

The dictionary use strategy for writing in English by engineering students - a case study

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ABSTRACT: The present research sampled 50 engineering freshmen to investigate their dictionary use strategy in writing in English on the Pigai Network. A contrastive analysis was further undertaken to explore the differences in dictionary use strategy and four sub-strategies between lower and upper groups of writing proficiency. The findings indicate that students' overall dictionary use strategy was at the intermediate level, with look-up strategies being the best, followed by dictionary use awareness skills, with strategies relating to lemmatisation and acquaintance with dictionary conventions and strategies of dictionary selection being the worst. Effective strategies for high writing quality and weakness during the dictionary use from the differences in specific strategies between groups could contribute to English teachers' corresponding measures and training programmes, so that engineering students can improve their writing quality with an effective dictionary use strategy.

INTRODUCTION

Writing is an integrated output skill and is an essential ingredient of second language learners' aptitude in language application [1]. With the mounting needs for international communication and cooperation, writing in English plays a significant role in effective cross-cultural communication and cooperation, and this is especially true for engineering students [2].

However, writing quality improvement takes time and effort to fulfil, which requires strenuous after-class work when students are supposed to do autonomous learning. Therefore, dictionaries as reliable sources [3-6] are of great help to engineering students in the face of various problems related to linguistic, syntactic, pragmatic and cultural information in the process of writing in English in out-of-classroom settings.

Recent years have witnessed vigorous growth of dictionary use research. Studies have recognised dictionary use as an important cognitive strategy [7-9], which is a factor influencing L2 writing quality [10][11]. Empirical studies have been conducted to investigate the role of dictionary use in vocabulary acquisition, reading comprehension, translation and overall language learning, with positive results [6][12-16].

Unfortunately, studies into dictionary use in L2 writing have been relatively few, with the main focus on learners' look-up behaviour in the different types of dictionary used [17][18], which is only one component of dictionary use strategy. Hence, dictionary use strategy as a comprehensive construct consisting of multiple strategies [8][9] should be studied as a whole in students' L2 writing.

In China, students' English proficiency varies greatly from region to region. In its vast western region, where the economy is relatively underdeveloped, students' English level falls below the national average. Of all the language skills, writing skill has been a long-term headache.

According to the College English Curriculum Requirements released in 2016, classroom teaching should be combined with after-class learning by fully utilising information technology. With instruction in learning strategies, students' capability to learn autonomously outside classroom teaching could be promoted, and progress in English learning could be steady.

In a bid to improve engineering students' writing quality in English during the autonomous learning period, the aim of this research was to investigate overall dictionary use strategy and its four sub-strategies when students engage in writing in English on the Pigai Network, a paid on-line automated essay evaluation tool. A contrastive analysis was

further undertaken to explore the differences of dictionary use strategy between lower and upper groups of writing proficiency in the hope that effective strategies could be distilled from English teachers' corresponding instructions on effective dictionary use strategy in writing English.

METHODOLOGY

Research Subjects

The participants of the present research were 52 lower-intermediate engineering freshmen from Southwest Forestry University of China, all from one class, with mixed majors of information engineering and electronic information engineering. The subjects comprised 31 male and 21 female students with an average age of 19. Students from Yu Nan Province where the University is located accounted for 70% of these, while the other 30% came from all over the country. Local students with lower-and-intermediate English level form the mainstream of the engineering majors in the University.

Research Instruments

A questionnaire, a composition assignment on the Pigai Network and a semi-structured interview were the main methods adopted in the present research.

The questionnaire comprised two sections: the first section collected information about the participants, including their age, gender, birthplace, English learning history, English score in the enrolment into college test (ESEC) and the dictionaries they used during the writing process on the Pigai Network. The second section was the strategy inventory for dictionary use (SIDU) designed by Gavriilidou with established validity and reliability. There were 36 items, from which four factors were extracted by factor analysis: dictionary use awareness skills (items 1-14); dictionary selection strategies (items 15-21); strategies for lemmatisation and acquaintance with dictionary conventions (items 22-29) and look-up strategies (items 30-36). Participants were required to respond from 1-5 on a Likert scale, with options ranging from never to always true [9].

Composition assignments on the Pigai Network are a regular component of autonomous learning: five essays each semester. Expanding English learning outside class-time is crucial in the betterment of English acquisition [15]. Each essay should be posted on-line within a two-week time limit, during which time students can edit their writing at will before the network is shut down. Therefore, the writing process in the present research includes two more stages: pre-writing and post-writing. The Pigai Network is an automated essay evaluation system, providing students with diagnostic feedback with marks and comments, focused on spelling, vocabulary, collocation, syntax, pragmatic knowledge and sentence structures.

An essay post introduces the real-time score, demonstrating the quality of students' writing in English. An English teacher has access to all the students' essays within the same topic, and oversees and intervenes in writing feedback when disputes on automated assessment emerge. It has been confirmed that the Pigai Network plays an effective role in improving the quality of writing in English by Chinese EFL learners [19][20]. The present research randomly sampled one composition titled: *A Survey on University Students Taking Part-time Jobs*.

Semi-structured interviews were conducted after the analysis of data on strategy inventory for dictionary use (SIDU) to interpret better students' dictionary use strategy in writing the essay. Twelve interviewees were selected from two contrastive groups, with equal numbers from the lower and the upper groups of writing proficiency.

Data Collection and Analysis

The present research was conducted in the second semester among engineering freshmen. There was a reason to believe that they had become well acquainted with how to use the Pigai Network. The participants were required to fill in the questionnaires in class after the composition was due on-line. Students were not informed of this survey ahead of time so that their dictionary use strategy in writing the composition could be objective. All the questionnaires were retrieved by the English teacher right after filling it in. Fifty valid responses were received out of the 52 participants. SPSS version 18 was used to analyse the data from the valid responses.

RESULTS AND DISCUSSIONS

According to the data collected from the open-ended question *What dictionaries do you usually use in the writing of English?* all 50 participants used the dictionary. Specifically, 25 students used two dictionaries, 18 students three dictionaries, six students only one dictionary and one student four dictionaries. During writing the essay, every engineering student used two dictionaries on average, which echoes the finding of previous studies that dictionary use is common and essential when writing in English [5][6][8][17].

Due to the indispensable role of the dictionary, investigations into students' dictionary use strategy and its differences resulting from their writing proficiency become urgent, so that English teachers' corresponding interventions can help engineering students' strategic level of dictionary use.

An Analysis of Engineering Students' Overall Dictionary Use Strategy and Four Sub-strategies

Descriptive statistics were used to reveal the overall level of engineering students' dictionary use strategy and its sub-strategies. From Table 1, it can be seen that the students' dictionary use strategy was at the intermediate level (3.024), indicating that teachers should instruct students on effective dictionary use. When it came to specific strategies, look-up strategies (3.452) ranked top, higher than the dictionary use strategy average and close to high use frequency, reflecting that one major function of the dictionary was to satisfy students' needs for reference.

After all, for Chinese EFL engineering students, consulting dictionaries was the first and best choice to help them to finish writing in English, correct errors and improve the final writing product effectively and efficiently in out-of-class settings.

Table 1: Descriptive statistics of overall dictionary use strategy and four sub-strategies.

	Average of dictionary use strategy	Average of dictionary use awareness skills	Average of dictionary selection strategies	Average of lemmatisation and acquaintance with dictionary conventions	Average of look-up strategies
Mean	3.024	3.012	2.788	2.888	3.452
SD	0.5089	0.6046	0.7771	0.6435	0.5672

Dictionary use awareness skills (3.012) ranked second, close to the average dictionary use level (3.024), better explaining students' best performance on look-up strategies. To get higher scores, engineering students tended to selectively adopt advice on the Pigai Network coupled with other feedback sources. In editing the original version, they preferred to consult dictionaries to correct errors or to replace less desirable expressions or structures.

Compared with lemmatisation and acquaintance with dictionary conventions (2.888), the level of dictionary selection strategies was at the bottom (2.788). Nowadays, dictionaries of various types and qualities are available. If students were not well equipped with enough dictionary knowledge, they would select dictionaries blindly without considering the real needs of task solutions or the features of the dictionary. Data from engineering students' choice of dictionaries showed that only one participant chose the thesaurus and 35 students chose on-line translation dictionaries.

Owing to students' familiarity with dictionaries, they were overconfident of their dictionary use skills [21], they assumed dictionaries had similar features and their consultations of different dictionaries were always based upon previous personal experience of dictionary use, failing to discern the conventions of different dictionaries.

The low lemmatisation skill imposed barriers to the successful location of the right lemma in a multi-word unit and finding the relevant information to solve problems, which accounted for why engineering students with low English proficiency failed to correct their errors effectively.

A Contrastive Analysis of Dictionary Use Strategy between Lower and Upper Groups of Writing Proficiency

A contrastive analysis aimed to detect the differences between lower and upper groups of writing proficiency and discover the specific strategies that were conducive to better writing quality.

The present research, based on the final scores of students' essays, selected the best and worst 25% students as two independent groups, 13 students, respectively. The independent samples test was run to check the significance of differentiation in writing proficiency of the two groups. The two-tailed significance value was 0.000, implying that the two groups had a high degree of discrimination and they were representative for conducting a contrastive analysis of dictionary use strategy.

From Table 2, it can be seen that in dictionary use strategy, the upper group of writing proficiency (3.185) performed better than the lower group (2.815) on the whole, which implied that an effective dictionary use strategy helped in improving the quality of written English. Hence, students with lower writing proficiency should be explicitly instructed by English teachers in special programmes.

As for specific strategies, the look-up strategies of the upper group (3.631) were the highest, but were closely followed by the lower group (3.415). Interestingly, for the lower group, the strategy of lemmatisation and acquaintance with dictionary conventions (2.631) was at the bottom, a slight difference from the strategy ratings of the upper group and those of overall strategy use, in both situations dictionary selection strategies (3.000/2.788) the lowest.

Table 2: Descriptive statistics of overall dictionary use strategy and four sub-strategies between two groups.

	Lower group of writing proficiency		Upper group of writing proficiency	
	Mean	SD	Mean	SD
Average of dictionary use strategy	2.815	0.5161	3.185	0.4741
Average of dictionary use awareness skills	2.685	0.6517	3.108	0.6034
Average of dictionary selection strategies	2.685	0.6669	3.000	0.6390
Average of lemmatisation and acquaintance	2.631	0.7761	3.070	0.6010
Average of look-up strategies	3.415	0.5097	3.631	0.6511

In later interviews, students from the lower group explained that they found it difficult to make speedy and correct location of lemmas, especially in multiple-word expressions, in line with the findings of previous studies [14][22]. When their lemmatisation did not succeed, they felt frustrated and gave up. Additionally, they preferred suggestions from teachers in their decisions about purchasing dictionaries. Contrarily, the upper group relied more on their own judgment and needs, and their low score in selection strategy reflected their knowledge-deficit in dictionary selection.

In order to explore the differences in what specific strategies the upper group of writing proficiency and the lower group used, and to summarise the effective strategies for writing in English, the present research undertook a contrastive analysis of responses to all the items of the strategy inventory for dictionary use (SIDU) from the two groups.

A Contrastive Analysis of Dictionary Awareness Skills between Groups

From Table 3, it is shown that the upper group reached the level of high frequency in using dictionaries to find the meanings of words (3.69), using dictionaries out of class (3.77), using dictionaries to help their reading (3.77) and using dictionaries in writing (4.15) By contrast, the lower group in these items arrived the level of intermediate frequency, scoring 3.38, 3.38, 3.46 and 3.23, respectively. Though differences between the two groups were not striking, instructors still could harvest useful implications from the data.

Table 3: Descriptive statistics of dictionary use awareness skills between groups.

Items of dictionary use awareness skills	Lower group		Upper group	
	Mean	SD	Mean	SD
1. I use a dictionary to find the meaning of a word.	3.38	0.768	3.69	0.947
2. I use a dictionary to find the spelling of a word.	2.62	0.870	3.15	1.144
3. I use a dictionary to find synonyms.	2.00	1.291	2.38	0.961
4. I use a dictionary to find antonyms.	2.08	1.256	2.54	0.877
5. I use a dictionary to check how a word is used.	2.77	1.166	2.77	0.927
6. I use a dictionary to help myself in translation.	2.08	1.115	2.15	0.689
7. I use a dictionary to find the origin of a word.	2.92	1.441	3.00	1.080
8. I use a dictionary to find the syntax of a word.	2.69	1.032	3.00	1.000
9. I use a dictionary to find the derivatives of a word.	1.92	0.954	2.85	1.068
10. I use a dictionary to find word families.	2.00	1.000	2.92	0.954
11. I use a dictionary to find the meaning of an expression.	3.15	0.689	3.31	0.947
12. I use a dictionary out of class.	3.38	1.193	3.77	0.832
13. I use a dictionary to help myself in reading.	3.46	0.967	3.77	0.832
14. I use a dictionary when I write a text.	3.23	1.166	4.15	0.689

In the follow-up interviews, participants from the upper group reported their constant alertness to the exact and proper meanings of expressions in written English. When encountering unknown or uncertain words in the writing process, they turned to dictionaries for cross-checking and confirmation in expressing their ideas. In view of cross-cultural differences, their consultations of dictionaries went beyond the meanings of words. For instance, examples, pragmatic information, register, collocation, etc, helped students determine the appropriateness of the words in the writing contexts. They acknowledged frequent use of dictionary out of class, which helped their autonomous learning.

Writing on the Pigai Network was not a traditional once-for-all activity, engineering students considered dictionaries at hand as being effective, for there was limited access to English teachers. Writing on-line requires students to read their

own writing, helping them to become aware of their errors. More importantly, for students of high writing proficiency, it meant additional materials related to the topic could be used to enrich their ideas and variety of expressions in writing.

According to the upper group after their essay posts, they seldom made few changes of the original version, so the final product could be more desirable. In practice, they not only corrected what the system marked, but also improved and updated their expressions or sentence structures in response to the comment *advanced vocabulary is limited and complex sentence structures are inadequate*.

For English teachers, in class teaching periods, they should draw students' attention to complex sentence patterns and deeper linguistic information of words, such as word families, knowledge on pragmatics, cultures, syntax, collocation, etc. In order to guarantee the quality of an essay, for students of lower-intermediate writing level, teachers should assign extra relevant reading materials and make more drills in sentence patterns, collocations, paraphrasing, sentence rewriting, etc, to raise their awareness by using dictionaries for multiple purposes.

Both groups performed poorly on items of using dictionary for synonyms, antonyms and translation, their scores being 2.00/2.38, 2.08/2.54, 2.08/2.15 for the lower group and the upper group, respectively. The data suggested English teachers should guide engineering students in how to determine exact meanings and to realise the diversity of expressions in English.

Moreover, lower-intermediate engineering students could not avoid translation in writing an essay in English, which was far from a simple semantic equivalence, but rather the equivalence of conceptual, cultural, emotional, referential, associative and other meanings of words in conveyance of thoughts in a second language [23].

In terms of using a dictionary for derivatives and word families, a gap between the lower and upper groups was easily discernible. The former's use frequency stayed at a low level (1.92; 2.00), while the latter was at the intermediate level (2.85; 2.92). Just as the lower representatives recalled, they felt easily confused about the syntactic distributions of sentences and judged parts of speech of words by their meanings, thus, information derived from the dictionary was not fully understood. In writing an essay on a topic, the lower group did worse in association of key words, negatively affecting the expansion of the content in a consistent way.

The upper group, however, also needed instructions on syntactic attention and semantic association [9][14][24]. From items of using a dictionary for spelling, etymological, idiomatic, syntactic information, both groups reached the level of intermediate frequency, revealing their loose attitude to second language learning, accordingly compromising the L2 writing quality.

A Contrastive Analysis of Dictionary Selection Strategies between Groups

From Table 4, it can be discovered that the upper group had a clear mind about the function and micro-structure of the dictionary selected, because items of dictionary selection from needs (3.77), content-arrangements (3.69) and information sufficiency (3.69) were each at a level of high frequency. They could distinguish a high-quality dictionary, the information from which was authoritative and which could better serve the users' needs.

Table 4: Descriptive statistics of dictionary selection strategies.

Items of dictionary selection strategies	Lower group		Upper group	
	Mean	SD	Mean	SD
15. Before I buy/use a dictionary, I know the reason why I need it.	3.38	1.044	3.77	0.832
16. Before I buy/use a dictionary, I glance through it to see what information it provides.	2.92	1.256	3.69	1.032
17. I choose a dictionary because it has a lot of entries and a lot of information in each entry.	3.08	1.115	3.69	1.109
18. I know what an etymological dictionary is and what it is used for.	2.31	1.316	1.85	0.899
19. I know what a general dictionary is and what it is used for.	3.00	1.414	2.85	1.068
20. I know what a bilingual dictionary is and what is used for.	2.23	1.092	2.92	1.188
21. I know what a dictionary of technical terms is and what it is used for.	1.77	0.832	2.23	1.013

On the other hand, what surprised the authors was that the lower group knew better than the upper group about the types of dictionary used. In second language learning, the origin of words is of the least concern, and engineering students

especially seemed to have no need to dig out the history of a word. Their endeavour cast on its usage, which led to the overall low frequency (2.31/1.85) in choosing an etymological dictionary.

For the lower group, they depended more on suggestions of English teachers, who mentioned the potential functions of an etymological dictionary, especially useful in understanding and memorising new words or expressions, by establishing cognitive associations. When writing is concerned, they instinctively chose more familiar and certain expressions, avoiding the added effort needed to dig out the origin of less familiar and certain ones, which in fact restrained their writing improvement.

When the present research was conducted, college English was a general education course, seldom irrelevant to majors, which gives engineering students limited access to and need for a technical dictionary, therefore, the low frequency of technical dictionary selection in both the lower (1.77) and upper (2.23) groups was understandable.

The upper group (2.92) used a bilingual dictionary more than the lower group (2.23), confirming the findings of some studies that a bilingual dictionary can benefit non-advanced students in second language learning [5][8][17][18].

A general dictionary is the most common dictionary type in second language learning [23], but the students failed to recognise its academic name, which indicated students' lack of dictionary knowledge. They were unable to distinguish the features of dictionary types, thus their selection of dictionaries lacked scientific guidance.

A Contrastive Analysis of Strategies for Lemmatisation and Acquaintance with Dictionary Conventions

From Table 5, it can be found that great discrepancy existed in lemmatisation and corresponding effort between the lower and upper groups for item 24 (2.62/3.62), item 25 (2.62/3.62) and item 26 (2.31/3.23). The lower group with lower English proficiency took it for granted that looking up a word or an expression was always the same and usually started from the first word. Once the lemmatisation failed, they did not know for sure which word was the right lemma for successful consultation. If failure continued, they did not want to bother with more trials, in line with the evidence from item 26 (2.31).

Table 5: Descriptive statistics of strategies for lemmatisation and acquaintance with dictionary conventions.

Items of lemmatisation and acquaintance with dictionary conventions	Lower group		Upper group	
	Mean	SD	Mean	SD
22. Before I use a new dictionary, I carefully read the introduction.	2.31	1.316	2.54	1.198
23. Before I use a new dictionary, I carefully study the list of abbreviations.	2.69	1.377	2.54	1.050
24. When I come across an unknown word, I try to think in what form I should look it up in the dictionary.	2.62	1.502	3.62	0.870
25. When I cannot locate a proverb or a set phrase in the entry where I thought I would find it, I begin a new search.	2.62	1.193	3.62	0.768
26. When I think of a word I am not sure, I consider various spelling possibilities and look it up accordingly.	2.31	1.377	2.92	1.320
27. When I cannot find a word where I thought I would find it, I begin a new search until I find it.	2.31	1.182	3.23	1.092
28. To see how a word is used in written language, I use the usage labels provided in the entry.	2.62	1.121	2.92	0.862
29. The synonyms and antonyms of a word help me with its meaning.	3.46	1.391	3.08	0.954

Help from usage labels in a dictionary in lower (2.62) and higher (2.92) groups was not fully used, resulting in their overall less desirable aptitude in English applications. In using dictionaries, the lower (2.31) and upper (2.54) groups did not develop the good habit of reading instructions carefully. They had too much confidence in their skills of dictionary use and the teacher seldom emphasised so. True, dictionaries share common formats or features in macro or microstructure design, but the special features of a certain dictionary may be ignored and underused [14][18][21].

On the other hand, in reading the list of abbreviations, the upper group (2.54) fell behind the lower group (2.69), though neither achieved a high score in this aspect. The lower group could remember the most common abbreviations, but they had to consult other abbreviations from time to time.

Comparatively, a slightly wider range is within the upper group's reach, reducing the frequency of list-reviewing. When the lower group (3.46) members were asked to clarify the paradox message in item 29, which contradicted their

behaviour in item 3 and 4, they explained that knowing is not acting, and English teachers' reminding them helped improve their knowledge without real implementations in practice.

A Contrastive Analysis of Look-up Strategies

From Table 6, it can be seen that items 30 to 33 were aimed at assessing English learners' familiarity with the macrostructure of a dictionary by measuring their reference speed in consulting a paper dictionary. As far as the present research was concerned, 35 students reported their consultation with paper dictionaries, for electronic dictionaries encouraged overuse [18], and rejection of paper dictionaries for the sake of convenience was not a wise choice [6].

Table 6: Descriptive statistics of look-up strategies.

Items of look-up strategies	Lower group		Upper group	
	Mean	SD	Mean	SD
1. When I look up a word beginning with E, I search in the first quarter pages as E is one of the first letters of the alphabet.	3.92	1.188	3.69	1.182
2. When I look up a word beginning with L, I open my dictionary in the middle.	3.62	1.193	3.69	1.032
3. When I look up a word, I bear in mind its initial letter and, then, search where I believe this initial letter is in the dictionary.	3.77	0.927	3.85	1.068
4. When I look up a word, I simply open the dictionary and see if I am near the specific initial letter.	3.08	1.498	2.77	0.725
5. When I look up a word, I constantly bear it in my mind during the search.	3.23	0.927	3.54	0.776
6. When I realise that the word I am looking for has various different meanings, I go through them all one by one, assisted by the example sentences.	2.85	1.405	3.54	1.050
7. When I find the word that I was searching for, I return to the text to confirm that the word matches the context.	3.46	1.266	4.46	0.660

In addition, these engineering students have learned English for an average of eight years, during which time they had rich experience in consulting paper dictionaries, good acquaintance with the alphabetic order of the headwords leading to slight differences between the two groups. Also, the upper group (3.54) had a better short memory of words during look-up. However, the lower group fell far behind the upper group in successful looking-up of words, because the less-advantaged students tended to choose options ranking first without considering the specific contexts [13][18], which may hinder them from writing correct, exact and proper expressions.

CONCLUSIONS

The present research, sampling 50 engineering students in a local university, surveyed their dictionary use strategy in writing English on an automated essay assessment network. It was found that students' overall dictionary use strategy was at the intermediate level, with look-up strategies best, followed by dictionary use awareness skills and strategies of lemmatisation and acquaintance with dictionary conventions and strategies of dictionary selection being the worst.

The contrastive analysis of dictionary use strategy and its sub-strategies between the upper and lower groups of writing proficiency found that the overall level of dictionary use strategy for the upper group was higher. Differences existed in strategies of lemmatisation and acquaintance with dictionary conventions and strategies of dictionary selection between these two groups. The former was the weakest point for the lower group, while the latter was for the upper group. From differences in specific strategies between the two groups, effective strategies were drawn: for high writing quality, effective strategies of using dictionary included consulting a dictionary for meaning, reading and appropriate frequency of use out of class.

Considerations into personal needs, and the content, arrangement and information sufficiency of a dictionary were necessary for suitable dictionary selection. Effective lemmatisation and corresponding effort was needed and was helpful. Meanwhile, the weak points of engineering students' dictionary use should be noted as well; for example, their underuse of usage labels, failure to read instructions and abbreviations before using a dictionary, inadequate attention to spelling, etymological, idiomatic, syntactic information, etc, contributed to lower levels of writing quality. In this way, engineering students could select dictionaries based on needs and the features of different types of dictionary, better serving their writing skills.

All in all, in view of the effective and important role of dictionary use in L2 writing, dictionary use strategy as a learned skill and an important component of learning strategy, it is necessary for English teachers to design corresponding

programmes to improve engineering students' effective strategy of dictionary use; for example, helping them improve their skills in dictionary use awareness, lemmatisation and dictionary choice by well-designed practice. With effective and efficient dictionary use, it is hoped that engineering students' writing skills in autonomous learning can be enhanced and promoted.

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