

“Indicating a Research Gap” in Computer Science Research Article Introductions by Non-Native English Writers

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Received: October 12, 2015 Accepted: November 13, 2015 Online Published: November 30, 2015

doi:10.5539/ass.v11n28p293

URL: <http://dx.doi.org/10.5539/ass.v11n28p293>

Abstract

Writing research article to a peer reviewed publication is a complex process and involves daunting communication with the referees, co-authors and editors. Publication writing is more challenging than the usual communicative expression yet; prolific writers often pass through the processes without too much difficulty. Prolific writers draw on many writing strategies and one of the strategies is by highlighting the research gap. Most of the time, the research gaps highlighted are those related to the intended research niche and the intended study. While the strategy has been used and taught in many research writing instances, the strategy has been reported to be unpopular amongst the non-native English research writers. Although many non-native English writers are aware of the importance of the research gap, not much is known on how this strategy is being practiced. In view of the underutilization of this strategy and limited studies on the strategy in non-native context, this paper investigates the use of this strategy in 150 research articles introductions in Computer Science disciplines written by academicians in Malaysian Universities. The finding of this study confirmed that “indicating research gap” is underutilized by the research articles written in the corpus. In addition, this paper also described four various ways on how this strategy is commonly used by the non-native writers. The confirmation and authentic examples may be useful in the teaching and learning of research article writing.

Keywords: English second language, research article, writing, computer science, non – native writers

1. Introduction

1.1 Problem of the Study

Writing research article for publication is more challenging than the usual communicative writing yet; prolific research writers often pass through the processes without too much difficulty. Prolific research writers draw on many writing strategies (Khamis & Abdullah, 2012; 2013) and one of the strategies is by highlighting the research gap. Studies have shown (Shehzad, 2012, Anthony, 1999) that this strategy is gaining recognition in Computer Science global research writing, however not much is known on how this strategy is being utilized by the Computer Science non-native English writers. While the strategy has been used and taught in many research writing classes, the strategy has been reported to be unpopular amongst the non-native English research writers (Kanoksilapatham, 2007; Fakhri, 2004; Hirano, 2009). Kanoksilapatham (2007) investigated on the similarities of research articles in Thai and English whereas Fakhri (2004) looked at the research articles introductions written by the Arabs writers while Hirano (2009) studied the phenomena in the context of Brazilian Portuguese. While these studies have reported on the practice amongst the non-native writers, the practice amongst the Malaysian writers is yet to be investigated. In view of the fact reported by the researchers that the characteristics and problems in research writing can be uniquely related to the nativity of the writer (Suryani, Yaacob, & Hashima, 2015), this study intends to zoom in the use of this strategy into the research article introductions written by the academicians in Malaysian universities.

1.2 The Strategy of Indicating the Research Gap

Indicating the research gap entails the writer to recount the research area and point out the research space which exists in the body of the research. The writer tries to convince the audience that the research space requires further investigation and is worth studying. Initially, the research area is described in general and then, the research is elaborated further with growing specificity that delves into the research niche. While giving the

account on the research niche, the research gap is identified after which, the research space is created and the necessity for the intended study is specified. The research gaps highlighted are particularly related to the intended research niche and study. The act of indicating the gap is described as “builds up a “demand” for “current contribution” (Shehzad, 2008, p. 6). The strategy of “Indicating a research gap” has been identified as one of the step that contributes to the move on indicating the research niche in Create-A-Research-Space model (CARS)(Swales, 2004). The CARS model (Swales, 2004) suggested a few rhetorical moves and steps that can be utilized in writing research article introduction. While the analysis for this study used all the strategies suggested in the CARS model (Swales, 2004), this paper reports only on one of the rhetorical strategies which is “Indicating a research gap”. The focal point of this paper is on this particular rhetorical strategy and such focus is determined to ensure that deeper explanation on the finding can be made.

1.3 Previous Studies

Swales (2004) has elaborated on the use of move analysis to identify the strategies in research article introductions and proposed that the strategy of “Indicating a research gap” is not an obligatory strategy in writing the introductions. Even though this strategy is suggested as non-obligatory by Swales (2004), many studies found that this strategy is utilized by most of the researchers in Computer Science discipline (Posteguillo, 1999, Anthony, 1999, Shehzad, 2012). The study by Posteguillo (1999) found that “Indicating a gap” is the most preferred strategy in highlighting that the intended research. Posteguillo (1999: 143) puts it “indicating a gap appears as the preferred means of presenting the need for the work”. Anthony (1999) who studied the introduction section of the best papers in Software Engineering found 91.7% of the researchers in the study practiced this strategy. Shehzad (2012) found 95% of the research article introduction in Computer Science discipline also utilized this strategy. In other words, studies on research article introductions have shown that the strategy of “Indicating a research gap” is highly used amongst Computer Science research article writers. While the strategy is being used by the Computer Science research writers at the global scale, it is unclear how this strategy is being used by the non native writers. Unlike the mentioned studies (Anthony, 1999; Posteguillo, 1999 and Shehzad, 2012) which did not put emphasis on the nativity of the writer, this study intends to explore further on how this strategy is being utilized by the non native writers particularly the academicians in Malaysian universities.

2. Method

Studies on research article writing have reported that researchers in different disciplines used different rhetorical strategies in writing (writers (Ina Suryani, Aizan, Noor Hashima & Salleh, 2015; Kanoksilapatham 2010; Sheldon, 2011). Taking heed from the reports on the significance of disciplinary variations on how writers write the research articles, this study focuses on the research article in Computer Science discipline. This study used two methods which are corpus analysis and interview.

2.1 The Corpus

Malaysian Universities Computer Science Scopus Articles Corpus is created for this study and the corpus includes 150 Computer Science research articles written by academicians in Malaysian universities. The analysis was conducted on the Introduction sections which comprises 98,597 words. Following Bowker and Pearson (2002 in Shehzad, 2005), Table 1 gives the profile of the Malaysian Universities Computer Science Scopus Articles Corpus.

Table 1. Profile of the corpus

Aspects	: 98, 597 words
Size	: 150 research articles
Number of texts	: Computer Science
Text type	: Introduction section of the Scopus indexed research articles
Authorship	: Written by academicians in Malaysian universities
Language	: English
Publication date	: 2010

The corpus are available both in the electronic and printed versions. Even though the records of the texts are registered using manual process, having the electronic version made the information retrieval faster (Suryani, Kamaruddin, Noor Hashima, Aizan, Rashid, & Desa, 2013).

Corpus sizes in similar studies indicate that the corpus size for this study is in the average range. Studies on research articles have similar sample size such as in the study by Dudley-Evans (1984 in Shehzad, 2005) used 156 research articles, the study by Swales and Najjar (1987) used 110 research articles, Habibi (2008) used 90 research articles and Perales-Escudero and Swales (2011) used 84 research articles. Shehzad (2010) suggested that rather than looking at the sheer size, it is more important to have a balanced mix group which has the potential to give results that are true indicators of the typical behavior, show central aspects of the language which can give enough samples of occurrences to establish reliable results. In line with the suggestion (Shehzad, 2010), the research articles in this study were chosen based on the Malaysian university groups as having a mix group would generate results which would be more typical to the target group.

2.2 Selection of the Research Articles

The universities in Malaysia can be categorized into 5 groups which are APEX University, research universities, comprehensive universities, focus universities, and Private universities. Each group allocates different amount of resources for researches which echoes to having different emphasis on the research writing. Table 2 tabulates the number of research articles affiliated with the respective university groups in Malaysia. The italicized fonts are details for the sampling from Research university group. The calculation was done based on the totals from each university group. However, many of the articles were co-written by authors from more than one university. To avoid confusion, the research articles were counted in only one of the university affiliation.

Table 2. Number of research articles by the university groups

University group	Number of research articles	Total counted
APEX	20	17
Research universities	94	77
Comprehensive	18	16
Focus	23	20
Private	21	20
Total	158	150

The ‘total counted’ column refers to where the article is being counted for the statistical analysis. For example, the total of research articles from each research universities is 94. However, because many of the articles overlapped in affiliation, the number of research articles titles is only 77 as the extra has been counted in for the other affiliation.

In the text selection process, the titles of the research articles are derived from the Scopus database. The keywords used for the database filters are affiliation, year 2010, research article, and Computer Science area. Filter function is also used to exclude Multidisciplinary articles and other document types. The orders of appearance for the titles are according to the highest citation on top. The highest cited paper are chosen because highly cited paper represents readership, impact and usefulness to the Computer Science area (Dong, Loh, & Mondry, 2005; Hirsch, 2005).

This qualitative study is further developed by performing move analysis on the selected Computer science research article introductions. The move analysis is employed using the rhetorical strategies proposed in CARS model (Swales, 2004) as the construct. As mentioned earlier, CARS model suggested a few strategies however this paper reports on only one of the strategies which is “Indicating a research gap”. In conducting the move analysis, each word, phrase and sentence in the paragraph is read carefully to identify any cue that relates to the construct. The cues for used in this study follows the suggestions in the studies by Mirahayuni (2001) and Ahmad (2001) which have provided descriptions on how to identify the cues for the strategies. In addition, semi structured interview with the writers were also used to substantiate the findings from the move analysis.

3. Results

The move analysis found that 73% of the research articles in the study have utilized the strategy of “Indicating a research gap”. The percentages of the occurrences according to the university groups are tabulated in Table 3.

Table 3. Percentage of realization for “Indicating a research gap”

University Group	Move 2 Step 1A
Apex University	70
Comprehensive University	38
Research University	82
Focus University	75
Private University	70
Total`	73

This study also investigates on how this strategy has been realized by the Malaysian writers. The move analysis of this study found that the strategy of “Indicating a gap” is fulfilled using a few other ways than criticizing the work of other researchers. The academicians in the Malaysian universities preferred to portray the research gap using the following four techniques. The four techniques used to realize the step of “indicating a research gap” can be classified mainly by:

1. Indicating limitation in the research area
2. Suggesting a problem that needs to be solved
3. Conveying the suggestions of research by previous researchers
4. Extending the works of others.

3.1 Technique 1: Indicating Limitation in the Research Area

In this first technique, the strategy of “Indicating a gap” is realized by indicating the limited research done in the research area. The technique of indicating the limited research to highlight the research gap is accomplished either by using adversative conjunction, by using various applications of the conjunction “however”, by giving direct statement on lack of study, or by giving a critical view on the previous works.

In the first example (UM4), the writer has used the Adversative conjunction ‘While’ and then proceed to indicate the limitation of the research done in the area hence accomplishing the step on Indicating a gap by stating ‘little information is available regarding...’ (lines 5-6). The Adversative conjunction is used at the beginning of the sentence which expressed the fact that the area has been studied, followed by the claim that not enough has been done. Here is how the technique has been applied in the excerpt (UM4)

While effects of the cigarette smoke on proteins expressed in 1
the bronchoalveolar lavage [36–38], nasal lavage fluid [39], 2
urine [40], lung tissue [41], bronchial airway epithelium and 3
pooled exhaled breath condensate samples [42] have been 4
analyzed, little information is available regarding the effects of 5
smoking on the whole saliva proteome. 6
(UM4) 7

In this excerpt (UM4), the writer listed out the citations which showed that the area that has been studied however at the same time the message on the limited information in the intended research area was clearly stated. The use of the Adversative conjunction coupled with the phrase of “little information is available.” has highlighted the limited information in the intended research area hence the strategy of “Indicating a gap” is realized.

The next excerpt (F19 UMT4 Pertanika2P3) also illustrated how the strategy of “Indicating a gap” is realized by using the first technique which is Indicating limitation in the research area. In this excerpt, the realization on the use of Adversative conjunction is coupled with a direct statement on lack of study in the intended research.

From historical times, carrageen and alginates from seaweeds 1
are used for medicinal purposes. In spite of their usefulness, 2
unfortunately only a little work has been done on the 3
incorporation of seaweed in formulated feeds of freshwater 4
cultivable fishes. 5

(F19 UMT4 Pertanika2P3)

In the first sentence of this excerpt (F19 UMT Pertanika2P3) the writer has initiated niche idea which is the

'seaweeds' by stating that seaweeds have been used for medicinal purposes. After pointing out that the work in this area has been in practice, the writer proceeded to indicate the limitation in the research area thus, accomplishing the step on Indicating a gap. In this excerpt the writer used the Adversative conjunction 'In spite of' to shift the strategy from initiating the niche area to indicate the limitation in the research gap. And then the writer completed the step by stating 'a little work has been done' (lines 3-4).

Another example on how "Indicating limitation in the research area" is used to accomplish the step on "Indicating a gap" is in the following excerpt (UM4).

While effects of the cigarette smoke on proteins expressed in the
 bronchoalveolar lavage [36–38], nasal lavage fluid [39], urine [40],
 lung tissue [41], bronchial airway epithelium and pooled exhaled
 breath condensate samples [42] have been analyzed, little information
is available regarding the effects of smoking on the whole saliva
proteome.
 (UM4)

In this example (UM4) the writer has used the Adversative conjunction 'While' and then proceeded to indicate the limitation of the research done in the area hence accomplishing the step on Indicating a gap by stating 'little information is available regarding...' (lines 4-6). Similarly, the following excerpt (UM4) also highlighted the research gap by suggesting the limitation in the research area as in "there had been no reported studies that" (lines 1-2). The full sentence on this step is as follows.

"To the best of our knowledge, there had been no reported studies that
specifically compared the expression of proteins in the saliva of
 smokers and non-smokers".
 (UM4)

In the following examples, the writers indicated the limitation in the research area by giving a critical view on the previous works.

Saif & Guan [13] aggregated the faults and disturbances to form a
 new fault' vector and used a linear unknown input observer to
 reconstruct the new 'fault' vector. Although this successfully
 decouples the disturbances from the fault reconstruction, it requires
 very stringent conditions to be fulfilled, and is conservative because
 the disturbance does not need to be reconstructed, only
 rejected/decoupled.
 IIUM8

In this excerpt (IIUM8) the writer acknowledged the works done in the area by stating "...this successfully decouples the disturbances from the fault reconstruction..." (lines 3-4) and then proceeded to point out the problems concerning the works that have been done by the previous researchers as in "it requires very stringent conditions to be fulfilled, and is conservative because the disturbance does not need to be reconstructed, only rejected/decoupled" (lines 4-7). Again the use of adversative conjunction which in this case is "Although" has highlighted the contrast between the two ideas in the sentence. The act of pointing out the unresolved problems despite the previous research done has effectively signified the research gap.

In the following excerpt (F13UniMAP), similar pattern of using adversative conjunction has been made in revealing the research gap.

Many codes have been proposed for OCDMA such as Optical
 Orthogonal Codes (OOCs) [1], prime codes, and Modified Frequency
 Hopping (MFH) codes [8]. However, these codes suffer from various
 limitations one way or another. The codes' constructions are either
 complicated (e.g., OOC and MFH codes), the cross-correlation are not
 ideal (e.g., Hadamard and Prime codes), or the code length is too long
 (e.g., OOC and Prime code).
 (F13 UniMAP2)

Similar to example (IIUM8), the writers of (F13UniMAP2) acknowledged the works that have been done in the area by stating "...Many codes have been proposed for OCDMA such as Optical Orthogonal Codes (OOCs) [1], prime codes, and Modified Frequency Hopping (MFH) codes [8]" (lines 1-2) and then proceeded to point out the problems concerning the works that have been done by the previous researchers as in "complicated" (line 6),

“not ideal” (line 7) and “code length is too long” (line 9). The use of adversative conjunction “However” (line 4) has signified the limitations that still exist in the research area. On top of this, the writers of (F13UniMAP2) have attempted on giving a critical view on the previous work by stating “However, these codes suffer from various limitations one way or another” (lines 3-4).

The examples (F19UMTPertanika2P3, UM4, IIUM8, F13UniMAP) indicated an emerging pattern on how Move 2 Establishing a niche using step 1A Indicating a gap has been accomplished by the Computer Science research article writers. The emerging pattern is by indicating the limitation in the research area by posing two opposite ideas and using adversative conjunction to highlight the research gap.

The word “However” has also been found to be used regularly in realizing this step in this corpus. Some of the examples are quoted below

By basing on the description of the traffic patterns, the control system is made adaptive, resulting in adjustment in the hall call assignment strategy. However, these approaches were heavily dependent on the accuracy and correctness of traffic pattern predictions. (UM7)

DPR has been widely studied in various fields [4–18]. However, current DPR design flows and implementations are not capable to provide a set of programs to establish communication between the FPGA and host computer. (F2 UTHM2)

“However, it can also be necessary to recognize the handwritten authorship without signature, such as in case of threatening let-ter, (sic) authorship determination of an old or historical manuscript.” (F6 UTEM2)

“...they are potentially good in finding high-quality solutions. However, they can be quite inefficient too in the use of computational resources.” (UM7)

The examples above show the usage of “however” in accomplishing the move of indicating a gap. Most of the time, the position of the word is at the beginning of the sentence. The prior sentence usually states the existence of the current research in the area and the word “however” highlights on the limitation of the existing research.

In short, the first identified technique on how to realize indicating a gap in the research article introductions of this study is by Indicating limitation in the research area. To highlight the research gap, this technique was found realized by using adversative conjunction, by using various applications of the conjunction “however”, by giving direct statement on lack of study, and by giving a critical view on the previous works.

3.2 Suggesting a Problem That Needs to Be Solved

In indicating a research gap, apart from addressing the limitation in the research area as explained in the previous sub section, a second technique was also identified. The technique is by suggesting a problem that needs to be solved. The research gap can be signified by suggesting the problem that needs to be solved. The need for difficulty or challenge to be resolved or improved is conveyed and then the advantage of resolving the problem or the disadvantage of not solving the problem is presented. The following quotes illustrate on the way the step is realized in some of the articles using this method.

Therefore, there is a need for a technique in data clustering to improve the accuracy and computational complexity (F1 UTHM1)

In this excerpt (F1 UTHM1) the writers have suggested “a need for a technique” next; the writers proceeded to suggest the advantage of meeting the need which is “to improve the accuracy and computational complexity”. The pattern of highlighting the problem that needs to be solved is usually followed by an indicative solution or advantage. This pattern also prevailed in the following examples (F2UTHM2) and (F1UTHM1)

Time and massive amount of data to be processed have resulted in vast challenges from a hardware implementation point of view. In order to address these issues, FPGAs with an efficient reconfigurability mechanism should be deployed to meet the requirements in terms of speed, area (size), power consumption and throughput. (F2UTHM2)

In the example above (F2UTHM2), similar pattern of highlighting the problem that needs to be solved followed by a suggestion on the solution or advantage has emerged. The problem highlighted was “Time and massive amount of data to be processed have resulted in vast challenges” and then the suggested solution of “FPGAs with an efficient reconfigurability mechanism” was made.

However, in the following example (F1UTHM1) only part of the pattern materialized. Nevertheless, the act of ‘suggesting a problem that need to be solved’ still managed to make the effect of “Indicating a gap”.

It has been shown in Section 4.1 that TR and MMR have the same result in selecting clustering attribute.

With this technique, the complexity is however still an issue due to all attributes are considered to obtain the clustering attribute. (F1 UTHM1)

In this example (F1 UTHM1), the writer suggested the problem that needs to be solved as in “the complexity is however still an issue”. Unlike the example prior to this (F2UTHM2), the writer did not proceed to suggest any solution for the problem or suggest any advantage for solving the problem highlighted; nevertheless the suggestion on the problem alone was meaningful enough to indicate the research gap.

3.3 Conveying the Suggestions of Research by the Previous Researchers

Conveying the suggestions by previous researchers has also been identified as one of the ways for the writers to establish the research gap. Limitations in the past studies are used to specify on the particular research space. The writers do not directly point out the inadequacy but rather, use citation on previous work to do so. The following quotes illustrate on how Move 2 is accomplished using this way.

Clearly, these limitations have contributed to the failure of DW projects [3][20]. (UUM1)

In the example above (UUM1), the inadequacy of the past studies was used to specify on the particular research gap as in the citation of “[3][20]”. The writers did not directly point out the limitation of the research but rather, used citation on previous work to highlight on the research gap. In a way, the research gap is conveyed tactfully as suggestion by the previous researchers.

Some established soft computing techniques applied by previous works to suggest the optimal cutting conditions for machining cutting problems are, for example, the genetic algorithm (GA), simulated annealing (SA), Tabu search (TS), ant colony optimization (ACO), and particle swarm optimization (PSO) (Aggarwal & Singh, 2005; Mukherjee & Ray, 2006). (UTM2)

In example (UTM2), the writers used the citation on the previous work to highlight the problems of “optimal cutting condition for machining cutting”. The works of “Aggarwal & Singh, and Mukherjee & Ray” were cited to support the problems being highlighted.

3.4 Extending the Works of Others

Usually the works of others are mentioned first and then, the inadequacy in relation to the work is mentioned. Mentioning the inadequacy in the previous study creates a research space that is likely to be fulfilled.

Existing works in WI concentrate on feature extraction and classification task in order to identify the handwritten authorship. However, additional steps need to be performed in order to have a better representation of input prior to the classification task. (F6 UTEM2)

In the above example (F6 UTEM2) usually the works of others are brought up first as in “Existing works in WI concentrate on”, and then, the inadequacy in relation to the work is mentioned as in “However, additional steps need to be performed in order to have a better representation”. Mentioning the inadequacy in the previous study creates a research space that is likely to be fulfilled.

Huang [4] and Kim et al. [9] work in the area of applying fuzzy sets in clustering categorical data. However, these algorithms require multiple runs to establish the stability needed to obtain a satisfactory value for one parameter used to control the membership fuzziness [10]. (F1 UTHM1)

In this example (F1 UTHM1) previous work as in “Huang [4] and Kim et al. [9] work in the area of”(line 1), and then, the shortcoming in relation to the work is mentioned as in “However, these algorithms require multiple runs to establish the stability needed” (lines 2-3). Mentioning the insufficiency in the previous study creates a research gap which comes in form of extending the works of others.

4. Discussion

The analysis indicated that 73% of the corpus in this study has realized in this step and the Research University group has the largest percentage of realization. The popularity of using this step amongst the Research University group writers is attributed to the competitive research environment which called for more publication. The interviewee suggested that limitation and problem of the study can be highlighted to indicate a research gap.

The utilization of this strategy by the writers in this study which is at 73% is lower compared to the previous studies on research article introductions in Computer science discipline Anthony (1999) who studied the introduction section of the best papers in Software Engineering found 91.7% of the researchers in the study put this strategy in practice. Shehzad (2012) found 95% of the research article introduction in Computer Science discipline utilized this strategy. In short, the occurrence at only 73% is lesser than those practiced by the Computer Science global writers.

The interpretation of the finding also indicates that in writing research article introductions, the Computer science academicians in the Malaysian universities utilized “Indicating a research gap” as an optional strategy. In interpreting the finding of this study, the occurrence scales proposed by Sheldon (2011:241) and Soler-Monreal, Carbonell-Olivares and Gil-Salom (2011) were used. The scale stated that a strategy that has occurrence of 90% and above is considered as obligatory strategy whereas a strategy that has occurrence of below 90% is considered as an optional strategy. The interpretation using the scales indicated shows that with the occurrence of 73%, the Computer science writers in the Malaysian universities were used as an optional strategy whereas with occurrence of above 90%, the global Computer science writers treated the strategy as an obligatory strategy.

While the practice of this strategy is lower and appears to be underutilized when compared to the findings in studies on research articles written by Computer science writers in general (Shehzad, 2012; Anthony, 1999), the practice which is at 73% is considerably better when compared to the findings of other studies that focused on non native writing. Brionnes (2012), Sheldon (2011), Adnan (2009), Jogthong (2001) and Kanoksilapatham (2007) who have conducted similar studies on non-native English writers also indicated that the research gaps were non-prevalence in the research articles written by the non-natives. The percentages of realizations found in the study were at 66.66% for the Thais (Kanoksilapatham, 2005) and under 35% by Spanish writers (Sheldon, 2011). Compared to the native English writers, the non-native English writers showed “a weaker version” in using this strategy hence rendering the introduction section to appear “flat”. (Sheldon, 2011: 245). Ahmad (1997) also found the similar shortcoming in the study on research articles written in Malay language. In this study, Ahmad (1997) reported that it was typical for the writers of the Malay research article to dismiss this strategy or simply avoid using it. In short, the realization of this step in this study is higher compared to the findings of the previous studies on non native research article introductions (Kanoksilapatham, 2005; Sheldon, 2011).

The researchers attributed the underutilization of this strategy to the small size of the research community (Briones, 2012; Kanoksilapatham, 2007; Sheldon, 2011; Jogthong, 2001; Ahmad, 1997). In writing English research articles by the Spanish writers, Sheldon (2011) reasoned that the Spanish writers “resist criticizing previous studies” because of the small research community size where the writers were “very likely to know the key members of the community”. The small research community size is also given as the reason for the Thai writers to avoid this strategy (Jogthong, 2001, p. 83). It was justified further as to “save face” and to respect the “system of seniority” making it “inappropriate to criticize the works of their colleagues” instead the Thai writers are said to “prefer to elaborate the problem” letting the audience “evaluate and make their own decision” (Jogthong, 2001, p. 83).

However, in relation to this study, the explanation of small research community size given in the studies (Jogthong, 2001; Kanoksilapatham, 2007; Sheldon, 2011; Briones, 2012) does not seem to fit. For one reason, the research articles were published in Scopus indexed journal so the audience and readership is more global (Suryani, Aizan, Noor Hashima, Rashid & Desa, 2013). The writers have the choice to comment the works of other researchers beyond the local research community (Ina Suryani, Petra, Rodziah, & Hamidun, 2015). Some writers (Rizon, et al., 2009; Hussain, Faiz & Hazry, 2014) preserve the culture of “saving face” by avoiding the local key research member. Instead, the writers (Hassan et al., 2014; Syed et al., 2014) examine the works of other researchers in the other part of the world.

The analysis of the corpus showed that in realizing the step on indicating a gap, four techniques were used. The four techniques used are by indicating limitation in the research area, by suggesting a problem that needs to be solved, by conveying the suggestions of research by previous researchers and by extending the works of others. The first technique which is “indicating limitation in the research area” has also been reported in the corpus of the study by Kanoksilapatham (2005: 275) who describes the strategy as “...draw(ing) scientist attention to weakness in the existing literature” and asserts that the weakness ‘requires an answer’. On the second technique which is “suggesting a problem that needs to be solved” confirms the studies that suggest non-native English writer avoid giving critical review (Fakhri, 2004; Hirano, 2009; Holmes and Asmahan, 2002; Kanoksilapatham, 2007). Instead of giving a critical view on the previous study, the writers prefer to suggest a problem that needs to be solved. The analysis of the corpus in this study also showed the various use of the word “however”. The finding is not farfetched from the report by Posteguillo (1999) on the frequent use of expressing limitation in the research articles studied and pointed out the word “however” is used most repeatedly in accomplishing this step.

The findings of this study also confirm the suggestion by Shehzad (2008) that in indicating the research gap, the writers realized this step by “Extending the works of others”. In this technique the works of others are mentioned first and then, the inadequacy in relation to the work is mentioned. Mentioning the inadequacy in the previous study creates a research space that is likely to be fulfilled. This technique has been described as “the extension of the author’s previous work” (Shehzad, 2008, p. 34). The final technique which is “Conveying the suggestions of

research by the previous researchers” also appears in the corpus of study by Shehzad (2008) In this technique, the “...weaknesses and shortcomings found by previous research...” is used to “serve as a background” for the intended work (Shehzad, 2008, p. 33).

5. Conclusion

In short, this study found that the rhetorical step of “Indicating a research gap” is underutilized by the writers of the research articles in the corpus. The rhetorical step has been realized by using four techniques which has also been reported in other similar studies. However this study is limited to Computer Science research articles only and therefore, a more comprehensive study in other discipline will give a clearer picture on how this step is realized.

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