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Exploring Citations in Chemical Engineering Literature Review

Yasmin Hanafi Zaid, Sarimah Shamsudin & Hadina Habil
Language Academy, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

ABSTRACT

Citation is considered as an essential part in any academic writing whereby it is one way for writers to support any claims or arguments made in their study with literature from previous research. Literature review is known as a chapter which provides background for research described in a thesis. However, relatively not many studies are done on literature review chapter of thesis which may be due to the extensive nature of the text. Writing academic texts such as a thesis requires an author to acknowledge other researchers' work through proper use of citations. Learning the appropriate way to cite is important in any kinds of academic writing especially among research students who are writing their theses. Therefore, the main aim of this study is to investigate the citation practices in doctoral theses of Chemical Engineering. The purpose of this study is two folds; i) to identify the types of citations used in the corpus (using Swale's 1990 categorization) and ii) to examine the functions related to the citations used (using Thompson's 2001 framework). Three literature review chapters were analysed first to identify the types of citations used in the mini corpus and the functions related to the citations. The results of the study show that engineering student writers mostly used Non-integral citations as compared to Integral. The study concludes with a discussion on the skills of citing the literature which should be given more attention to raise the awareness level among students.

Keywords: Citation, chemical engineering, literature review, engineering thesis

INTRODUCTION

Swales (2004) defines citation as a way for an author to introduce and discuss the contributions of other researchers and scholars by discussing previous literature in order for the author to establish relationship in any particular discipline. It generally refers to the act of giving credit to the author of any document which has been cited in any written work. Writing academic texts such as a thesis or journal papers requires an author to acknowledge other researchers' work through proper use of citations. Hence, citation is regarded as the most overt and obvious indication that a text is academic (Swales, 2014). Following the definition, Swales (2014) further claims that through citing, an author can discuss the contributions of other researchers since such knowledge displays previous literatures which allow the researchers to establish membership of any disciplinary community.

**Correspondence to:* Yasmin Hanafi Zaid (email: yasmin @utm.my)

Citation practice provides justification for arguments and allows the writer to show why his or her research is different from what is being documented in the literature or fills in a gap in research (Soler-Monreal & Gil-Salom, 2011). On top of that, citation also functions as evidence which strengthen arguments and claims in various ways (Hyland, 2004). Previous studies have proven that academic writing is closely related to citing the literature which makes writing tough among student writers (Thompson, 2001; Thompson & Tribble, 2001). One important aspect of academic writing is to be able to support the arguments with citations from other researchers as well as identifying any weaknesses in others' arguments. Hence, it is important to note that student writers may face difficulties in citing references mainly because cognitively they have not reached the level which enables them to think and write as a scholar should (Thompson, 2001; Thompson & Tribble, 2001). To reach a higher level of academic literacy, students need to be able to relate their work to the work of others and develop their own scholarly identity within their research communities. In other words, a student writer needs to produce a kind of text which has its own voice in conveying the expertise and knowledge of the subject and proving that it is worthy of the award of a doctorate (Thompson, 2005). Citation in academic community should not be taken lightly as it is the base of any research where researchers or students are indebted to previous researchers who have established their research theories or results. Having to cite all those information, the correct way of citing references is very pertinent in any academic writing. Thompson (2005) further claimed that one way of examining how those writers build the thesis upon the work of others is by analysing the uses of citation in academic writing.

Realising the importance of citation in writing, many studies have been carried out in various disciplines starting with applied linguistics (Swales, 1986, 1990; Hyland, 1999; Thompson, 2001; Pramoolsook, 2016), followed by agriculture (Thompson and Tribble, 2001), gender studies (Petric, 2007), health science (Clugston, 2008), computer engineering (Soler-Monreal & Gil-Salom, 2011), management (Harwood and Petric, 2012), and biology (Samraj, 2013; Swales, 2014). Over the years, numerous researchers (Harwood, 2009; Hyland, 1999; Samraj, 2008; Mansourizadeh & Ahmad, 2011; Soler-Monreal & Gil-Salom, 2011; Pramoolsook, 2016) have explored studies on citation which leads to various type of categorization. As a result, analysing texts has proven the potential to reveal different forms and functions of citations in academic writing (Thompson & Tribble, 2001). Upon exploring the citation in academic text, Swales (1990), Hyland (1999) and Pramoolsook (2016) also highlighted the difference of citation forms in hard and soft science. There appear to be different preferences in the way writers from different disciplines cite their references which resulted in different rhetorical conventions. Hence, through this study, the researcher aims at identifying the forms and functions of citation in another less explored discipline; Chemical Engineering.

Even after many years, a recent study by Pramoolsook (2016:17) still found that non-native novice writers cannot fully depend on just a guideline to learn about citation practices in their academic writing. The findings were further supported by previous claim by Thompson and Tribble (2001:91) who assert that "appropriate reference to other texts is an essential feature of most academic writing, and we should expect courses in academic writing to sensitize students to the choices that are available to them when they decide to refer to other texts." Taking this statement into considerations, Pramoolsook (2016) alleged that a literature review chapter contains the majority of citations in a thesis. With this in mind, this study, therefore, aims to answer the question "How do doctoral

students cite the previous literature in Chemical Engineering?" The answer to this question will offer insightful description of citation practices in doctoral theses of Chemical Engineering students.

2.0 THE CORPUS AND THE METHODOLOGY

The corpus used for this study consists of three Literature Review (LR) chapters of doctoral theses in the field of Chemical Engineering from one of the public universities in Malaysia. In this study, these three theses were coded as LR1, LR2 and LR3 respectively.

The theses were gathered with the consent obtained from the university library which was in the form of a compact disc. Theses analysed in this study were obtained using random sampling in which two criteria were determined by the researcher; i) written in simple traditional format and ii) written by Malaysian writers. The term "traditional format" thesis was coined by Dudley-Evans (1999) as "IMRAD" (Introduction-Methods-Results- Discussions) and later was further refined by Thompson (1999) who distinguished traditional thesis into two categories; simple and complex. The simple traditional format consist of a basic structure of Introduction, Review of the Literature, Materials and Methods, Results, Discussion and Conclusion; while the complex thesis format consist of more than one study where the structure commences with Introduction, Review of Literature and Method sections. It is then followed by a series of chapters which report on individual studies and later ending with a Conclusion chapter. For the purpose of this study, the researcher chose theses which were written in simple traditional format. And the chosen chapter is the chapter with Literature Review as the heading which typically comes after the Introduction chapter and before Method chapter (Soler-Monreal & Gil-Salom, 2011). Table 1 illustrates the corpus of Literature Review chapters in Chemical Engineering doctoral theses.

Table 1 Description of the corpus

Literature Review Chapter (LR)	Length(words)	No of Citation	Average per 1000 words
LR 1	9013	170	18.86
LR 2	7420	123	16.57
LR 3	8504	151	17.75
Total	24937	444	

As shown in Table 1 above, the corpus consists of three Literature Review chapters of Chemical Engineering doctoral theses. For easy reference, the chapters were coded as LR1, LR2 and LR3 respectively. The length of words for each LR ranges between 7000 and 9100 words with the total number of tokens for the corpus is 24937. The third column shows the number of citation for each LR ranges between 150 and 170 citations. And for the last column the researcher calculated the average number/value of citation per 1000 words. The average value for each LR in this study was surprisingly high as compared to a study by Pramoolsook (2016:22) which found only 12 citations for

average of 1000 words. Pramoolsook (2016) did a study on thesis of TESOL M.A. theses written by Vietnamese students. The difference could be related to the nature of the texts being examined with the hard discipline texts having more citations than the soft discipline.

After the corpus has been compiled, the types of citation found in the corpus were determined using Swale's (1990) criteria. In determining every frequency of citations in the corpus, this study follows the method used by Bloch and Chi (1995), Mansourizadeh & Ahmad (2011) and Samraj (2013). This is done by assigning one citation to one rhetorical function or assigning multiple citations which appear together (Example A) or there can be more than one citation location in a sentence (Example B) as shown below:

Example A:

Numerous examples of thermophilic protein stabilization via additional salt bridges can be found in the literature (Lam et al., 2011, Ge et al., 2008).[1] (LR 1-16)[2]

Example B:

On the other hand, cold-adapted chitinases are observed mostly from marine psychrophilic bacterium [Moritella marina (Stefanidi and Vorgias, 2008)], Vibrio sp. Fi:7 (Bendt et al., 2001), Arthrobacter sp. TAD20 (Lonhienne et al., 2001)and Alteromonas sp. O-7 (Orikoshi et al., 2003), freezing-tolerant plants of bromegrass, Bromus inermis (Nakamura et al., 2008) and psychrophilic fungus of Verticillium lecanii (Fenice et al., 1998). (LR 1-88)

Example A has two cited references in the parenthesis. Following the method mentioned above, Example A is counted as one citation. Example B is also counted as one citation although the sentence has multiple references which appear together. Once completed with the first level of tagging (types of citation), the corpus were analysed to determine the rhetorical functions of the citations. The citation function was coded regardless of whether it is Integral or Non-integral. To determine the functions, the citations were analysed using Thompson's (2001) category of citation functions (researchers sometimes referred to the sub-categorization as "citation function"). A more detailed explanation of each rhetorical function is described in the next section.

2.1 Citation Typology

Swales (1990) has pioneered the study of citation by analysing citation practice in the area of Applied Linguistics. He categorised citations into Non-integral and Integral. Non-integral refers to the type of citations where the name of the cited author was not included in the sentence. Integral citation, on the other hand mentioned the cited author in the sentence. Thompson (2001:104) further refined the type into a few sub-categories; he proposed five sub-categories for non-integral citations: Source,

[1] Italic sentences in this study refers to citation taken from the corpus

[2] LR1-16 refers to citation number 16 from Literature Review One

Identification, Reference, Origin and Example. The function of Source is referred to as citations that indicate where the idea comes from. Identification is one function where the citation signals the cited author(s) as the agent(s) of the action through the verb choice such as '*has been suggested*'. Under the function of Reference, the citation directed the reader to the citation being provided for further information. This is normally done through directive verb such as '*see*'. Next, the function of Origin is ascribed to citations that provide the Origin of a concept or product. Lastly, Example refers to citation that acknowledges a number of examples of studies that are referred to in the sentence, either 'e.g.' or 'for example'. Three main functions were categorised under Integral citations; Verb-controlling, Naming and Non-citation. Based on previous studies on citation (Thompson, 2001; Thompson and Tribble, 2001; Petric, 2007; Mansourizadeh and Ahmad, 2011; and Samraj, 2013) this study also focuses on the types of citations based on their syntactic criteria and functions of citation which is based on the writer's intention when using citations. This study mainly adopts Thompson's (2001) typology. The sub-classification under Integral type of citation was not analysed in this study as this paper concerns only on the types and functions of citations used in the corpus. The types and functions of citations used in this study are illustrated in Table 2.

Table 2 Citation typology

Type of citation	Rhetorical function	Description of function	Example
Non-integral	*Source*	Citation tells the reader where the information (verbal or numerical) or idea comes from. The function of the citation is that of *attribution*. The information is contained in a proposition, rather than in a single noun phrase.	*Both diseases are of economic importance, but black Sigatoka develops much more rapidly, causes more severe defoliation, and is more difficult to control than yellow Sigatoka (Stover and Dickson, 1976). (TAB-005)*
	Identification (Ident)	Citation identifies an actor in the sentence, where the actor is either explicitly or implicitly included.	*A simulation model has therefore been developed to incorporate all the important features in the population dynamics (Potts, 1980).*
	Reference (Ref)	Citation refers the reader to a text to find further details. The details are not given in the writer's text. This form of citation usually has the word 'see' included, but not necessarily.	*This equation can be rearranged to express Total Factor Productivity as a function of research spending (**see** Thirtle, 1988).*
	Origin (Ori)	Citation indicates the originator of a concept or product	*The software package used was Wordsmith Tools (Scott, 1996).*
	Example (e.g)	Citation provides a number of examples of studies that are referred to in the sentence.	*The existing literature on the returns to research is considerable, and several summaries of the*

Type of citation	Rhetorical function	Description of function	Example
		'e.g.' or 'for example' typically preface the name(s) but not necessarily.	*indicators found in the literature are available (e.g. Thirtle and Bottomley (1988) or Echeverria…*
Integral	*Verb-controlling*	Citation acts as the agent that controls the verb, in active or passive voice	*Davis and Olson (1985) define a management information system more precisely as…*
	Naming	Citation is a noun phrase or part of noun phrase	*Typical price elasticities of demand for poultry products in Canada, Germany and the UK are shown in harling and Thompson (1983)*
	Non-citation	There is a reference to another writer but the name is given without a year reference	*The "classical" form of the disease, described by mark, causes significant mortality losses.*

(Taken from Thompson, 2001:105; Thompson & Tribble, 2001: 95-96)

Table 2 illustrates the two types of citation followed by categorization under each type. As shown in the table, Non-integral citation are further divided into five sub-categorization which researchers refer as the functions in the citations; Source, Identification, Reference, Origin and Example. Integral citation is further divided into three categories; Verb-controlling, Naming and Non-citation. The description and examples of every rhetorical function is compressed in one table based on what was described by Thompson (2001:105) and Thompson and Tribble (2001:95-96). The corpus was tagged based on the description given in Table 2.

After tagging the corpus, the percentages of Integral and Non-integral citations and their sub-categories were calculated. Even though the corpus of this study only contains a small number of data, the results could provide a preliminary understanding of citation patterns and practice among Chemical Engineering student writers. It is hoped that the findings obtained on student writers' citation patterns would benefit both the students and instructors in improving and add varieties to citation style.

3.0 RESULTS AND DISCUSSION

As noted earlier, the mini-corpus of three Literature Review chapters were analysed using two different frameworks: Swales' (1990) Non-integral and Integral categorization of citation and Thompson's (2001) sub-categorization of Integral citation (see Table 2). A total of 444 citations were identified in 24,937 words of three literature review chapters. A detailed finding is discussed in the following section.

3.1 Analysis of Citation Types

Non-integral citation is referred to citation which appears at the end of each sentence while Integral citation appears within the sentence. Table 3 presents the results from the analysis of the citation types.

Table 3 Occurrence of Non-integral and Integral citations in the corpus

Citation type	Number (percentage)
Non-integral citations	384 (86.5%)
Integral citations	60 (13.5%)
Total	444

Numbers may not add up to 100% due to inclusion of citations with more than one rhetorical function.

As shown in Table 3, the total number of citations is 444. As expected, the percentage of Non-integral citation is higher than Integral (86.5%) with Integral citation only 13.5%.

When Charles (2006) claimed that the use of integral or non-integral citations is influenced by genres and disciplines; this finding conforms to the trend in using citations in the hard disciplines (Hyland, 1999, 2000; Kanoksilapatham, 2003; Thompson, 2005; Mansourizadeh and Ahmad, 2011) which preferred Non-integral over Integral citations. Perhaps Non-integral citation were being favoured among engineering student writers as Non-integral type of citation helps engineering student writers to stress more on the content and not on the researcher (Hyland, 1999; Thompson, 2005).

Observation on the structure of sentences in LR3 shows that the writer possesses a higher level of English language proficiency. Previous literature such as (Campbell, 1990) who investigated the use of citations among student writers also highlighted that language proficiency did affect the use of citation in the students' writing. The result in this study is further supported by Petric (2007) who established a strong relationship between citation use and thesis grade and thus pointing out the importance of citation strategies for students to be successful in academic writing. Petric's (2007) findings and the result in this study however, are in contrast with the findings of Mansourizadeh and Ahmad (2011). Mansourizadeh and Ahmad (2011) investigated the use of citations among expert and novice writers by using research article in the area of chemical engineering as their corpus. In their study, they found that the Non-integral citation was practised more among the expert writers as compared to the novice writers. They further claimed that the used of Non-integral citation shows objectivity and impersonality of scientific experience in the writing (Mansourizadeh and Ahmad, 2011; Hyland, 1999; Thompson, 2005). Their explanation for the findings indicated that Non-integral citations are more preferred by expert writers when citing any information related to their research (Mansourizadeh and Ahmad, 2011:157). The small percentage of integral citation among student writers in this corpus probably are associated to the nature of novice writers who have yet to master advanced writing skills which is quite challenging to them (Mansourizadeh and Ahmad, 2011:157). The students' preference for using Non-integral citation is most likely influenced by the nature of

engineering students who focus more on the citations as compared to the author discussed in the writing. This citation form thus gives prominence to the information rather than the researchers (Thompson, 2005).

3.2 Analysis of Citation Function using Thompson's (2001) Framework

The second part of analysis in this study is to identify the functions of citations in this corpus by using Thompson's (2001) sub-categorization of Non-integral citation. The functions were identified regardless of whether it is Non-integral or Integral type of citations.

Table 4 Analysis of citation functions

Citation functions	Number (percentage)
Source	307 (69.15%)
Identifying	119 (26.80%)
Origin	6 (1.35%)
Reference	2 (0.45%)
Example	10 (2.25%)
Total	444

Table 4 presents the number and percentages of each rhetorical function. The analysis of the rhetorical function of citations highlighted the preferences of engineering student writers when writing their doctoral theses. Table 4 highlighted the dominance of Source in the corpus. With 307 occurrence of Source, it covers 69.15 percent of overall percentages which was similar to the result derived from Thompson's (2005) data which found heavy use of Source functioning as attributions of a proposition. This is followed by 119 (26.80%) occurrences of Identifying which identifies any particular studies referred to in the text. Next, the results indicate only 10 occurrences (2.25%) of Example in the text while the indication of Origin of a concept or product falls as the second last percentage (1.35%) and even lesser Reference to a text were identified in the corpus (0.45%).

3.2.1 Source

This function of citation is used to indicate where the idea or information is taken from (Thompson, 2001). Petric (2007:242) however, claimed the term Source as confusing and changed it to Attribution. The results in Table 4 indicates similar findings to the study by Mansourizadeh and Ahmad (2011:157) who used Petric's (2007) citation typology and they found that Attribution was the dominant citation function in the novice writers' papers. Listed below are examples taken from the corpus.

Example 1:

Chitin appears to be ubiquitous in fungi and constitutes the main structural component of filamentous fungi (Seidl, 2008). [LR1-52]

Example 2:

Proteins of interest are fused to a protein carrier protein that is often a native extracellular or outer membrane protein (Choi and Lee, 2004). [LR2-92]

Example 3:

Xylanases also acts synergistically with other hemicellulases to produce commercial xylooligosaccharides (Jiang et al., 2004). [LR3-113]

This particular citation function seemed to be the most popular among the student writers basically because engineering writers focus more on the information as compared to the author cited. Displaying result of previous studies is pertinent in any engineering research which explains why Source is the most dominant in this study.

3.2.2 Identification

The second highest function is Identification with 119 occurrences (27.05%). This citation is used to identify the actor or agent in the cited sentence where there is a reporting verb as shown in the sample sentences below:

Example 4:

Thus, a great deal of work ***has been done*** *on the isolation and characterization of extremophiles from various harsh environments (van den Burg, 2003).* [LR1-2]

Example 5:

The N region ***has been suggested*** *to bind the negatively charged surface of the lipid bilayer of the membrane (de Vrije et al., 1990).* [LR2-55]

Example 6:

Moreover, several papers ***have been published*** *reporting the optimization of a variety of culture conditions for the production of β-galactosidase by K. marxianus (Furlan et al., 2000, Furlan et al., 2001) and inulase using experimental design (Burkert et al., 2006).* [LR3-104]

Shown in Examples 4, 5 and 6 are the verb choice such as "*has been done*," *"has been suggested*" and *"have been published*" which identify the cited author(s) as the agent(s) of the action. In Example 4, the sentence could also be expressed as *"… a great deal of work has been done by van de Burg (2003)…"* but the writer decided not to include the name of the author in the sentence. Next, Example 6 is one example of a citation where the writer listed a few previous studies with different kind of research in a single sentence (Mansourizadeh and Ahmad, 2011). Thompson (2005) termed this kind of listing as "economical move" where a few references were included in one sentence.

3.2.3 Origin

This function of citation is used to indicate the originator of a concept or product. Example 7 and 8 below show samples of Origin.

Example 7

G. antarctica ***was first isolated*** *by Fell and colleagues in 1966 near the northern edge of the Antartica Peninsula (Fell et al., 1969).* [LR1-41]

Example 8:

Work done by Pohlner and his collegues (1987) ***was the first to describe and propose*** *a model for type V secretion, elegantly elucidating the relationship between the gene encoding the gonococcal immunoglobulinA1(IgA1) protease and its extracellular product.* [LR2-2]

Samraj (2013) also applied Thompson's (2001) citation typology to analyse forms and function in her corpus of Biology on master's theses and research articles. She somehow collapsed the function of Origin and referred to it as Source. Her rational was that it was difficult to distinguish concept from ideas and she detected a very low occurrence of citation that referred to as Origin. In his study however, the phrase "*was first isolated*" (Example 7) and "*was the first to describe and propose*" (Example 8) give clear indication that these citations belong to this category. Even though this study only identified 1.35 percent of the function of Origin in this study, the researchers felt that it is not fair to just merge the function with other function as the function itself has its own interpretation.

3.2.4 Reference

A Reference citation functions as a shorthand device; the reader is directed to another text in which exact details can be found (Thompson, 2001: 105). The results in Table 4 indicate that this function has the lowest percentage among all. With only 2 occurrences out of 440 citations, this function seemed to be the least utilised by the engineering student writers.

Example 9:

NAG, is linked entirely in the β-1, 4-configuration which resulted into a rigid and unbranched structure of chitin, as shown in Figure 2.1 (Dahiya et al., 2006). [LR1-47]

Example 10:

As shown in Figure 2.3, SRP binds to the H-domain of the signal peptide when it emerges from the ribosome, and subsequently targets the ribosome-bound nascent chain complex via the SRP receptor FtsY at the membrane to the translocation machinery (De Gier et al., 1997). [LR2-51]

Examples 9 and 10 were identified from literature review 1 and 2 respectively. The researchers could not identify any occurrence of Reference function in LR3. It could possibly be attributed to the

student not having sufficient knowledge to include additional information or lack of experience in academic writing conventions.

3.2.5 Example

This is where the cited work illustrates what is stated in the sentence.

Example 11:

For example, derivatives of chitooligosaccharides, chitoheptaose and chitohexaose, can be used in medicine due to its potential anti-tumour activity (Shaikh and Deshpande, 1993). [LR1-119]

Example 12:

Genetic modification may be applied to influence the targeting of the gene product, for example it can determines whether the gene product will accumulate intracellularly in a soluble form or as inclusion bodies, or whether the product is secreted into the periplasm or even into the culture medium (Pierre, 2000). [LR2-11]

Example 13:

For instance, the successful use of S. cerevisiae expressing M. thermophila laccase in directed evolution was recently reported, which showed an eightfold improvement in terms of expression and had the highest yet reported ratings for a laccase in yeast (Bulter et al., 2003). [LR3-13]

As indicated by the results in Table 4, although not the lowest, only very small percentage (2.27%) is attributed to the function Example. Thompson's (2005) classification of citation functions does not have the Example function. Anyhow, while doing the tagging, researcher found some amount of Example in the corpus which explains why researcher chose the Thompson's (2001) framework instead of Thompson (2005).

Table 5 shows the tabulation of citation for each Literature Review chapter (LR1, LR2 and LR3).

Table 5 Tabulation of citations for each Literature Review chapter

Citation functions	LR 1	LR 2	LR 3	Total (every function)
Source	112	94	101	307
Identifying	51	20	48	119
Origin	1	5	0	6
Reference	1	1	0	2
Example	5	3	2	10
Total (every LR text)	170	123	151	444

The highest number of the function of Example used in the corpus is in LR 1 with 5 occurrences. The other two literature review chapters were less than five occurrences. This finding is not surprising as this result is in line with the findings obtained by Petric (see Petric, 2007) which also indicated 2.71 percent of Exemplification function in her study. This also can be applied to the function of reference (Petric's- Further Reference) which corroborates the findings of Petric (2007), being the lowest count among all the functions. The student writers rarely used the phrase "for example" or "for instance" as most of the descriptions in engineering theses were being portrayed through diagrams and pictures.

4.0 CONCLUSION

This study was based on a mini-corpus of literature review chapter of doctoral theses from chemical engineering field. Even though this small-scale study cannot be used to generalise the findings, the preliminary findings have indeed contributed insights on citation patterns and practices in the writing of literature review chapter of engineering thesis. This study could be an eye opener to other researchers who are interested in citation practices in similar academic genre which include analysing citation patterns and practices of student writers in hard science disciplines (i.e. chemical, electrical, mechanical engineering disciplines). Due to the nature and rigorousness of thesis writing, it is expected that studies analysing this kind of genre is scarce. This study attempts to uncover the nature of thesis writing genre particularly literature review chapter in Chemical Engineering discipline and at the same time aims to establish analysed understanding on the importance of citation in academic writing. In summary, as pointed out by Petric (2007), investigating the functions of citation could be a platform to explore other possible research on citations from a different which later would provide more comprehensive insights into academic writing. Pedagogically, the findings in this study therefore suggest that student writers should be given more exposure in learning how to use citation effectively which will later help them to develop their writing ability.

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