A COMPARISON OF MOVES IN CONCLUSION SECTIONS OF RESEARCH ARTICLES IN MECHANICAL ENGINEERING AND APPLIED LINGUISTICS

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ABSTRACT
The purpose of this research was to draw a comparison between the moves used in the two known distinct academic territories, namely Hard and Soft sciences. To meet this end we chose the two fields of Mechanical Engineering and Applied Linguistics to represent Hard and Soft sciences, respectively. Forty research articles written by native and non-native researchers were selected from Mechanical Engineering and Applied Linguistics. The Conclusion and Implication sections of these Research Articles (RA) were analyzed for their moves based on Dadley-Evans’s (1994) model. The frequency analysis of the moves along with an independent samples t-test showed significant differences between the moves employed in Conclusion sections of RAs in Mechanical Engineering and Applied Linguistics. The results also indicated a shortcoming regarding the Model proposed by Dadley Evans (1994) and the findings of the research include Implications to develop a new and more sophisticated Model for the analysis of the Conclusion sections of RAs.

KEYWORDS: Conclusion, moves, Mechanical Engineering and Applied Linguistics, Dadley Evans’s model

INTRODUCTION
As one of the most important genre of knowledge production, Research Articles (RAs), have been the focus of analysis by several researchers (e.g. Bazerman, 1988; Berkenkotter & Huckin, 1995; Brett, 1994; Holmes, 1997; Hopkins & Dudley-Evans, 1988; Swales, 1981, 1990). In the past two decades different studies have analyzed textual products such as dissertations, and most of the studies tried to reach patterns for the organization on different sections of those writings (Hyland, 1992, 1996; Salager-Meyer, 1992; Thompson & Ye, 1991; Mann & Thomson, 1988;...
On the other hand, some scholars have focused more on institutional contexts that the RA genre has evolved in and also they have focused on behavior of genre users, particularly in science (Bazerman, 1988; Berkenkotter & Huckin, 1995; Rymer, 1988). The researchers’ main concern in this study is on the moves employed in RAs. According to Kanoksilapatham (2005), a move refers to the section of a text that performs a specific communicative function.

Based on Hyland (2008), Swales has been most influential in the emergence of ESP, due to his breakthrough into the move structure of RAs in 1981. Since then research studies came to focus on the organizational patterns of RA sections. The studies on the RA Introductions are the most important line of the researches among others that has also caught the most attention (Swales, 1981, 1990); in addition, others include studies of the Results sections (e.g. Brett, 1994, in sociology RAs) and the Discussion sections, in sociology, political sciences, and history RAs (Holmes, 1997), in economics, business and financial articles (Lindeberg, 1994), and across a wide range of sciences (Berkenkotter & Huckin, 1995). Most studies appear to treat each RA section as an independent entity, except that Berkenkotter and Huckin relate their analysis of the Discussion to the Introduction. Regarding the possible relation between the function of RAs in their respective fields and the moves employed in RAs’ specific sections, we can report Swales (1990) which welcomes this idea. Swales also notes that Results and Discussion sections are often merged, and refers briefly to ‘additional or substituted sections labeled Conclusions, Implications or Applications and so on’ (p. 170). However, Swales (1990) does not go on to offer a model for the move structure of final sections, which as he proposes, are merged Conclusions, Implications or Applications sections.

No one who has ever had the experience of writing or reading RAs, would argue against the fact that Conclusion /or Implications sections of RAs are important, and that they are related to the whole RA.

The only study in the literature regarding final sections of RAs, is Yang and Allison’s (2003) study, which studied 20 RAs in Applied Linguistics for their organizational patterning focusing on moves and steps as the unit of analysis. In their study, they came up with three recurrent moves, namely, summarizing the results, evaluating the results, and making deductions based on findings. Although Yang and Allison’s (2003) research was considered a novel study at the time it was carried out, it suffered from some major short-comings such as unrepresentative number of articles, and not using any known model in their study.

The present study, however, was an attempt to fill the gap in the literature regarding the move analysis of final sections of RAs. This study is different from others in that it has made use of Dudley Evans’s (1994) model for the Discussion sections of RAs as a framework to analyze the move structure of Conclusion sections. The purpose of the study was two-fold: the move analysis
of Conclusions sections, and the exploration of the relationship between neighboring sections in RAs, namely, discussion and Conclusion sections.

Our choices of disciplines, i.e., Applied Linguistics and Mechanical Engineering, representing Hard and Soft sciences, respectively, is based on Smith, L. D., Best, L. A., Stubbs, D. A., Johnston, J. and Andrea Archibald, B. (2000) who applied Latour’s (1990) distinction between Soft and Hard sciences and devised a continuum for hardness of sciences (Figure 1). Based on Latour (ibid.), the use of graphs to present the results is a good criterion to decide on their hardness and softness.

![Graph use as a function of the rated hardness of seven scientific disciplines](image)

*Source:* Data from Cleveland, op. cit. note 19.

*Figure 1:* Graph use as a function of the rated hardness of seven scientific disciplines.

The study had two main motives, one was the fact that the conclusion sections of RAs have not been studied to date, especially in a comparative research design, second the researchers try to pave the path for the development of a model of the moves in Conclusion sections of RAs.

Furthermore, a close look into the literature on teaching writing reveals that most students, even those with good command of English, often have difficulties in expressing themselves in writing. Students’ main difficulties are not just in choosing proper vocabulary and correct grammar rules but also in organizing the structure depending on topic and selecting the right structure for getting across the right intention. Therefore, investigating the organization of different written texts, and the moves and steps they are comprised of, can provide invaluable help in foreign language teaching and learning. This study aims at investigating the moves that are used in Conclusion
parts of the papers in Mechanical Engineering and Applied linguistic journals written by either native or non-native researchers to give a better understanding of the moves used in Conclusion and Implication sections of papers in the two fields and to explore any differences in the inclusion of genres between native and non-native researchers.

REVIEW OF PREVIOUS STUDIES ON RAS
Considering the fact that research reports are of great importance to students of higher education all over the world, university students often face difficulties comprehending the forms and functions of various sections of RAs (Swales, 2004). There are, unquestionably, a great number of samples of research articles and dissertations available. However, novice writers may find these forms and functions of writing ambiguous and incomprehensible (Basturkmen, 2009). The combinatory framework has been used by many studies which have focused on generic variations across disciplines (see Samraj, 2005; Ozturk, 2007; Lores, 2004; Kanaksilapatham, 2005; Bruce, 2009, for instance). Samraj (2005) came up with a closer similarity in terms of function and organization between research article introductions and abstracts in Conservation Biology than was the case with Wild Life Behavior articles.

Peacock (2002) analyzed the moves used in discussion sections of RAs in seven disciplines namely, Physics, Biology, Environmental Science, Business, Language and Linguistics, Public and Social Administration, and Law, using Dudley Evans’s (1994) model for Discussion sections of RAs, and they offered a revised version of Dudley Evans’s (1994) model which is given below:

1. information move (background about theory/research aims/methodology)
2. finding (with or without a reference to a graph or table)
3. expected or unexpected outcome (comment on whether the result is expected or not)
4. reference to previous research
5. explanation (reasons for expected or unexpected results)
6. claim [contribution to research (sometimes with recommendations for action)]
7. limitation
8. recommendation (suggestions for future research).

The three-part framework and move cycle series are:
- Introduction (moves 1, or 2, or 6)
- Evaluation (the key move cycles are 2+4, 2+6, 3+4, and 3+5. Other less common cycles are 6+4 and 4+6)
- Conclusion (moves 2+6, or 8, or 8+6, or 7+6).

The corpus in Peacock’s (2002) study, which consisted of 252 articles comprising a 1.4 million word corpus, adds more value to the findings of his study. Not all the move analysis studies are done on RAs, for example, Ding (2007) analyzed 30 medical/dental school application letters using both a hand-tagged move analysis and computerized analysis of text features, and he offered five recurrent moves, namely, explaining the reason to pursue the proposed study, establishing credentials related to the fields of medicine/dentistry, discussing relevant life...
experience, stating future career goals, and describing personality. Studies such as Ding (2007) help the researchers understand and sometimes redefine limits and horizons of ESP.

Of the studies done on RAs in Applied Linguistics, Tseng (2011) is more important. He examined 90 research articles from Applied Linguistics for their move structure and verb tense, and found a pattern for verb tense in each move. The researcher also found that there is variation between abstracts written by Native and Non-Native researchers.

Yaghoubi and Tarlani (2012), examined 40 RAs in Applied Linguistics, 20 of which were written by Native and 20 ones by non-native Researchers using Swales’ (1999) model for introduction sections of RAs, found that Native and Non-Native writers show different trends in their application of the moves.

In another study, Kanaksilapatham (2005) employed Swales’ model for the moves used in articles and concluded that the moves are present in the articles, and the only thing that variation variation was observed was the clustering of the moves. The primary departure from Swales model lied in the patterns of cyclical configuration between moves. One other famous line of research on RAs has focused on the ethnicities and linguistic background of the writers in one single discipline, and tried to see if native or non-native writers vary significantly in they employment of the moves and traditional categories. Taylor and Chen (1991) conducted an study on RAs considering the nativity variable and they observed systematic variation in using the moves, the proposed that the observed variation was due to the interconnected discourse structures and “culturo-linguistic systems” (p. 319). Ansarin and Rashidi (2009) in an study on the abstracts by college students in the filed of Applied Linguistics, they study showed that the macro-structures employed in the abstracts were bound by idiosyncratic characteristics of the ethnic group, for whom the texts are written, rather than by the conventions of the authors’ native language writing culture. These and several other studies have been the movements which triggered the avalanche of contrastive studies on rhetoric and writing “examines differences and similarities in ESL and EFL writing across languages and cultures” (Connor, 2002, p. 493). As a result of this prioritization of rhetorical studies Atkinson (2004) along with several other researchers beats the drum for more attention to culture as an important variable in contrastive studies of writings. As Flowerdew (2002) puts it, contrastive analysis of writings by students and specialists in different academic fields points to the discrepancies in how information is cobbled together in a piece of writing in different languages and cultures. In other words, it brings to light “vast complexities of the cultural, social, situational and contextual factors affecting a writing situation (Connor, 2004, p. 304). Another profound effect of Contrastive study of Writings and texts was that it helped understand and elaborate on different cultural conventions which come to play in writing. However, it is natural to expect some culture specific peculiarities in the text production.

Different models have been suggested for different parts of papers by different scholars. The present study makes use of Dudley-Evans’s Model for Research Articles Discussion Sections. According to this model, discussion parts of research articles are generally made up of the following moves:

1. Information move (background about theory/research aims/methodology)
2. Statement of result (either a numerical value or reference to a graph or table)
3. Finding (same as statement of result, but without a reference to a graph or table)
4. (Un)expected outcome (a comment on whether the result is expected or not)
5. Reference to previous research
6. Explanation (reasons for unexpected results)
7. Claim (a generalization arising from the results: contribution to research)
8. Limitation
9. Recommendation (suggestions for future research).

RESEARCH QUESTIONS
The researchers tried to answer the following research questions:

1. How the moves are employed in the Conclusion sections of RAs in Mechanical Engineering and Applied Linguistics?
2. How the moves are employed by Native and Non-Native researchers in the Conclusion sections of RAs?
3. Is there any significance difference between the Conclusion sections of RAs in Mechanical Engineering and Applied Linguistics as far as the Application of moves in their Conclusion sections is concerned?
4. Is there any significance difference between the Native and Non-Native researchers’ application of moves?
5. Do the two neighboring sections, i.e., discussion and Conclusion of RAs, share any of the moves used in their structure?

METHODOLOGY
Corpus
The corpus for this study includes forty RAs, twenty ones in the field of Mechanical Engineering, ten of which were selected from Iranian journals written by EFL speakers and ten of them were chosen from the large pool of RAs written by Native English speakers. The same number of RAs was selected from Applied Linguistics in a way that ten of them were written by Native and the other ten were written by non-native Iranian researchers. In selecting the articles, the researchers did their utmost effort to meet Nwogu’s (1997) three criteria, namely, representativeness, reputation, and accessibility. This means, the selected articles were almost representative of the genre (research articles) in content (all the articles were also controlled for their topics to prevent any incongruity that might distort the result of the study) in the two fields of Applied Linguistics and Mechanical Engineering. Regarding reputation requirement, it can be claimed that all English journals had strong international stance and with regard to Persian journals, they were all peer-reviewed and most cited journals in Iran. And finally, the ease with which the articles could be accessed contributed to the realization of the accessibility criterion.

All English articles which were written by native English writers were randomly selected from the five most leading international journals in the fields (namely, Applied Linguistics, English for
Instrument

Dudley Evans’s (1994) model for the moves employed in discussion sections of RAs was employed to analyze the Conclusion and Implications sections of RAs. Since there was no previously developed model for final sections of RAs, the researchers had to make use of a similar model. As Swales (1999) contends, in RAs the researchers seem to sum up the findings that they have discussed in the discussion section of the Conclusion section of RAs. So, due to the similarity of the two sections, and also the fact the cycle introduced in discussion section contained a Conclusion cycle, the researchers made use of Dudley Evans’s (1994) model in investigating the moves employed in Conclusion and Implication sections of RAs. He also introduced cycles which are made of different combinations of moves mentioned above.

Data Analysis

Two raters rated the articles based on Dudley Evans’s (1994) model in a two week period of time. Inter-rater reliability of 0.9, which is a good index of reliability, was calculated for the raters, implying that the raters performed their jobs quite consistently.

Longer articles were included in very few cases where moves represented comparable patterns. The unit of analysis was the sentence though there were moves that were represented by multiple sentential units. In such cases, the whole group of the sentences was assigned to one move. After the moves were analyzed, a frequency count and also a chi-square analysis were run to answer the research questions which were of the two types of qualitative and quantitative.

RESULTS AND DISCUSSION

To answer the first research question about how the moves are employed in Conclusion sections of RAs in Mechanical Engineering and Applied Linguistics, the researchers did a frequency count in the RAs in two fields.

<p>| Table 1: Frequency of Moves in Mechanical Engineering and Applied Linguistics |
|-------------------------------|------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|</p>
<table>
<thead>
<tr>
<th>Move 1</th>
<th>Move 2</th>
<th>Move 3</th>
<th>Move 4</th>
<th>Move 5</th>
<th>Move 6</th>
<th>Move 7</th>
<th>Move 8</th>
<th>Move 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Linguistics</td>
<td>17</td>
<td>3</td>
<td>18</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>85%</td>
<td>15%</td>
<td>90%</td>
<td>20%</td>
<td>30%</td>
<td>10%</td>
<td>70%</td>
<td>20%</td>
<td>55%</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>18</td>
<td>5</td>
<td>18</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>90%</td>
<td>25%</td>
<td>90%</td>
<td>20%</td>
<td>10%</td>
<td>0%</td>
<td>30%</td>
<td>0%</td>
<td>35%</td>
</tr>
</tbody>
</table>

As Table 1 shows, all the moves have been employed in all the RAs of two fields. However, moves 2, 5, 6, and 7 suggest a meaningful point regarding the two disciplines.
Moves 2 which is the statement of the result, is used more often in Mechanical Engineering RAs’ Conclusion sections than in Applied Linguistics, which suggests that in most cases the researchers in Applied Linguistics avoid direct mentioning of the results; while as shown by the frequency of the move, the researchers in Mechanical Engineering tend to be more explicit in reporting the results of their study.

Reference to previous study, i.e., move 5 shown in Table 1, has been used 6 times in Applied Linguistics and 2 times in Mechanical Engineering RAs. This might suggest that writers in Applied Linguistics have an inclination to refer more to the previous studies, or probably, they attach more importance to the related studies than scholars in the field of Mechanical Engineering.

Move 6, i.e., reasoning for the unexpected results, has a zero frequency in RAs in Mechanical Engineering, which can be considered quite justifiable, due to the hardness of the field in that, in Hard sciences there are relatively less unexpected results. But the same move, having the frequency of 3 in Applied Linguistics points to differences between the two fields. However, a word of caution is necessary because these findings might have deviations from the truth if larger samples are assigned to the study.

Claiming is the next move which is of remarkable significance, since its frequency is so different in the two fields under study. Move 7, i.e., generalization from the results, has been used 14 times in the twenty Applied Linguistics RAs equaling to 70 percent of the time; it is worthy of notice that the same number for Mechanical Engineering RAs is 6, which is 40 percent lower.

This suggests that in Applied Linguistics, the researchers are apparently more willing to generalize than their counterparts in Mechanical Engineering.

To give a better presentation of the moves employed in Mechanical Engineering and Applied Linguistics a Bar Chart has been provided in Figure 2 below.
To answer the second Research Question, i.e., how Native and Non-Native researchers in the two fields used the moves in the Conclusion sections of RAs, the moves were counted, and the results are shown in Table 2.

Table 2: Moves Employed by Native and Non-Native Researchers

<table>
<thead>
<tr>
<th></th>
<th>Move 1</th>
<th>Move 2</th>
<th>Move 3</th>
<th>Move 4</th>
<th>Move 5</th>
<th>Move 6</th>
<th>Move 7</th>
<th>Move 8</th>
<th>Move 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native</td>
<td>19</td>
<td>3</td>
<td>18</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>95%</td>
<td>15%</td>
<td>90%</td>
<td>20%</td>
<td>30%</td>
<td>5%</td>
<td>50%</td>
<td>10%</td>
<td>50%</td>
</tr>
<tr>
<td>Non-Native</td>
<td>16</td>
<td>5</td>
<td>18</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>80%</td>
<td>25%</td>
<td>90%</td>
<td>20%</td>
<td>10%</td>
<td>10%</td>
<td>50%</td>
<td>10%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Figure 3 provides a more lucid description of the moves employed by Native and Non-Native Writers below:
With regard to Research Question three that was concerned with whether a significant difference existed between Native and Non-Native writers in their application of the moves in the Conclusion sections of RAs, a Chi-Square test was performed to determine if Native and Non-Native speakers of English had used different moves in the Conclusion parts of research articles. It was found that there was not a significant difference between Native speakers and Non-Native speakers as far as the use of moves in the Conclusion section of RAs are concerned, $X^2(8, N=140) = 3.06, p>.05$.

Another chi-Square analysis was run to see if there is a significant difference in the application of the moves between the RAs in Mechanical Engineering and Applied Linguistics. As can be seen by the frequencies cross tabulated in Table 4, there is not a significant difference between the use of moves in the Conclusion section of RAs in Applied Linguistics and Mechanical Engineering, $X^2(8, N=140) = .20, p>.05$. This suggests that it is not statistically improbable that the results may have happened by chance.

Table 3: Chi-Square Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>10.984a</td>
<td>8</td>
<td>.203</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>13.652</td>
<td>8</td>
<td>.091</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>5.038</td>
<td>1</td>
<td>.025</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>140</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 10 cells (55.6%) have expected count less than 5. The minimum expected count is 1.29.

Table 4: Chi-Square Tests
As the results show, there is a great deal of similarity between the Discussion and Conclusion sections, as the two neighboring final sections in RAs. They shared many of the moves in their structures. Information, finding, claim, (de)limitation, recommendation, and implications moves were found in the Conclusion sections, suggesting that the two neighboring sections, namely, Discussion and Conclusion shared these moves.

CONCLUSION AND IMPLICATIONS

The researchers in the current study compared the moves in the Conclusion sections of RAs in the two fields of Mechanical Engineering and Applied Linguistics, which represented Soft and Hard sciences. The framework for this move analysis was the model for the Discussion sections of RAs proposed by Dudley Evans (1994).

With regard to the findings of the this study, Dudley Evans (1994) model needs to be modified to suit the analysis of Conclusion sections of RAs, since discussion sections are not usually the last sections as observed; this finding is in line with Peacock (2002) who also concluded that Dudley Evans’s (1994) model needed revision and improvement.

Although statistical analysis did not show any significant difference between Native and Non-Native writers in their application of the moves in the Conclusion sections of RAs, mother tongue is believed to be a presumably influential factor in employing the moves.

The results also did not show any significant difference between moves in RAs of Native and Non-Native researchers. The data also shed light on the short-coming of the Model proposed by Dudley Evans (1994), because move 1 had not been predicted by the Model.

Taking the findings of the present study into account, the following Model for the Conclusion sections of RAs is suggested. Moreover, it is worth mentioning that the corpus for this study was comprised of 40 RAs, which might be considered relatively small for a claim like this which needs to be rectified in future related studies.

- Information move (background about theory/research aims/methodology)
- Finding (same as statement of result with/without reference to a graph or table)
- Claim (a generalization arising from the result)
- (De)limitation
- Recommendation (suggestions for further research)
Move 6 is an optional move which is usually employed in RAs in which there is a single unified section titled Conclusion and Implications.

Actually, the study did not face any major limitations; however, there were certain delimitations which need to be taken into account in the interpretation of the findings. Due to the limitations in the available resources and time pressure, the researchers could not afford to include greater number of papers from each given Field in the analysis, a fact which could have altered the results of the study. Another delimitation of the study was taking only two fields of study in the analysis, i.e., one from the hard sciences and another from the soft sciences.

Based on the findings of this study the following researches are suggested:
1. Other fields belonging to Hard and Soft scientific territories can be compared for their move structure in the Conclusion sections.
2. Courses related to composition of RAs in universities can be closely examined to find out any probable relationships between teaching writing and the moves used in the actual production of the learners.

REFERENCES


