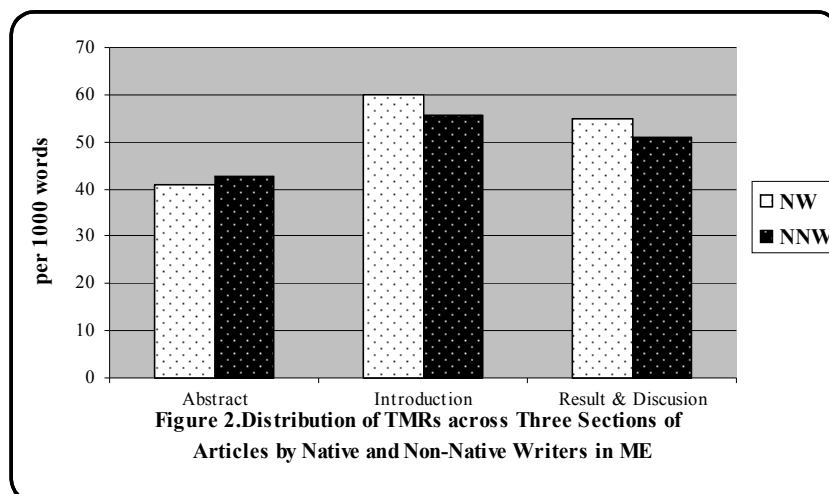
Table 8 shows the distribution of TMRs in ME research articles of non-native writers. The results of this Table indicate that the total frequency of TMRs in the articles of non-native writers is 51.99 per 1,000 words with 310 TMRs occurrences. The order of the findings in Table 8 shows trends very similar to the order existing in Table 7 with the sense that the highest concentrations of TMRs are in the Introduction section of the articles of non-native, with a ratio of 55.49 occurrences per 1000 words.

Table 8. Frequency of TMRs across Three Sections of ME Articles Written By Non-native Writers

| ME Research Articles (Non-Native) | | | | |
|-----------------------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | | 749 | 2685 | 2528 |
| Total devices of TMRs | 32 | 149 | 129 | 310 |
| F per 1,000 | 42.72 | 55.49 | 51.03 | 51.99 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

Figure 2 illustrates the distribution of TMRs across three sections of ME articles by native and non-native writers more clearly.



The results indicated a similarity in the rhetorical distribution of TMRs in the articles of native and non-native writers. The highest incidence of TMRs in the articles of both groups occurred in the Introduction section and the lowest in the Abstract section. This indicates that non-native writers that write their articles in English show the same level of awareness to the rhetorical purposes and linguistic resources as their native peers as it is evident in the result of Chi-Square test.

Categorical Distribution

In regard to categorical distribution of TMRs and its potential differences between native and non-native writers in ME articles, we represent the frequency of TMRs in each category per 1,000 words and in a percentages. Table 9 shows the distribution of seven categories of TMRs in the articles of native and non-native writers in ME. It reveals that three TMRs categories with the highest frequency rate in articles of native writer are not fully identical to those in the articles of non-native writers. Transitions (40.04%), code glosses (26.62%) and evidentials (17%) in articles of native writers and transitions (42.26%), evidentials (20%) and code glosses (15.16%) in articles of non-native writers are the most important categories of TMRs.

Table 9. Distribution of Different Categories of TMRs in Articles of Native and Non-Native Writers in ME

| ME Research Articles | | | | | | |
|--------------------------------|---------------|---------|-----|---------------|---------|------------|
| Categories of TMRs | Native | | | Non-Native | | |
| | F Per 1,000 W | Percent | Raw | F Per 1,000 W | Percent | Raw number |
| Topicalizers | 2.50 | 4.47 | 20 | 1.34 | 2.58 | 8 |
| Sequencers | 2.50 | 4.47 | 20 | 2.68 | 5.16 | 16 |
| Illocutionary resources | 1.50 | 2.68 | 12 | 5.03 | 9.68 | 30 |
| Code glosses | 14.85 | 26.62 | 119 | 7.88 | 15.16 | 47 |
| Transitions | 22.34 | 40.04 | 179 | 21.97 | 42.26 | 131 |
| Evidentials | 9.49 | 17 | 76 | 10.4 | 20 | 62 |
| Endophorics | 2.62 | 4.70 | 21 | 2.68 | 5.16 | 16 |
| Total | 55.80 | 100 | 447 | 51.99 | 100 | 310 |

Note: F = Frequency, TMRs = Textual Metadiscourse Resources, W = Words

In the case of categorical distribution of TMRs in ME articles of native and non-native writers, the result showed that both groups most widely used transitions, code glosses, and evidentials. In the articles of native writers, the category of transitions was followed in terms of actual count by code glosses, evidentials, and endophorics. But in the articles of non-native writers transitions followed by evidentials, code glosses, and illocutionary resources. Topicalizers in the articles of the non-native and illocutionary resources in articles of native writers appeared in much lower frequencies in the groups studied.

As to endophorics, illocutionary resources, sequencers, and transitions, the result showed that non-native writers of ME research articles used more these TMRs. As we noted previously, it seems that those articles that have more structured and rigid format do not have higher number of these TMRs. This suggests that research articles of non-native writers in ME are not highly structured and use of these resources for navigating readers through the text seems necessary.

Evidentials in the research articles of non-native writers were higher than research articles of native writers. This indicates that non-native writers in ME discipline present the generally accepted ideas by

reviewing the past studies. In addition, it shows that the non-native writers are knowledgeable enough in their field of study.

In the case of code glosses and topicalizers, native research articles had a higher number of these resources than non-native research articles. This result clearly indicates that native writers reformulate more often than non-native writers.

Distribution of TMRs in MED Articles of Native and Non-Native Writers

Overall Distribution

The frequency of TMRs across three sections of MED research articles written by native and non-native writers was computed per 1,000 words. The results showed that the overall distribution of TMRs in articles of non-native writers (67.13 per 1,000 words) was greater than the articles of native writers (55.10 per 1,000 words). The results of the Chi-Square test demonstrated that the difference between native and non-native in the use of TMRs in MED articles was significant. The fact that the difference between the two groups is more salient in the use of TMRs may show that non-native writers tend to establish more coherent text, hence providing more guidance for the reader to comprehend the purpose of the text.

Rhetorical Distribution

The frequency of TMRs across three sections of MED articles written by native and non-native writers was computed per 1,000 words. Table 10 shows the total number of words; the distribution of TMRs across three sections of MED articles written by native writers, and their total frequencies. As it is shown in the Table, there are 529 TMRs occurrences representing the total frequency of 55.10 per 1,000 words. The Table also indicates that the highest incidence of TMRs is in the Introduction section (64.28 per 1,000 words) followed by Result & Discussion (55.64 per 1,000 words) and Abstract sections (38.12 per 1,000 words).

Table 10. Frequency of TMRs across Three Sections of MED Articles Written By Native Writers

| MED Research Articles (Native) | | | | |
|--------------------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | 1128 | 1680 | 6793 | 9601 |
| Total devices of TMRs | 43 | 108 | 378 | 529 |
| F per 1,000 | 38.12 | 64.28 | 55.64 | 55.10 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

Table 11 indicates the distribution of TMRs in MED research articles of non-native writers. The Table shows that the total frequency of TMRs is 67.13 per 1,000 words with 557 TMRs occurrences. According to the Table 11, the Result & Discussion section (69.55 per 1,000 words) in the articles of non-native writers contains more TMRs followed by Introduction (67.72 per 1,000 words) and Abstract sections (56.08 per 1,000 words). This order of TMRs occurrences in three sections of Non-native writers is not fully identical to those in the articles of native writers.

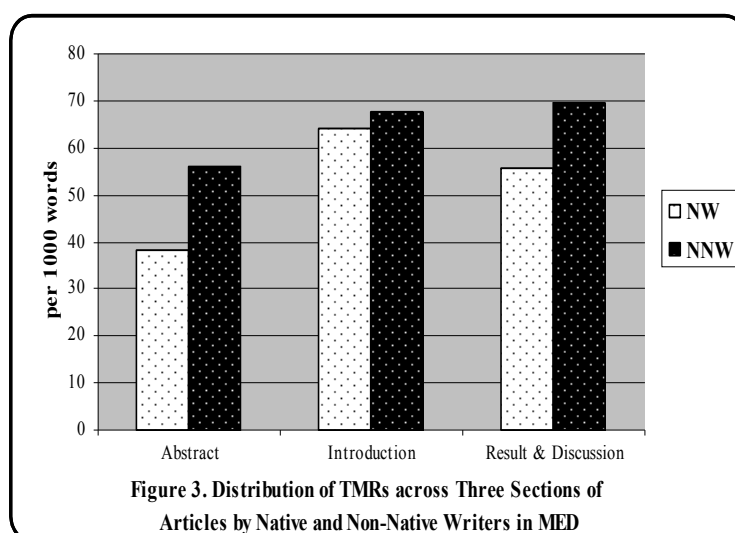
Table 11. Frequency of TMRs across Three Sections of MED Articles Written By Non-Native Writers

| MED Research Articles (Non-Native) | | | | |
|------------------------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | 1266 | 1639 | 5392 | 8297 |
| Total devices of TMRs | 71 | 111 | 375 | 557 |
| F per 1,000 | 56.08 | 67.72 | 69.55 | 67.13 |

Note: F= Frequency, TMR= Textual Metadiscourse Resources

The distributions of TMRs in the articles of native and non-native writers of MED across rhetorical sections of research article were not

identical. The main finding is that the Introduction section in the articles of native writers and the Result & Discussion section in the articles of non-native writers contained the highest incidence of TMRs. Non-native writers in their attempt to establish a sense of membership in the larger scientific community reflect the main rhetorical function of the Discussion section contextualizing the reported study and relating it to previous work in the field.



Categorical Distribution

The differences in the use of different categories of TMRs between native and non-native writers can be obtained by expressing the frequency of TMRs in each category per 1,000 words and also by calculating their percents. Table 12 represents the categorical distribution of TMRs in the articles of native and non-native writers. It also indicates that both native and non-native writers use three TMRs categories with the highest occurrences: transitions (34.78% and 31.96% respectively), code glosses (36.67% and 31.78% respectively) and evidentials (15.31% and 23.70% respectively).

Table 12. Distribution of Different Categories of TMRs in Articles of Native and Non-Native Writers in MED

| MED Research Articles | | | | | | |
|--------------------------------|---------------|---------|------------|---------------|---------|------------|
| Categories of TMRs | Native | | | Non-Native | | |
| | F Per 1,000 W | Percent | Raw number | F Per 1,000 W | Percent | Raw number |
| Topicalizers | 0.31 | 0.57 | 3 | 0.36 | 0.54 | 3 |
| Sequencers | 2.08 | 3.78 | 20 | 2.65 | 3.95 | 22 |
| Illocutionary resources | 3.23 | 5.86 | 31 | 2.89 | 4.31 | 24 |
| Code glosses | 20.21 | 36.67 | 194 | 21.33 | 31.78 | 177 |
| Transitions | 19.16 | 34.78 | 184 | 21.45 | 31.96 | 178 |
| Evidentials | 8.44 | 15.31 | 81 | 15.91 | 23.70 | 132 |
| Endophorics | 1.67 | 3.02 | 16 | 2.53 | 3.77 | 21 |
| Total | 55.10 | 100 | 529 | 67.13 | 100 | 557 |

Note: F = Frequency, TMRs = textual metadiscourse resources, W = Words

In terms of categorical distribution, the result showed three common categories in terms of frequency in articles of MED discipline, that is, transitions, code glosses, and evidentials. The two groups differed in the way they prioritized the respective categories. Native writers capitalized maximally on the code glosses and minimally on the topicalizers. Non-native writers used transitions as the first priority and like native writers used topicalizers as the last.

In the case of endophorics and sequencers, non-native writers of MED like those in ME used more resources than native writers. Native writers in their writing follow a highly structured format that more closely determines where in the text the information is to be found.

In MED research articles of non-native writers, there were higher occurrences of evidentials than research articles of native writers. The results also suggest that non-native academic writing is in a developing stage and is influenced by English academic style of writing by the appropriate and enough uses of citations. Like non-native writers in ME, they tried to establish their membership in academic discourse community by using evidentials.

Native research articles in MED had a higher number of code glosses than non-native research articles. In this study, native writers of hard sciences, i.e., medicine and mechanical engineering proved the Anglo-Saxon traditions in which as Dahl (2004, p.1822) states the author wants "to be clearly visible in the text, taking responsibility for the argumentation as well as providing signposts for the reader to ease processing".

Illocutionary resources and transitions were more common in the articles of native writers than in the articles of the non-native. These results were not consistent with the finding obtained from the AL and ME articles in which non-native writers used more illocutionary resources.

Distribution of TMRs in AL Articles of Native and Non-Native Writers

Overall Distribution

The frequency of TMRs across three sections of AL research articles written by native and non-native writers was computed per 1,000 words. The results showed that the overall distribution of TMRs in articles of native writers (58.32 per 1,000 words) was greater than the articles of non-native writers (56.40 per 1,000 words). The results of the Chi-Square test demonstrated that the difference between native and non-native in the use of TMRs in AL articles was significant. This difference may be due to the unfamiliarity of non-native writers with the norms of academic writing or with the essential characteristics of disciplinary community, i.e., metadiscourse resources. As Hyland (2004) points out metadiscourse resources are particularly important at advanced levels of academic writing because these resources enable writers to present information in a meaningful and appropriate way to a particular disciplinary community.

Rhetorical Distribution

The frequency of TMRs across three sections of AL articles written by native and non-native writers was computed per 1,000 words. Table 13 shows the total number of words; the distribution of TMRs across three sections of AL articles written by native writers, and their total frequencies. As it is shown in the Table, there are 1017 TMRs

occurrences in the articles of native writers; this represents the total frequency of 58.32 per 1,000 words. The table also indicates that the highest concentration of TMRs is in the Results & Discussion section (59.09 per 1,000 words) followed by Introduction (57.35 per 1,000 words) and Abstract sections (49.16 per 1,000 words).

Table 13. Frequency of TMRs across Three Sections of AL Articles Written By Native Writers

| AL Research Articles (Native) | | | | |
|-------------------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | 773 | 3226 | 13438 | 17437 |
| Total devices of TMRs | 38 | 185 | 794 | 1017 |
| F per 1,000 | 49.16 | 57.35 | 59.09 | 58.32 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

Table 14 below illustrates a detailed distribution of TMRs in AL research articles of non-native writers. The table shows that the total frequency of TMRs is 56.40 per 1,000 words with 530 TMRs occurrences. According to the Table 14, the Introduction (59.32 per 1,000 words) in the articles of non-native writers contains more TMRs followed by Result & Discussion (55.79 per 1,000 words) and Abstract sections (52.56 per 1,000 words), not coinciding with the articles of native writers of AL.

Table 14. Frequency of TMRs across Three Sections of AL Articles Written By Non-Native Writers

| AL Research Articles (Non-Native) | | | | |
|-----------------------------------|----------|--------------|---------------------|-------|
| Total words | Abstract | Introduction | Result & Discussion | Total |
| | 799 | 2343 | 6255 | 9397 |
| Total devices of TMRs | 42 | 139 | 349 | 530 |
| F per 1,000 | 52.56 | 59.32 | 55.79 | 56.40 |

Note: F= Frequency, TMRs= Textual Metadiscourse Resources

The results in the rhetorical distribution of TMRs in the articles of native and non-native writers were not identical. The main finding is that the Result & Discussion section in the articles of native writers contained the highest, but in the articles of the non-native, it is the Introduction section that had the highest incidence of TMRs. It seems that for native writers of AL the challenging section of article in persuading the audience is Result & Discussion section and for non-native writers is Introduction section.

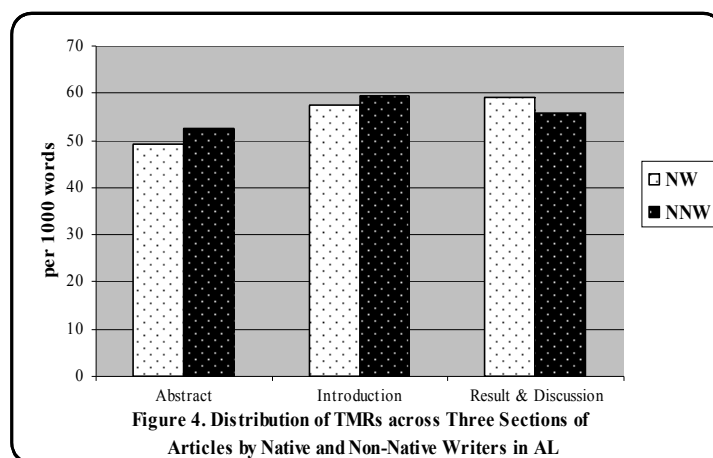


Figure 4. Distribution of TMRs across Three Sections of Articles by Native and Non-Native Writers in AL

Categorical Distribution

In order to find out the differences between native and non-native writers in the use of different categories of TMRs in AL articles, the frequency of TMRs in each category was expressed per 1,000 words and their percents were calculated. Table 15 represents the categorical distribution of TMRs in the articles of native and non-native writers. Within the articles of both native and non-native writers the three categories in order of frequency are: transitions (44.64% and 35.09% respectively), code glosses (28.91% and 34.72% respectively) and evidentials (10.52% and 9.81% respectively). Topicalizers both in native and non-native articles show the lowest frequency rate of TMRs, representing only 1.77% and 1.89%, respectively.

Table 15. Distribution of Different Categories of TMRs in Articles of Native and Non-Native Writers in AL

| AL Research Articles | | | | | | |
|-------------------------|---------------|------------|-------------|---------------|------------|------------|
| Categories of TMRs | Native | | | Non-Native | | |
| | F Per 1,000 W | Percent | Raw number | F Per 1,000 W | Percent | Raw number |
| Topicalizers | 1.03 | 1.77 | 18 | 1.06 | 1.89 | 10 |
| Sequencers | 2.12 | 3.64 | 37 | 2.34 | 4.15 | 22 |
| Illocutionary resources | 3.33 | 5.70 | 58 | 4.68 | 8.30 | 44 |
| Code glosses | 16.86 | 28.91 | 294 | 19.58 | 34.72 | 184 |
| Transitions | 26.04 | 44.64 | 454 | 19.79 | 35.09 | 186 |
| Evidentials | 6.14 | 10.52 | 107 | 5.53 | 9.81 | 52 |
| Endophorics | 2.81 | 4.82 | 49 | 3.40 | 6.04 | 32 |
| Total | 58.32 | 100 | 1017 | 56.4 | 100 | 530 |

Note: F = Frequency, TMRs = Textual Metadiscourse Resources, W = Words

As for the more common individual TMRs studied – i.e. transitions, code glosses, and evidentials – the results indicated similar patterns in their use in the native and non-native alike. In regard to the total frequency of actual occurrences, the transitions were the most common type of TMRs. Topicalizers, on the other hand, appeared in much lower frequencies in research articles of both native and non-native writers.

In the case of endophorics, illocutionary resources, and sequencers, non-native writers of AL used these resources more than native writers.

Conclusion

TMRs are complex devices with a variety of functions and they are central to the coherence and organization of research articles. The results of this study suggest that the use of TMRs in academic discourse is regulated by the conventions each discourse community has to rely on. The results obtained in the present study show significant differences among ME, MED, and AL research articles in

three sections of Abstract, Introduction, and Result & Discussion. They also show that MED writers of research articles use more TMRs than AL and ME writers. In the case of rhetorical distribution one interesting result is that in the three disciplines, Introduction section contains more TMRs than Abstract and Result & Discussion sections. In three disciplines the categories of transitions, code glosses, and evidentials are the most widely used ones in three sections of research articles. There was a similarity in the distribution of TMRs between ME articles of native and non-native writers because there was not a significant difference between native and non-native writers in the use of TMRs in three sections of Abstract, Introduction, and Result & Discussion sections. In these two groups there were more TMRs in the Introduction section. But in the case of categorical use there are some differences and they don't act consistently in different sections.

In MED research articles, there was a difference in the use of TMRs between native and non-native writers in three sections. Introduction section in the research articles of native writers and Result & Discussion section in the research articles of non-native writers contained the highest occurrences of TMRs. Code glosses in the research articles of native writers and transitions in the research articles of non-native were as the first priorities.

There was a difference in the use of TMRs between native and non-native writers in AL research articles. In this discipline, the Result & Discussion section in the articles of native writers and Introduction section in the articles of non-native writers contained the highest occurrences. There were similarities in the use of TMRs categories between the groups of native and non-native writers.

Lack of familiarity with these resources of academic discourse may cause difficulties for those students who want to be considered as a member of disciplinary community. The awareness of TMRs provides this opportunity for learners to meet the needs of audience. Therefore, it seems necessary to devote special attention to the teaching of these resources to the foreign language learners of English in the research or ESP course. Our understanding of the TMRs also needs to be sharpened by doing further research in this area of rhetorical competence.

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Appendix 1

Sources of the selected articles

Mechanical Engineering

Proc.IMEch E, Part J:J. Engineering Tribology (1 article)

Proc.IMEch E, Part C:J. Mechanical Engineering Sciences(1 article)

Journal of Manufacturing Processes (1 article)

International Journal of Solids and Structures (1 article)

Proc. Instn Mech. Engrs, Part B:J. Engineering Manufacture(1 article)

Journal of Applied Sciences (2 articles)

American Journal of Applied Sciences (2 articles)

Australian Journal of Basic & Applied Sciences (1 article)

Medicine

BMC Dermatology(3 articles)

BMC Gastroenterology(1 article)

Journal of the American College of Cardiology(2 articles)

Iranian Cardiovascular Research Journal(1 article)

Iranian Journal of Reproductive Medicine(1 article)

The International Medical Journal(1 article)

Tannffos(1 article)

Applied Linguistics

SYSTEM (4 articles)

Journal of English for Academic Purposes (2 articles)

Journal of Second Language Writing (1 article)

The Modern Language Journal (1 article)

Asian EFL Journal (1 article)

Asian ESP Journal (1 article)

Appendix 2

A list of TMRs that was compiled from Hyland (2005), Dahl (2004), Rahman (2004), Hempel & Degand (2008) and Dafouz-Milne (2008) to determine the frequency of these resources.

| | |
|--|--|
| Topicalizers | I/we tend to include |
| As for | (the) Intent of the study/ paper/analysis |
| Concerning X | (the) Interest of the study/ paper/analysis |
| For X | It is suggested |
| In regard to | It is proposed |
| In the case of X | It may be concluded |
| In ... terms of | (the)Objective of the study/ paper/analysis |
| Now | (my)Purpose here is |
| So | This article reports on |
| Turn to | This report summarizes. . . |
| With regard to | This study deals with |
| Sequencers | The study compared/set out toinvestigate/attempted to |
| First/second/third/... | predict/was carried out to determine.... |
| Firstly/secondly/thirdly/... | Code glosses |
| Finally | As far as X is concerned |
| Last | Concerning |
| Lastly | e.g. |
| Next | Especially |
| Numbering (1, 2, 3, etc.) | For example |
| On the one hand . . . on the other hand | For instance |
| One/another | i.e. |
| Respectively | In other words |
| Then | In particular |
| To begin | In terms of |
| Illocutionary Resources | In the sense that |
| (the) Aim of the study/ paper/analysis | Like as |
| (the) Goal of the study/ paper/analysis | Namely |
| I/we argue that, | Parentheses |
| I/we agree | Punctuation devices |
| I/we conclude that | Regarding |
| I/we emphasize that | Such as |
| I/we hope to persuade | |
| I/we point out that | |

| | |
|--------------------|---------------------------------|
| I/we propose | That is |
| I/we report | Rather |
| That is to say | Similarly |
| This means | Since |
| To put it simply | So |
| Transitions | Still |
| Accordingly | Then |
| Additionally | Thereby |
| Also | Therefore |
| Although | Thus |
| And | Whereas |
| As | While |
| As a consequence | Yet |
| As a result | Evidentials |
| As well | According to X |
| Because | [ref. no.]/ [name] |
| Besides | (name, date) |
| But | X states/demonstrates/argues... |
| By contrast | X says that "...." |
| Consequently | Endophorics |
| Conversely | Already |
| Correspondingly | Article |
| Even though | Chapter |
| Further | Following X |
| Furthermore | Here |
| However | Now |
| Despite | Paper |
| Due to | Previously |
| Generally | Research |
| If | Section |
| In contrast | So far |
| In the same way | Study |
| Instead | Work |
| Likely | X above |
| Likewise | X before |
| Moreover | X below |
| Nevertheless | X earlier |
| On the contrary | X later |
| Or | |
| Otherwise | |
| Overall | |