CHAPTER V

DISCUSSION AND CONCLUSIONS

5.1. Introduction

In this chapter, a summary of the study is firstly provided. Then, the findings presented in the previous lesson are discussed according to the five research questions. The first three questions are concerned with the comparisons of the learning effects of the concordance-based method and those of the conventional teaching methods. The other two questions explore learning processes and learners' attitudes in dealing with the method. Accordingly, the findings on the effects of the concordance-based method on vocabulary gains, learning processes and learners' attitudes are discussed respectively. After that, the discussions are on the implications of the study, suggestions on the application of the method and recommendations for further study.

5.2 Summary of the study

The primary goal of the study is to investigate the effects of the concordance-based method on vocabulary learning in three areas: learning effects, learning processes and learners' attitudes. In particular, the learning effects of the concordance-based method are compared with those of the conventional teaching method in three dimensions: definitional knowledge, transferable knowledge and retention rates. In addition, learning processes and learners' attitudes in dealing with the concordance-based method are explored. The present study is aimed at providing insights into studies on vocabulary learning and instruction as well as providing suggestions on how to increase students' vocabulary size so that they can efficiently cope with academic reading.

The conceptual framework of the study is based on pedagogical principles that words can be learnt explicitly, implicitly and through strategy learning. Based on the concept of an incremental nature of vocabulary acquisition, lessons are designed in

such a way that target words are presented in multiple contexts with repeated encounters so that many aspects of particular words can be learnt accumulatively. This is to enhance both the quantity and quality of word knowledge. Regarding teaching/learning methods, the DDL approach is partially adopted to allow for students' self discovery. By studying target words in the concordances, students are expected to come up with rules of word co-occurrences as well as lexical meanings.

This comparative study was designed in the form of '*a matching-only pretest-posttest comparison*'. It was conducted with two intact groups of engineering students at an undergraduate level. One group was randomly assigned to be the experimental group using the concordance-based method whereas the comparison group studied with the conventional teaching method. In both groups, all learning conditions were the same, except for the teaching methods used. With the concordance-based method, the students were trained to explore the corpus information for vocabulary learning with the support and guidance from the teachers and classroom materials. On the other hand, students in the comparison group were taught to learn vocabulary through the contexts of short reading passages including reading and vocabulary exercises.

Classroom materials were based on the Engineering Corpus which was compiled from academic texts in engineering, and target words were selected on the criteria that they were words in the established wordlists of the GSL and the AWL, which were high frequency words in the corpus. These target words were used to design all classroom materials, tasks and tests. The lesson plans and class handouts were designed in two versions: one for the experimental group and the other for the comparison group. Four review tasks were developed for ongoing assessments whereas the pretest, the immediate posttest and the delayed posttest were designed for assessing the overall learning effects on definitional knowledge, transferable knowledge and retention rates. The other instruments were teacher's field notes and students' logs to be collected after each concordance-based lesson whereas the questionnaire and the interview were used at the end of the study to investigate students' learning processes and attitudes towards the concordance-based method.

As for data collection, a questionnaire and a pretest were administered at the beginning of the study. During the experiment, teacher's field notes and students' logs were recorded after every concordance-based lesson. The first two review tasks were used as the midterm exam whereas the other two tasks were administered separately

after every three lessons. At the end of the study, an immediate posttest was administered with both groups and another set of questionnaires and the interviews were administered only with the experimental group. Finally, both groups took a delayed posttest about one month after the study.

The main findings from the study can be summarized in three areas: learning effects, learning processes and learners' attitudes. Regarding learning effects, it was found that the students' average scores in the experimental group were significantly higher than those in the comparison group in all measures of definitional knowledge, transferable knowledge and retention rates. In addition, the effect sizes of such differences were found greater on the measures of transferable knowledge than those of definitional knowledge, suggesting the better quality of lexical knowledge gained from the concordance-based method. As far as the students' learning process is concerned, it was found that students could acquire the skills in operating the concordancer quickly whereas it took a longer time for them to master the skills in identifying various aspects of words, interpreting concordance texts and deducing word meaning from contexts. However, findings at the end of the study revealed that these skills improved satisfactorily: the improvement in identifying skills was found earlier than that in interpretative and deductive skills. At the end of the study, learners expressed positive attitudes towards the concordance-based method. The students found the method challenging, interesting and useful for studying vocabulary. They liked dealing with the method and stated that they would continue to practise utilizing the method for their self-study.

5.3 Discussions on the Findings

5.3.1 Effects of the concordance-based method on vocabulary gains

Vocabulary gains are the emphases of the first three research questions on investigating the learning effects of the concordance-based method in comparison with those of the conventional teaching method. With regard to these questions, it is hypothesized that significant differences exist in the effects of using these two teaching methods in maximizing learning gains in definitional and transferable knowledge as well as retention rates of both knowledge types.

It was found from the study that the concordance-based method was more effective than the conventional teaching method in maximizing students' vocabulary gains as well as their retention rates. As is evidenced, the average scores of the experimental group were significantly higher than those of the comparison group on all measures of students' definitional knowledge, transferable knowledge and retention rates. Apart from significant differences, the greater effect sizes were found on all measures of transferable knowledge rather than those of the definitional knowledge. In fact, the effect sizes on the measures of transferable knowledge were found at the maximum points although it is much more difficult for this type of knowledge to be acquired. For knowledge to be transferable, a depth of knowledge is necessary for ensuring the quality of word knowledge. In other words, transferable knowledge needs more knowledge than one aspect of each word whereas definitional knowledge requires only the memorization of word meaning (Qian, 1999). This also explains why definitional knowledge in both groups was found to be greater than transferable knowledge. In addition, the findings on the maximum effect sizes in knowledge transfer indicate that the lexical knowledge gained by the concordance-based method is more consolidated, resulting in students' significant gains on both knowledge types as well as retentions of these knowledge types.

These findings are consistent with those in Cobb's studies (1999a and b) where differences in the effects of definitional knowledge were little but students dealing with hands-on concordances were more able to transfer their word knowledge to novel texts than students learning vocabulary from a wordlist and a dictionary. In Cobb's (1999b) study, students learning vocabulary through a concordancing program had strong gains both in definitional and transferable knowledge in the short and long term. In contrast, students learning from a wordlist and a dictionary had strong gains only in definitional knowledge but this knowledge was not well retained. Cobb (1999a, p.30) viewed the strong gains of definitional and transferable knowledge in the experimental group as having taken place because hands-on concordancing facilitated word learning in multiple contexts, which was the main precondition for producing transferable knowledge (Mezynski, 1983, and Stahl and Fairbanks, 1986; cited in Cobb, 1999a). Cobb concluded that interpreting new words in various contexts made students think of new words in a new way which made their knowledge more transferable.

His conclusion is congruent with suggestions in Cobb and Horst (2001), Nation (2001) and Nagy (1997) that learning words in rich contexts with a number of word encounters could lead to word acquisition. According to these suggestions, words are best learnt through meaningful encounters in several natural contexts either with or without being given word definitions. One reason is that many words have more than one meaning and their actual meanings need to be determined by the surrounding contexts. Apart from having various meanings, words also possess more than one aspect such as grammatical functions and collocations, and these aspects are unlikely to be exemplified and learnt in only one word encounter. Therefore, the effectiveness of the teaching method can be accounted for by the use of rich contexts and the increasing number of word encounters, resulting in productive and transferable knowledge.

Accordingly, in the present study, students learning vocabulary through concordance input have significant differences in learning gains from students' learning words through paper-based teaching. With the concordance-based method, the students have an access to large linguistic resources in a variety of contexts, providing them more chances to find more linguistic examples and re-encounter particular words in different contexts. Especially, in the present study, the selection of words according to their high frequency in the corpus increases frequency of word re-encounters in the concordance lessons. In addition, the concordance format enhances word salience, resulting in the high possibility for words to be noticed and closely observed by the students. According to Gavioli (1997), concordances highlight the aspects of language use which show up as recurrent patterns or repetition in the corpus. These advantages were also evidenced in the present study. The students reported in their logs and interviews that the concordance inputs made particular collocations so salient and frequent that they recognized such recurrent patterns and became aware of their frequent use. This recognition seldom occurred in their normal reading in paper-based texts. As a result, re-encountering new words salient in contexts seems to have significant rewards in word retention and long-term memory since plenty of word encounters illustrated various aspects of each word so frequently that each of them becomes recognized, accumulatively learnt and consolidated (Sokmen, 1997; and Nagy, 1997). Learning with the concordance-based method combines the benefits of learning vocabulary through multiple contexts in

concordances with multiple word encounters, as measured by its strong gains and retentions of both definitional and transferable knowledge in the experimental group of the present study.

In contrast, with the conventional teaching method, the presentation of linguistic items and examples are controlled and pre-conditioned solely by the teacher, using traditional class handouts as a main linguistic resource. Although paper-based reading texts also plans for words to be learnt in various contexts with a number of word recycles, the availability of linguistic items, word contexts and recycles are, in practice, rather limited in most traditional types of texts in the class handouts. Compared to learning vocabulary through hands-on concordancing, various aspects of each word were less exemplified and less encountered through normal reading texts, resulting in less accumulative acquisition. In addition, although keywords in the conventional handouts were also highlighted, they might not be as salient and recognized as those in a concordance format. Several studies found that new words went by typically unnoticed when being encountered in normal continuous reading in paper-based texts (Cobb, 1999c). With the limited availability of word contexts, encounters and salience, despite having high learning gains, lexical knowledge resulting from the conventional teaching method is significantly less transferable and retained than that of the concordance-based method.

Apart from providing richer contexts, more word encounters and more word salience, the concordance-based method can encourage more active and student-centered learning. With the conventional teaching method, learning is passive since it is largely controlled by the teacher in pre-conditioning language inputs and learning activities and the students only reflect and memorize the obtained information to complete the given tasks. According to Chen (2004), a learning process in which knowledge is provided by the teacher is usually regarded as a '*passive way of learning*'. In contrast, with the concordance-based method, the students have more control over their own learning, thus making them more actively involved in learning. While dealing with corpus information, they have more freedom in choosing concordancing techniques to accomplish the given tasks. Accordingly, they have more chances to practise observing more word contexts, identifying word parts or collocations, interpreting concordance texts, and inferring from the obtained data. When learners are involved in tasks of exploring, choosing and determining the

language from various resources that the computer has found, the classroom becomes student-centered and learners have active control over their own learning (Chen, 2004; and Nation, 2001). In Hadley's (2001) study, learners were consistently found to be active when they engaged in a *'content decision making'* learning situation while exploring and noticing the target language in the corpus. It is evidenced in students' logs and interviews in the present study that students dealt with a lot of English texts and more of these texts than they had ever used before when dealing with the concordances. This consequently encourages them to use skills in observing word contexts to get the word meanings. Their active interaction with language makes the lessons more meaningful, resulting in high vocabulary gains. As Cobb (1999a, p.15) stated, knowledge encoded from data by learners themselves will be more flexible, transferable and useful than knowledge encoded for them by experts and transmitted to them by an instructor or other delivery agents.

To summarize, significant differences in vocabulary gains and retention are considered to be as a result of the potential of the concordance-based method in facilitating vocabulary learning in multiple contexts with a unique display of word salience and plenty of word encounters as well as in encouraging learners' active involvement. These factors enhance the accumulation of so that knowledge gained from the concordance-based method is consolidated more sufficiently than that from the conventional teaching method, resulting in its greater effects on transferable knowledge and retention.

5.3.2 Effects of the concordance-based method on learning processes

Research Question 4 is aimed at exploring students' learning processes in dealing with the concordance-based input at different stages of the study. At the beginning stage, the students are trained to deal with a computer concordancer before they start using it in studying new lexical knowledge. As the findings suggest, the students become quickly familiar with the computer concordancing program and can operate the concordancer very well although the method is completely new to them. However, it takes a while for them to be able to deal with concordance information effectively. This is due to their unfamiliarity of the concordance format, the vast amount of the corpus data, and their limitation of vocabulary size to cope with those authentic texts. This evidence is consistent with that in Hadley's (2002 and 2001)

studies in which the students faced difficulties with the concordance material when they initially dealt with data-driven learning. However, Hadley found a pleasant improvement in the writing skills and test scores of his students at the end of the study. This supports Gavioli's (2001) suggestion that the processes of observation and generalization can pose many difficulties to learners because concordances do not provide support for a particular analysis; and EFL learners cannot rely on their intuition to guide and back up their observations and to suggest and reinforce explanatory generalizations. Therefore, it seems common to find such difficulties at the beginning of dealing with the concordance-based method before its productive outcome takes place because of the provision of learner training and teacher's support.

Despite these difficulties, in the present study, the students' skills in dealing with concordances gradually improved at the subsequent stages. It is found that their skills in utilizing context observation to identify word parts or chunks are acquired more quickly than the skills in utilizing such concordance information to deduce word meaning or interpret texts. This is not surprising since deducing and interpreting data involves students' existing knowledge (Hossain and Saddik, 2004), which, in this case, is very limited at the beginning stage. In addition, Gavioli (2001, p.129) points out that the methods of analyses aimed at identifying recurrences and inferring patterns in particular contexts may be problematic for many learners since raw concordance data are not filtered pedagogically. However, the students need time to acquire the appropriate methods of such language analyses as well as to appreciate their usefulness in vocabulary learning before they can do it properly and independently.

Accordingly, before the end of the experiment, the students appeared to be more capable of utilizing the data to interpret the concordance texts. This is seen to be partly because they are more familiar with dealing with the concordance information and acquire the trained strategies to cope with a lot of corpus information by screening out irrelevant information and/or interpreting only from comprehensible data in order to get the overall rather than specific meaning. Apart from acquiring such strategies, the students' improvement is partly due to the expansion of their vocabulary size after studying more words in the earlier lessons. As the target words are words from the GSL and AWL, regarded as lexical thresholds for academic

reading (Nation, 2001; Cobb and Horst, 2001), the expansion of such lexical knowledge increases students' capability to cope with reading texts in concordances.

The findings based on the ongoing assessment from the four review tasks reveal the difference in learning development between groups at the middle stage of the study. After the midterm examination, the average scores of the experimental group were gradually and significantly higher than those of the comparison group on all the measures. This suggested positive learning development in the experimental group. Moreover, all the interviewees were confident that with extended training, they would be able to utilize the method properly for their language study. They reported they had learnt these skills and recognized the usefulness of the method. However, support and guidelines would be needed either from the teacher or the handouts for these students to become more skillful and confident in utilizing the method independently.

All these findings suggest that the concordance-based method not only enhances learning but also promotes learning independence. The concordancing skills would enable students to practise and explore new knowledge by themselves, even after finishing all ESP courses. It is evident that although the process of the concordance-based training takes time, it is a prerequisite for independent learning to take place.

5.3.3 Learners' attitudes towards the concordance-based method

The last research question surveyed the students' attitude towards the application of the concordance-based method. It was found that the students had positive attitudes towards the method as has been frequently found in most classroom-based research concerning classroom concordancing (Chan and Liou, 2005; Kaur and Hegelheimer, 2005; Hadley, 2002 and 2001; Sirphicharn, 2002; Cobb and Horst, 2001; Cobb, 1999a and b; and Cobb, 1997a and b). The students were aware that the concordance-based method was very useful and challenging though they reported some difficulties in dealing with the method. Many students indicated that they would continue to practise utilizing the method for self-study. The students' positive attitudes might be attributed to the potential of the concordance-based method in raising students' awareness. The authenticity of corpus texts and frequency information of particular items make students aware that the target words are really

useful as they are used frequently in the corpus, which is compiled from authentic reading texts. This may lead to the increase in their motivation and efforts to learn those words. Although it is hard for students with limited proficiency to deal with a lot of authentic texts, they realize that these vocabulary items are necessary for successful academic reading. Therefore, they find such difficulty challenging.

However, it should be pointed out that learning motivation cannot be fostered without the teacher's intervention, as exposure to a vast number of authentic texts may cause confusion and discouragement (Hadley, 2002 and 2001; and Aston, 2002 and 1997). A student will be motivated only if he feels a sense of achievement in learning (Larsen-Freeman, 1991). If he sees no chance of development, he will soon lose interest in studying. Therefore, it is important for the teacher, especially at the beginning stage, to select and organize the texts in such a way that they are manageable for the students. The paper-based concordancing activities will serve this purpose as suggested in Aston (2002). With these activities, the amount of language inputs could be controlled and the inputs which might pose problems to the students could be screened out. In many cases, these authentic texts might have to be slightly modified and only short concordances with simple language structures will be presented for the students to practise dealing with the corpus information.

Moreover, the high motivation of students studying with the concordance-based method may be partly due to their preference for the use of computers and experiential learning. Generally, engineering students like dealing with technological equipment. This is also true with the students in the experimental group. Their preference tends to encourage them to be actively involved in hands-on activities. In addition, working with computers to explore the corpus information makes them feel more independent since they can learn by doing things themselves. Therefore, this experiential learning is likely to make them feel motivated and engaged in the activities. According to Fox (1998), learning from corpora by discovering linguistic knowledge oneself is motivating because most people enjoy finding things out for themselves, and the majority believe that learning is enhanced by doing so.

5.3.4 Conclusions of the Findings

Based on these findings, the concordance-based method is considered more effective than the conventional teaching method in maximizing students' definitional and transferable knowledge as well as the vocabulary retention of these knowledge types. In addition, the greater effect size in transferable knowledge than in definitional knowledge indicated that lexical knowledge gained from the concordance-based method increased both quantitatively and qualitatively. The outstanding performances in the concordance-based group are attributed to the potentials of the method in facilitating vocabulary learning in multiple concordance contexts with plenty of word encounters as well as in encouraging students' active involvement in vocabulary learning. On the one hand, language presented in concordances provides richer contexts for word study and allows for a larger number of word encounters. The concordance format makes it easier to learn words in multiple contexts or observe word behaviors with a greater number of encounters. This gives students more chance to learn various aspects of words accumulatively with sufficient word recycle. On the other hand, the concordance-based method is more learner-centered. The students have more control over their own learning and, consequently, are actively engaged in class activities.

Regarding learning processes, with the concordance-based method, students' language performance improved remarkably. Although the students could not adequately master all the necessary skills at the end of the study, their learning development may be sustained given longer training. Findings also suggest that learner training is necessary in applying the concordance-based method. Although the process of training might take time, it is beneficial as it promises to enhance learning independence. Equipped with concordancing skills, the students can explore new knowledge by themselves even after finishing the EAP courses. In addition, the concordance-based method can raise students' awareness of the importance of word study. This awareness can bring insights into word use, which will in turn motivate students to utilize the corpus information for their self-study.

In conclusion, the concordance-based method proves fruitful in expanding students' vocabulary size for academic reading. It is more effective than the conventional teaching method in enhancing the quality of vocabulary knowledge, resulting in the students' ability to transfer knowledge of word meaning to new

contexts as well as to retain such lexical knowledge. However, due to the small sample size in the study and its implementation in language laboratory, these findings may not be generalizable to all academic settings. Nevertheless, findings can still provide useful insights into pedagogical approaches in other similar settings. The framework of the study and the application of the concordance-based method may be adapted in many EFL academic situations with different levels of students' proficiency.

5.4 Implications for vocabulary instruction and vocabulary learning

The present study tends to suggest that the concordance-based method can be used well in conjunction with many other conventional teaching approaches. In this study, the benefits of three main approaches: explicit, implicit and strategy learning are integrated into the implementation of the present study. Words were explicitly or intentionally taught through hands-on concordancing including strategies to extract word meaning from contexts whereas implicit or incidental learning was made possible through the extensive reading from the corpus information. Regarding explicit learning, the target wordlist was established as a clear goal for students to accomplish. Various techniques were used to teach these target words via three learning processes which include 'noticing', 'retrieval' and 'creative (generative) use' (Nation, 2000). To enhance students' 'noticing', their attention was initially drawn to the target words mostly presented as keywords in the concordance lines and then to their contexts. After that, for 'retrieving knowledge', students were assigned to do some tasks such as replacing the missing keywords in the given concordances. In addition to explicit learning, students were extensively trained in strategy learning. The students did not only learn word meaning and functions but they also learnt how to use this knowledge to extract or guess the meaning of the word or the reading texts. While dealing with the vast amount of the corpus data, incidental learning probably took place at any of the stages.

The present study is an attempt to integrate the concordance-based method with other familiar methods of language learning. The balance of the combined methods depends on the goal of instruction. In some cases, the concordance-based

method might be fully used for language study such as in the present study. However, in other cases, it might be used as a supplementary tool to other teaching methods. The purpose of using the method should, therefore, be clearly determined. Since the concordance-based method deals only with plain texts, one of its disadvantages is a lack of variety in language presentation. Integrating it with other methods might be helpful for making the lessons more interesting. In the study, some figures or illustrations were used in the handouts to stimulate the students to learn. Data from the interview showed that students liked learning with those figures and illustrations, and some suggested having more illustrations such as technical drawing, and processes in engineering work etc. One interviewee suggested using advertisements when studying '*Engineering Products*'. Based on this evidence, the integration of methods seems to be one of the best options since the maximum benefits could be obtained. As is obvious from the study, the concordance-based method has the potential to be used in conjunction with various current teaching methods in promoting the explicit learning, incidental learning and strategy learning of vocabulary.

Results from the study indicate that vocabulary is best taught through reading. With this approach, words can be learnt in multiple contexts relevant to students' interests. At the same time, vocabulary and reading strategies can be explicitly taught. In addition, incidental learning is also possible with the amount of information in the corpus. With low proficiency students, '*narrow reading*' (cf. Schmitt, 2000), reading a lot of texts on the same topic, is suitable as seen from the significant gains of the students in the experimental group. In addition, the application of the concordance-based method entails systematic word and content selection as well as lesson designs if students' high motivation and positive attitudes are to be anticipated. Words selected for study should rank high on the frequency list of academic reading so that students see their relevance. Word recycles are important to consolidate what has been learnt. Meeting words in multiple contexts several times provides chances for various aspects of particular words to be learnt and consolidated not only in terms of lexical meanings but also word co-occurrences (Cobb and Horst, 2001; and Nagy, 1997). Finally, with the concordance-based method, instruction should move from teacher control to learner independence in order for them to be responsible for their own learning.

5.5 Suggestions on the application of the concordance-based method

Suggestions are given on the application of the concordance-based method. They are discussed in terms of the needs for the concordance-based training, degrees of planning the concordance-based lessons, content selection and corpus compilation, and design of concordance-based lessons.

5.5.1 Need for the concordance-based training

It is obvious that learner training is indispensable if the concordance-based is to be used. As a number of skills is involved in this method, enhancing learner independence does not mean just providing the facilities and then leaving the students to explore new knowledge in the corpus by themselves. Simply giving students direct access to the data from a corpus is not enough to make them capable of gaining new knowledge independently. In contrast, such a practice is likely to leave them too much alone, overwhelmed with information and resources (Gavioli, 1997). Therefore, the sole use of a corpus and a concordancer cannot promote positive learning effects and independence. The students need to be motivated to do their own learning as well as to be trained on some skills to exploit these facilities.

In the process of training, a gradual introduction to concordance work and extensive guidance is recommended. For proper training, the process should be implemented step by step in order to gradually expose the students to the concordance-based method as well as to increase their responsibility for their own learning. During the process, learners need to be trained how to exploit corpora. At the same time, materials or handouts with adequate sample tasks and exercises must be provided to help learners develop their analytic and interpretative skills. As found in the study, different skills took different times to be acquired. The computer concordancing skills, for example, could be mastered quickly but the analytic and interpretative skills took a longer time. Therefore, training on various concordancing skills should be carefully planned to allow sufficient practice on each skill; otherwise, learning may not take place. Currently, in ELT more attention has been paid to how to train learners to be responsible for their own learning and more pedagogical activities have required learners' involvement in order for them to make their own discoveries (Tomlinson, 2002). Accordingly, training students to utilize the concordance-based

method should be a good practice which fits nicely with the current trends in EFL teaching.

5.5.2 Degrees of planning the concordance-based lessons

The concordance-based lessons used in the present study were fully planned since the students possessed limited existing knowledge. As the link between students' old and new knowledge should be established, the process of training would help in guiding how new knowledge can be explored and later acquired through the concordance-based method. However, the fully planned lessons had some limitations as the concrete framework of the planned lessons might limit the potential utilization of the concordance-based method. In other words, it might limit the students' creativity and ability to explore and discover new knowledge themselves. In the study, all language concepts and rules were provided or guided by the teacher whereas the students were assigned to find evidence from the corpus to support those concepts and rules, gearing more towards deductive learning. The students' resulting performance was, therefore, conditioned by the manipulation on the part of the teacher, not by their ability to formulate or infer from the information available. As McDonough (1995, cited in Stevens, 1995) points out, providing a rule first might impose rule formation rather than encouraging students to make one up in their own terms.

However, according to the so-called data-driven learning (DDL) approach, inductive learning is more valued. In this approach, both the teacher and students do not necessarily know what linguistic items or patterns will be found in the corpus. Without rule teaching, learners could explore available data from corpora to generalize or induce new rules and patterns. The naturally occurring language in the corpus makes it possible for the users to explore and discover new knowledge for themselves without limit. Learners are like *researchers* in that they form hypotheses and test them against the authentic data provided by the corpus. Only by doing so, can discovery learning take place. However, it is obvious that such formulation of productive queries is particularly difficult for language learners, especially low proficiency students. Before they can be exposed to subtle patterns in the language to do the query independently, such patterns have to be pre-considered by the teacher. They need assistance until they become familiar with the concordancing techniques. Only when they are ready, should they have to be trained to formulate and test their

own hypotheses by inferring or inducing something from the available corpus data, and they should be provided opportunities to learn how to discover new knowledge themselves.

Findings suggest that the degree of planning is one important factor for consideration before the method is implemented. Such considerations include students' proficiency levels and their readiness to take responsibility for their own learning. On the one end of the learning continuum, full planning might be necessary for low proficiency students, especially at the beginning stage. However, if pre-conditioning is used for too long, it might over-protect the students and limit their creativity to learn by themselves. It is, therefore, suggested that the students should have increasing opportunities to learn through self-discovery at later stages and more use of the corpus information in formulating rules or deducing meaning.

5.5.3 Content selection and corpus compilation

With the concordance-based method, the corpus is a unique and reliable linguistic resource. The corpus data best serve pedagogical needs for providing authentic and representative language as well as for guiding learners to explore and exploit a corpus for particular learning purposes. Therefore, a corpus is certainly another important factor to be considered since the quality of language inputs in the classroom entirely depends on the content in the corpus. Under situations where learning objectives are clear, compiling one specific corpus is justified in order to obtain linguistic information as used in the target situations. In compiling a corpus, at least two main factors should be considers: a corpus size and text selection. Although a bigger corpus may ensure the representativeness of particular language areas, the corpus for pedagogical purposes is not necessarily big. The judgment mostly depends on the purposes and availability of resources and time. A small corpus may suffice as long as it can provide sufficient examples of the language in focus. Regarding text selection, texts to be included in the corpus must be texts with content relating to the students' specialized fields. In addition, text types and content should be taken into consideration. If the texts are general and not specially selected for any particular groups, the corpus data may not serve the specific needs of students and the content is unlikely to be motivating. As evidenced in this study, even engineering students from different branches such as mechanics and electrical power seem to appreciate reading

different texts. According to Jordan (2000), students prefer to devote time to study texts and topics related to their particular disciplines.

In compiling a corpus for advanced students, the types and topics of texts should be balanced in order to cover as many areas as possible in the particular fields of study. With low proficiency students, however, some pre-conditioning is suggested to facilitate their learning. To accelerate their authentic reading, for example, the underlying principles of the 'narrow reading' method can be applied. According to Schmitt (2001), this method is concerned with reading numerous authentic texts, but all on the same topic in order that much of the topic-specific vocabulary will be repeated throughout the course of reading. Schmitt suggests that the method of 'narrow reading' can accelerate access to authentic materials. To integrate this idea into the concordance-based method, texts selected for corpus compilation should be confined only to a few text types and topics, thus making the corpus data condensed with language in particular areas so that students will distinguish them while exploring the corpus data. Moreover, students will have more chance to reencounter target words recycled in the concordance lines.

5.5.4 Design of concordance-based lessons

The corpus alone may not be able to create good learning effects if the link among language in the corpus, language studied in classes and language in their real academic situations is not established. This connection would help motivate students to learn. In the present study, the content was categorized according to particular themes such as 'technical drawing' and 'computers in engineering'. Such organization helped to facilitate their mind mapping process, linking their existing knowledge with what is to be learnt. As was frequently found from their logs, the students expressed their admiration for the content and their motivation to learn it. They found the content in each lesson very interesting and useful. Their motivation seemed to be due to the fact that they could find a clear connection between language taught in classes and that in their engineering field.

5.6 Recommendations for further study

The present study has shown with empirical evidence the potential of the concordance-based method in increasing students' lexical knowledge for academic reading. In the study, although gains in lexical knowledge were assessed according to definitional knowledge, transferable knowledge and retention rate, gains in reading comprehension were not measured. Future research should investigate whether the concordance-based method would also help increase reading proficiency. Also, as this method has the potential to promote independent learning, it would be interesting to conduct a study investigating how long it will take students to be properly prepared for exploring new knowledge from the corpus themselves, that is how much training would be needed before the students can take responsibility for their own learning. Such a study would give insights into the principles of learner autonomy. In addition, since this study was conducted with a small number of samples who were Thai engineering students at an undergraduate level, further investigations with larger samples might be needed so that the findings may be generalized to populations other than Thai engineering students at an undergraduate level. Moreover, studies which compare the learning effects of high and low proficiency students may be beneficial. Finally, as the design and preparation of the concordance-based method are an important factor contributing to its success, future research may aim at designing and developing classroom materials that will bring about optimal benefits.