

CHAPTER IV

FINDINGS

4.1. Introduction

This chapter presents the findings from the study according to the focuses of the five proposed research questions i.e. learning effects, learning processes and learners' attitudes. On the one hand, the first three questions focused on comparing the learning effects of the concordance-based method and the conventional teaching method on vocabulary learning. On the other hand, the fourth and fifth questions dealt with students' learning processes and attitudes in dealing with the concordance-based method. Therefore, the findings of the learning effects, learning processes and learners' attitudes are presented respectively.

4.2. Learning Effects

The first three research questions focused on comparing the learning effects from the application of the concordance-based method and the conventional teaching method on definitional knowledge, transferable knowledge and retention rates of both knowledge types. It was hypothesized as in the following representations that significant differences were present between students' average scores of the experimental group and the comparison group on the measures of their vocabulary size, ability to transfer lexical knowledge to new contexts and retention rates of both knowledge types.

$$H_1: \bar{X}_{\text{definitional knowledge scores (E)}} \neq \bar{X}_{\text{definitional knowledge scores (C)}}$$

$$H_2: \bar{X}_{\text{transferable knowledge scores (E)}} \neq \bar{X}_{\text{transferable knowledge scores (C)}}$$

$$H_3: \bar{X}_{\text{retention rates (E)}} \neq \bar{X}_{\text{retention rates (C)}}$$

To test these hypotheses, the data were collected from four measures of two lexical knowledge types being studied. A MANOVA with the Bonferroni correction method ($p = 0.05$) was performed to examine the learning effects of the concordance-based method and the conventional teaching methods on vocabulary learning. On testing the basic assumption of MANOVA, it was found that the p -value of Box's M in Table 4.1 was significant ($p(M) < 0.05$), indexing that the assumption on the equality of covariance matrices was not met so the covariances were not equal.

Table 4.1: Results of Box's test of equality of covariance Matrices

Box's M	60.562
F	5.530
df1	10
df2	11952.191
Sig.	.000

Although this assumption was not met, the violation did not have much effect on the results of MANOVA because the equality of the sample sizes and the use of Wilk's Lambda as a multivariate test were fairly robust (Lewicki and Hill, 2006; Hinto et al, 2004; and Tabachnick and Fidell, 2001). Regarding the multivariate test (see Table 4.2), a significant difference was found at Wilk's $\Lambda = 0.253$, $F(4, 47) = 34.609$, $p < 0.05$, and $\eta_p^2 = 0.747$, indicating that the two methods had different learning effects with a large effect size.

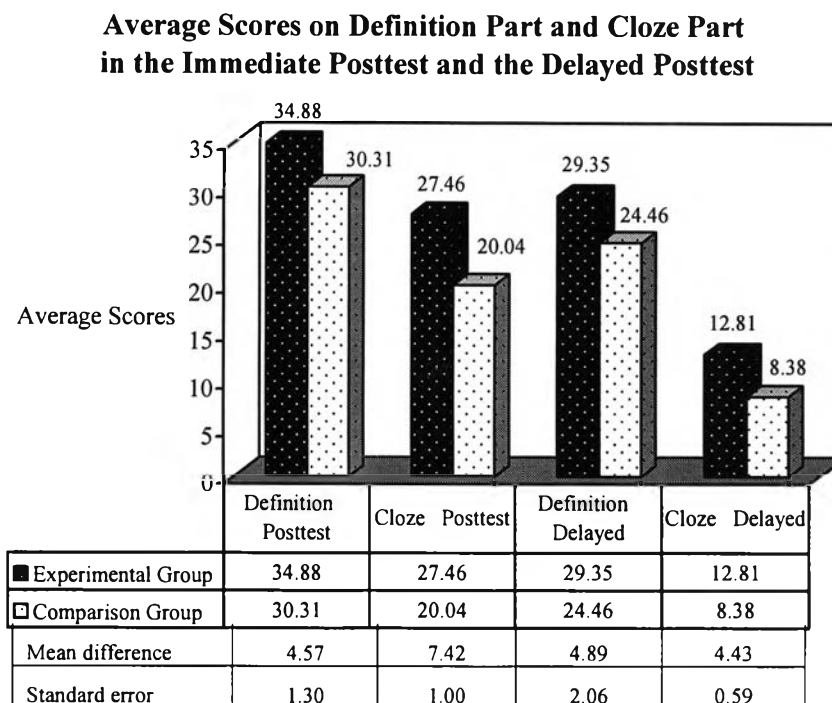
Table 4.2: Results of multivariate tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Wilks' Lambda	.006	1806.041	4.000	47.000	.000	.994
Group	Wilks' Lambda	.253	34.609	4.000	47.000	.000	.747

However, the Wilk's test could not exactly specify which method could increase significantly the scores on which measure. Therefore, an analysis of variance on each measure was needed to examine the effects of the methods on each measure. Descriptive statistics in Figure 4.1 show that the average scores of the experimental group were higher than those of the comparison group in all measures. It was also

found that the average scores of both groups on the Definition Part were higher than their scores on the Cloze Part in the same tests.

Figure 4.1: Average scores on four measures of definitional and transferable knowledge



(Note: Total scores on Definition Part = 51 scores, Total scores of Cloze Part = 50 scores)

An analysis of variance on each measure was illustrated in Table 4.3. The results revealed that the differences between the learning effects of both teaching methods were significant in all four measures.

Table 4.3: The results of tests of between-subjects effects

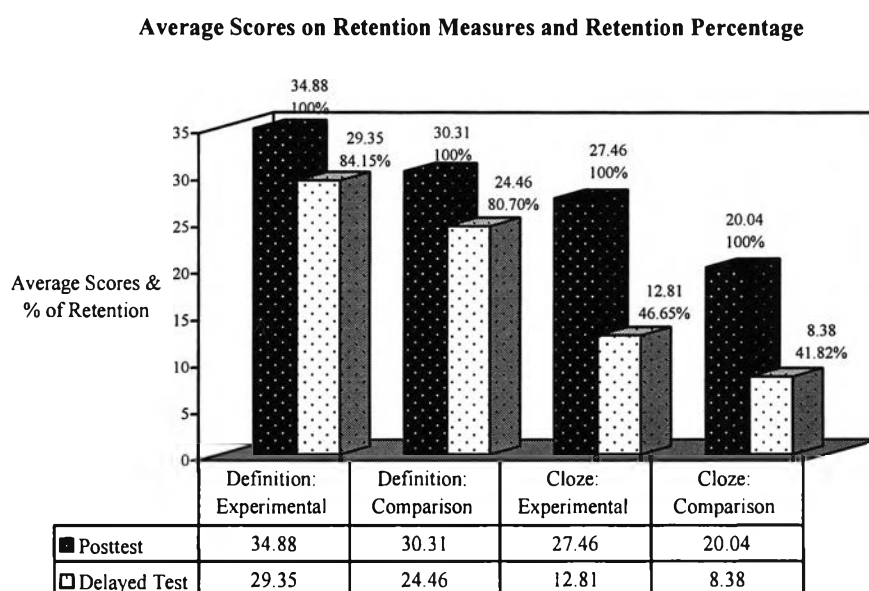
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Methods or Groups	Definition Part: Posttest	272.327	1	272.327	12.376	.001*	.198
	Cloze Part: Posttest	716.327	1	716.327	54.480	.000*	.521
	Definition Part: Delayed Posttest	310.173	1	310.173	5.598	.022*	.101
	Cloze Part: Delayed Posttest	254.327	1	254.327	57.231	.000*	.534
Error	Definition Part: Posttest	1100.192	50	22.004			
	Cloze Part: Posttest	657.423	50	13.148			
	Definition Part: Delayed Posttest	2770.346	50	55.407			
	Cloze Part: Delayed Posttest	222.192	50	4.444			

* $p < 0.05$

On the measure of definitional knowledge, it was found that the average scores of the experimental group were significantly higher than those of the comparison group with a large effect size; $F(1, 50) = 12.376, p < 0.05, \eta_p^2 = 0.198 / d = 0.97$, percentile standing = 52, and % of non-overlap = 51.6%. Similarly, on the measure of transferable knowledge, their average scores were also significantly higher than those of the other group with a large effect size; $F(1, 50) = 54.480, p < 0.05, \eta_p^2 = 0.521 / d = 2.0$, percentile standing = 97.7, and % of non-overlap = 81.1%. These results provided answers to Research Questions 1 and 2 that there were significant differences between the effects of the concordance-based method and the conventional teaching method on students' average scores on the measures of their vocabulary size and their ability to transfer vocabulary knowledge to new contexts.

Regarding retention rates, Figure 4.2 revealed that the retention percentages of the experimental group about a month after the study were higher than those of the comparison group on both measures of definitional and transferable knowledge, with the differences between these two pairs of percentages at 3.45% and 4.83% respectively.

Figure 4.2: Average scores on retention measures and retention percentages



(Note: Total scores on Definition Part = 51 scores, Total scores of Cloze Part = 50 scores)

The results on each measure in the delayed posttest in Table 4.3 confirmed that these differences were significant with a medium effect size on definitional

knowledge, $F(1, 50) = 5.598$, $p < 0.05$, and $\eta_p^2 = 0.101$ / $d = 0.66$, percentile standing = 73, and % of non-overlap = 38.2%; and with a large effect size on transferable knowledge, $F(1, 50) = 57.231$, $p < 0.05$, $\eta_p^2 = 0.534$ / $d = 2.0$, percentile standing = 97.7, and % of non-overlap = 81.1%. Therefore, the difference in word retention was found to be significant between both groups, and the concordance-based method was proven to have better effects on students' retention rates than the conventional teaching method.

One interesting finding was on the effect sizes of transferable knowledge. It was noted that the differences on transferable knowledge had the effect sizes at the maximum point of Cohen's d , $d = 2.0$ both in the immediate posttest and the delayed posttest. These differences were considerably greater than those of the definitional knowledge in the immediate posttest ($d = 0.97$) and in the delayed posttest ($d = 0.66$) respectively. This meant that the concordance-based method was much more effective in increasing students' transferable knowledge than the conventional teaching method.

To summarize, it was found that the students' average scores between the experimental and the comparison groups were significantly different in all measures of their definitional knowledge, transferable knowledge and retention rates of both knowledge types. These significant differences were large in magnitude, except the retention rate of the definitional knowledge of which the difference was of a medium effect size. One interesting finding was on the effect sizes of the transferable knowledge which were found to be very large and were much greater than those of the definitional knowledge both in the immediate posttest and the delayed posttest. These findings supported the three hypotheses proposed in the study. Based on these findings, it can be concluded that the application of the concordance-based method was more effective than the conventional teaching method in increasing students' definitional knowledge, transferable knowledge and retention rates of both knowledge types.

4.3. Learning Processes

Students' learning processes while dealing with the concordance-based input are explored in students' performances in dealing with a computer concordancer and

concordance information for learning vocabulary. Dealing with a concordancer referred to students' abilities to operate a concordancer to find corpus information, display and manipulate concordance output for facilitating the observation of word behaviours in various concordance contexts. On the other hand, dealing with concordance information was concerned with students' abilities to utilize the concordance facilities i.e. a corpus, a concordancer and a concordance display format for enhancing their vocabulary learning. The second type of performances involved strategies used in reading concordances, observing contexts of keywords to identify word parts, functions, chunks or collocations in order to deduce or interpret word meaning from context clues. Apart from these performances, students' difficulties or problems arising during these processes were also explored. Moreover, their learning development at different stages of the experiment was examined.

In this topic, findings on students' learning processes are presented respectively on a process in dealing with a computer concordancer and concordance information including problems and difficulties found in each process. After that, an overall learning development is revealed.

4.3.1 Process in dealing with a computer concordancer

It was found that the students could deal with a concordancer well and did not have problems in dealing with it. According to the teacher's observations, students showed enthusiasm to deal with a concordancer when the training to use it was introduced. At the beginning stage, they actively followed the teacher's demonstration step by step. When being assigned to complete particular concordancing tasks, they could somewhat operate a concordancer to build a word frequency list, searching corpus information, displaying and sorting concordance outputs etc. The data from students' logs at the initial stage were consistent with the teacher's observation. One of them reported that:

- S1: Today, I enjoy following the teacher's demonstration to access a corpus, build word frequency lists, search and sort words to produce the concordances. I can somewhat operate it myself when being assigned at the end of the lesson. A concordancer is not difficult to operate as I had expected.

Students' performances at this stage were moderate because the method was unfamiliar to them. After a few lessons, the teacher observed that their computer concordancing skills improved noticeably and they could operate a concordancer more skillfully at the middle stage. For example, they were quicker in turning on the concordancer, importing the corpus, searching words, and sorting concordances. Without being guided at the last stage, they could decide which sub-corpus should be accessed and/or which concordancer's instructions should be used. In other words, they could identify the functions of a concordancer suitable for particular tasks. When being asked to select a type of search for studying different parts or affixes of the given root words, for example, the students could explain and demonstrate how to search information for such a task. In addition, their ability to search words to find specific information to complete the given tasks was notably quicker and most students could complete the tasks in time. To find some words or information missing from the given concordances, students reported that they located some words in immediate contexts to be searched and sorted to obtain the missing information.

In students' logs, however, students did not explicitly mention on what and how they dealt with a concordancer. Instead, data seemed to suggest that students had no problems in operating it since the word '*interesting*', '*enjoy*' and '*like*' were often found in their logs. Nevertheless, the results from the analyses of the questionnaire data in Table 4.4 clearly shows that the students were able to use all eleven basic concordancing sub-skills necessary for studying the concordance lessons in the experiment.

Table 4.4: Analysis of students' computer concordancing skills (1)

Items with 'yes-unsure-no' questions in Part 2 of Questionnaire II	Percentages		
	Yes	Unsure	No
3. Can you use a concordancer to do the following activities?			
* Finding statistical information of the corpus	81	19	-
* Building word frequency lists	69	27	4
* Finding frequency information of words	100	-	-
* Sorting word frequency lists	100	-	-
* Searching words	96	4	-
* Searching collocations	62	35	4
* Searching words with a wildcard	73	27	-
* Sorting contexts of keywords	92	4	4
* Finding more contexts in full sentences	89	11	-
* Finding more contexts in the source texts	69	23	8
* Deleting duplicate/unnecessary sentences	46	50	4

(Note: N = 26)

According to Table 4.4, it was found that students could use the concordancer to operate all listed activities. All of them (100%) could operate a concordancer to find frequency information of words and sort the lists. Nearly all of them (over 90%) used it to search words and sort contexts of the keywords and over 80% of them used it to find more contexts in full sentences and to find statistic information of the corpus. More than half (over 50%) of the students reported that they could use these concordancing sub-skills, except the sub-skill of deleting duplicate/unnecessary sentences which was utilized by 46% of students for dealing with a large amount of corpus information. More details in Items 1 and 2 in Table 4.5 support the evidence on students' ability to deal with a computer concordancer. About 60% of the students rated their abilities to operate general computer programs and a concordancer well whereas the others rated as average, except for two students (7%) who rated their operation on the concordancer as poor.

Table 4.5: Analysis of students' computer concordancing skills (2)

Scaled items in Part 2 of Questionnaire II	Percentages				
	5	4	3	2	1
1. How well can you use general computer programs?	4	54	42	-	-
2. How well can you use a concordancer?	4	58	31	7	-
4. How often do you use a concordancer to do the following activities?					
* Finding statistical information of the corpus	8	46	35	11	-
* Building word frequency lists	27	39	31	4	-
* Finding frequency information of words	27	50	16	7	-
* Sorting word frequency lists	50	42	8	-	-
* Searching words	58	42	-	-	-
* Searching collocations	4	62	19	12	4
* Searching words with a wildcard	12	58	19	8	3
* Sorting contexts of keywords	65	31	4	-	-
* Finding more contexts in full sentences	31	50	15	4	-
* Finding more contexts in the source texts	12	50	23	15	-
* Deleting duplicate/unnecessary sentences	19	19	35	12	15
5. How quick can you do the following activities?					
* Finding statistical information of the corpus	4	46	46	4	-
* Building word frequency lists	12	50	35	1	-
* Finding frequency information of words	23	45	27	4	-
* Sorting word frequency lists	31	42	19	8	-
* Searching words	35	35	30	-	-
* Searching collocations	8	31	42	15	4
* Searching words with a wildcard	15	31	42	8	4
* Sorting contexts of keywords	46	35	12	7	-
* Finding more contexts in full sentences	19	35	31	12	3
* Finding more contexts in the source texts	15	27	35	23	-
* Deleting duplicate/unnecessary sentences	12	23	42	15	8
6. How often do you access a corpus for your self-study?	-	-	54	19	27

(Note: N = 26; 5 = always, very well or very quick; 4 = frequent, well, or quick; 3 = average or sometimes; 2 = rarely, poor or slow; and 1 = never, very poor or very slow)

In addition, the results of Items 4 and 5 in Table 4.5 revealed more details on these activities in terms of their frequency and quality of uses. The majority of the students (more than 70%) rated their frequency of uses of these sub-skills ranging from 'always', 'frequent' to 'average'. As most of them frequently performed these activities, their performances in dealing with most activities were consequently rated as 'very quick', 'quick' and 'average'. In fact, more than half of them reported their frequent uses in a quick manner. These results indicated that the students could deal with the concordancer well for facilitating their vocabulary learning, resulting from their frequent uses. However, one sub-skill which was less frequently used i.e. deleting duplicate/unnecessary sentences also indicated that the students did not fully utilize this concordancer's function for screening out irrelevant information from a vast amount of data. In addition, the results in Item 6 revealed that only half of the students occasionally practicing these skills outside class whereas the others did not.

Apart from the data from the teacher's field notes and questionnaire, the interview data also supported the evidence that the students could deal with a computer concordancer well without problems. All interviewees reported together with a demonstration that they could operate the concordancer with no difficulty. These interviewees could explain and demonstrate clearly how to operate the concordancer. In the demonstration, they could quickly point to the icons on the computer screen in the illustration in order to indicate the particular purpose of using each icon. The following translated transcript was extracted from an interview with one student. The transcript exemplified how the students dealt with the concordancing program. Before the interview, the on-screen concordance information such as in Figure 3.10 in Chapter III was illustrated as follows.

On-screen concordances of 'depend' re-illustrated from Figure 3.10 in Chapter III

Line	Text Segment	Concordance	Definition/Context
1	Operation All internal combustion engines	depend	on the chemical process of combustion and explosion, that
2	They	depend	on the fact that force is generated by an electric current flow
3	Thermocouple meters	depend	on the heating effect of an electric current are used to measure
4	Magnetic forces will also	depend	on the velocities of the two objects.
5	Whether resistive constraints are met will	depend	upon whether the definition of the problem included these
6	All other forces encountered only	depend	on the relative distance.
7	If a physical result	depend	on the right-handed rule that would constitute violation of p.
8	on wires and was able to show that the size of an electric current	depend	upon their length and thickness.
9	It immediately brings up the question of frame	dependence	"How can a force depend on the velocity, when an object's
10	to expand in response to environmental concerns, and as our	dependence	on ecosystem "services" becomes better understood (Cairn
11	Because of Ohm's law, electrical energy losses are	dependence	on current flow, not on energy flow.
12	reference to DC (inversely related), and a higher impedance to AC	dependence	on the value of inductance and the frequency.
13	Information is a term with many meanings.	depending	on context, but is a rule closely related to such concepts
14	It is now known that,	depending	on the circumstances, an electric current can consist of a II
15	The parts of an engine vary	depending	on the engine's type.
16	Several different types of equipment may be present,	depending	on the functions of the particular substance.
17	There are three kinds of systems	depending	on the kinds of exchangers taking place between a system
18	Different bits can be used	depending	on the material and type of cut.
19	Polymer may be either ductile or brittle.	depending	on whether a thermoplastic or thermosetting polymer is set
20	There are rated in Farads, and the standard symbol is "C" or "F".	depending	upon the design of the machine, either the rotor or the stator
21	They will vary in colour, size and shape.	depending	upon the imagination of the computer manufacturer.
22	Current can be AC or DC, positive or negative.	depending	upon the reference.
23	DC motor speed generally	depends	on a combination of the voltage and current flowing in the
24		depends	on an object's mass and its speed.
25	What counts as an I/O device	depends	on how detailed you are looking at a computer system.
26	Well, that	depends	on how much precision is needed.
27	The reactance or AC resistance (called impedance) of a capacitor	depends	on its value and the frequency of the AC signal.
28	The hidden clutch, which	depends	on a valid contact between engine and transmission, consist
29	As the rotation of the second disc directly	depends	on the amount of engine power delivered, the prime result
30	The amount of time that a UPS can keep a system running	depends	on the capacity of the UPS and the current drawn by the use
31	The radius of the orbit	depends	on the charge and velocity of the particle as well as the vte
32	This	depends	on the circuit configuration.

- T: (Gives the illustration of the concordance output of 'depend')
- If we want to study the word '*depend*', how can we do that?
- S1: Just click this icon. (Points to the icon for a simple search.)
- T: And then?
- S1: Then, type the word we want to search in the pop-up box.
- T: How many words do we have to type in if we want the output with many keywords like this? (Points to the illustration.)
- S1: Just one word, but with the asterisk.
- T: Where should we put it?
- S1: At the end of the searched word.
- T: Do you know what the asterisk represents?
- S1: Er..represents ..er.. similar characters ..er. different.
- T: What do you mean? Does it represent similar or different characters from the typed words?
- S1: Different. Yes, any more possible characters which are different from '*depend*'.
- T: If we want to know how many occurrences of these words in the Corpus, what should we do?
- S1: Look at these numbers to help in counting. (Points to the left side of the computer screen.)
- T: But if there are more word occurrences than the ones appearing on the screen, how could we count them?
- S1: That's so simple. Just scroll down the screen by using the scroll bar. (Points to the scroll bar at the right side of the screen.)

One more example is from the interview transcript of another student. It illustrates how well the students dealt with the concordancer. In this case, the concordance information such as in Figure 3.11 in Chapter III was illustrated.

On-screen concordances of '*refer*' re-illustrated from Figure 3.11 in Chapter III

The screenshot shows a window titled 'Concordancer - [Concordance: refer*]'. The window contains a table of concordances. The table has four columns: a line number, a snippet of text, the word 'refer', and a definition or context. The text is as follows:

Line	Text	refer	Context
1	The term "database application" usually [refers] to software providing a user interface to a database.		
1	Primary storage can be used to	refer	to local random-access disk storage, which should properly
2	High Current When measuring high current [amps] values,	refer	to resistor self-heating.
3	Electronic design automation (EDA) is used to	refer	to the category of tools for designing and producing electronic
4	All these latter terms are essentially synonymous, and	refer	to the designing and technical drawing of various projects.
5	The term is also used to	refer	to the field of scientific investigation into the plausibility of
6	The name is commonly used to	refer	to the large set of operating systems which resemble the one
7	For more information on base replacement,	refer	to the NI Digital Multimeters Getting Started Guide.
8	Rather than using the word electricity to	refer	to the quantity of electric charge, many sources instead use
9	The term may also	refer	to the size of an instruction in the computer's instruction set
10	Engineering drawings are often	referred	to as "blueprints."
11	"Section lines are commonly	referred	to as "cross-hatching."
12	You will hear them	referred	to as "random logic."
13	A family of CPU designs is often	referred	to as a CPU architecture.
14	This small interval of time is often	referred	to as a time slice.
15	Electric current is therefore sometimes informally	referred	to as amperage, by analogy with the term voltage.
16	Practically every device from the industrial revolution was	referred	to as an engine, and this is where the steam engine gained
17	In electrical engineering, this is	referred	to as a lagging power factor.
18	The resistance is	referred	to as ESR (Equivalent Series Resistance), and this can have
19	This gravitational force is often	referred	to as a g question.
20	You will hear them	referred	to as multi-viscosity, all-season and all-weather oils.
21	The phenomenon is often	referred	to as resistor self-heating and can cause significant errors
22	He actually distributed PC-Talk via what is now	referred	to as shareware.
23	The actual price is sometimes	referred	to as the "spot" or "peak" price, depending on the market.
24	Speed is a scalar quantity which	refers	to "how fast an object is moving."
25	Velocity is a vector quantity which	refers	to "the rate at which an object changes its position."
26	True ground	refers	to Earth itself, but just driving a metal rod into the earth is
27	combustion, but the term "internal combustion engine" normally	refers	to engines in which combustion is intermittent and there are
28	For this reason, the use of the term "thermodynamics" usually	refers	to equilibrium thermodynamics.
29	The word "free" in "free software"	refers	to freedom, not price; specifically, it refers to software whose
30	Electrical power	refers	to how much energy is expended performing work, and it is
31	Old Weights & Measures weight, or viscosity,	refers	to how thick or thin the oil is.
32	The term "database application" usually	refers	to software providing a user interface to a database.
33	refers in "free software" refers to freedom, not price; specifically, it	refers	to software whose license terms permit its use, regardless

- T: After dealing with the concordancer for one semester, how well do you think you can operate the program?
- S2: I think I can do it quite well.
- T: Quick?
- S2: Yes, rather quick.
- T: Can you tell me what you have used the program for?
- S2: Umm. I use it for searching words and observing the contexts.
- T: You observe contexts before searching, right?
- S2: I think so.
- T: How?
- S2: I observed the immediate contexts of the missing words or the gaps (in the given tasks) and then located one or two words for searching. In many cases, I use an advanced search to reduce some irrelevant output as well as to make the needed information easier to spot.
- T: Right. Do you sort the output?
- S2: Yes, of course.
- T: What happens if you don't sort the output?
- S2: It is much more difficult to observe the focused points of language.
- T: You mostly search words and find specific information quickly, right? Can you give me one example of your search?
- S2: Certainly. I searched 'in order to', for example.
- T: This means that you know this collocation, don't you?
- S2: Right. In the case of knowing particular collocations, we can use an advanced search. However, if we don't know particular collocations, we could use a simple search and then sort the output by the left or the right parts of the keywords before locating some recurrent patterns.
- T: You seem to deal with the program very well and can explain it clearly. For what purposes, do you use the concordancer?
- S2: To specify chunks of words.
- T: Can you do that?
- S2: Yes. Very easily.
- T: Suppose that you found a very long sentence such as in concordance line number 27 of 'refer'. (Points to line number 27 in the illustration.) And you want to read its full sentence, how can you do that?
- S2: Just click the line.
- T: Which part?
- S2: Any part of the line in question.
- T: All right. And where is the full sentence?
- S2: Here. It appears at the top. (Points to the top box on the screen.)
- T: Good. Is this the full sentence of number 27? (Points to the top box.)
- S2: It belongs to this line. (Points to the concordance line 32.)
- T: Yes, but how do you know that?
- S2: Because its keyword was selected.
- T: Well done. If we want to find more contexts of the keyword than one full sentence, can we do that?
- S2: Just click 'Edit' (Points to the menu bar.) and then select 'Display source texts'. We can see the whole passages or articles containing this keyword.

The above samples clearly show that the students' computer concordancing skills were quite good although some students might be humble in expressing themselves. The demonstration during the interview revealed that they could operate the computer concordancing program quite well. Therefore, all data concerning students' performances in dealing with computer concordancing skills were consistent and it could be summarized that the students' computer concordancing skills were not obstacles in studying the concordance-based lessons

4.3.2 Process in dealing with concordance information

It was found that the students' performances in dealing with concordance information developed gradually until they appeared to have gained studying skills in vocabulary learning at the end of the study. When initially dealing with the concordance information, these performances were marginal because of their unfamiliarity of the concordance format, the difficulty of authentic texts in concordances, and a large amount of on-screen concordances. However, after being trained, they could cope with the concordance information better. They learnt how to cope with difficulty in dealing with concordance texts as well as with a lot of concordance information, and utilize concordance facilities for acquiring vocabulary knowledge. At the end of the study, the students rated their performance as having substantially improved both in their vocabulary and reading proficiency. In this section, findings on students' performances in coping with the concordance information are presented, which reveal how students deal with such difficulty before they could utilize the concordance information to gain vocabulary knowledge at the end.

4.3.2.1 Performances in coping with a large amount of concordance information

The data from teacher's field notes and students' logs were consistent in revealing students' performances during the experiment. At the first encounter to paper-based concordances, the teacher observed that students looked puzzled and nervous when dealing with the concordance information. Although the concordance examples were pre-selected from full short sentences with simple language structures, they contained a lot of words unknown to the students. When

students tried to read all the words in the concordances, they appeared more discouraged. This evidence is congruent with data from students' logs regarding the first paper-based lesson as in the following two examples.

- S3: At the beginning of the lesson, I was confused with the strange appearance of the concordances and the vocabulary in the concordances looked formidable for me since there are a lot of unknown words. Therefore, I could not concentrate on the lesson and felt nervous.
- S4: At the first encounter, the concordance format and context observation looked very difficult. When I tried to read the concordances, I felt discouraged since I could not interpret the concordance texts.

Accordingly, the students were given a demonstration on how to cope with text difficulty by utilizing the concordance format to observe the immediate contexts of the keywords and break down the texts into manageable chunks. In other words, they were trained to screen out irrelevant information and pay attention only to the word chunks in focus. Instead of reading all the words in the given concordances, the teacher focused their attention on the highlighted contexts and the focused chunks of words. As a result, the students began to utilize the concordance format to identify word chunks for being interpretable as evidenced in one of students' log shows.

- S5: Previously, I did not know how to identify word chunks while reading so I was often confused and misinterpreted the texts. I find from the lesson today that words such as '*current*' mostly familiar to me as meaning '*electric power*' has another meaning when it functions as an adjective. I have become aware that identifying its chunks can help me identify its function in interpreting its meanings in various concordances more accurately.

However, when the first hands-on lesson was introduced after two paper-based lessons, the students consistently reported the difficulty of authentic texts due to the nature of on-screen concordances which mainly contained authentic texts without simplification and highlights. Moreover, the output of each search included a large number of concordance lines in fragments. The students complained about such difficulty in their logs as shown in the following example.

S6: I have limited vocabulary knowledge so I am unable to understand the concordance texts. Dealing with concordance information is complicated because the concordance texts are strange, difficult and overwhelming for me to read them all.

In training students to cope with these difficulties, some useful strategies to screen out irrelevant information were taught such as selecting to read only comprehensible word chunks or concordances, locating word chunks or context clues to help in interpretation. It was evident in the later stages of the study that the students gradually learnt how to use these strategies for coping with their difficulties. The following records from students' logs described how the students dealt with the concordance information in the middle stage.

S7: Instead of reading all on-screen concordances, I pay more attention to the language points in focus and select only short simple concordances to interpret.

S8: Although I still have the problem of improperly interpreting all the concordances, I have realized how to ignore irrelevant information. Today, I learnt more about words for classifying things and I started to notice that the immediate contexts of the keywords in the on-screen concordances were useful for studying the uses of the keywords. Therefore, I tried to observe the contexts of the verbs such as '*classify*', '*categorize*', '*divide*' and I found that I could identify their typical collocations. A concordance format makes the contexts of '*classify*' so clear that its recurrent collocations mostly in passive form are detected i.e. '*be classified according to*', '*be classified into/to*' etc..

Similarly, data from the interview also confirmed their ability to cope with a large amount of corpus data. One of the interviewees reported his way in dealing with plenty of texts as follows.

T: After searching, we often find that there are so many concordance lines on the screen. How can you cope with such a lot of information?

S5: I just pay attention to only the necessary contexts. Sort the texts by the left or the right parts of the keywords and then try to specify words in chunks. These chunks can be found easily.

T: Do you select any part of texts or words to read?

S5: Yes. I try to find short words or sentences which I can somewhat interpret.

Despite being trained, it was observed that some students still had the habit of reading all the words in concordances and forgot to make use of strategies helpful for coping with difficult and large data. The questionnaire data in Table 4.6 provide details on how students used these strategies in coping with the concordance texts. Similar to the teacher's observation, the questionnaire data at the end of the study revealed that nearly half of the students (46%) still had the habit of reading word by word. In addition, 65% of them forgot to screen out unnecessary information and 31% were unaware of finding some clues to facilitate their interpretation of concordance texts. However, some useful strategies were also made use of. Nearly all students (96%) selected to find information by reading only short comprehensible concordances whereas over 60% of them utilized the concordance format to locate word chunks and collocations to facilitate reading comprehension.

Table 4.6: Analysis of students' strategies in concordance reading

Items with 'yes-unsure-no' questions in Part 3 of Questionnaire II	Percentages		
	Yes	Unsure	No
1. Do you use these strategies in concordance reading?			
* Read the concordance lines word by word.	54	27	19
* Ignore unnecessary information.	35	35	30
* Locate immediate contexts and read words in chunks.	62	31	7
* Read only short or comprehensible concordances.	96	4	-
* Read full sentences at the top.	50	31	19
* Find some clues to help understand texts.	31	58	11
* Find regular collocations of the keywords.	65	31	4
* Identify parts of speech of keywords in interpreting them	42	46	12
* Other strategies	-	-	-

(Note: N = 26)

Table 4.7 clearly summarizes how the students coped with the concordance information. When dealing with a large amount of corpus data, the students chose to ignore irrelevant information (54%) or to further search other words (46%). Nobody stopped using a concordancer or used other strategies.

Table 4.7: Analysis of students' strategies in dealing with a large amount of concordances

Checklist items in Part 3 of Questionnaire II	Percentages
5. What do you do when dealing with a large amount of concordance data?	
* Ignore irrelevant information	54
* Further search other words	46
* Stop using a concordancer	-
* Others	-

4.3.2.2 Performances in utilizing concordances for acquiring vocabulary knowledge

Regarding students' performances in utilizing concordances to learn new words, their skills in identifying various aspects of words were acquired before those in interpreting concordance texts or deducing word meaning. These skills were gradually improved and became evident from the middle stage to the end of the study. In this section, the findings on students' skills in identifying word parts, functions and collocations as well as skills in interpreting concordance texts and/or deduce word meanings are presented.

At the beginning of the experiment, students were not aware that they should make use of context observation in concordances to identify various aspects of words for facilitating their text interpretation and meaning deduction of a word. Such incompetence was due to their inadequate knowledge of word grammatical function and their unawareness of utilizing word formation knowledge to help in guessing the meaning of unknown words. Thus, they seldom paid attention to word affixes, and they were rarely aware of breaking words into parts which might help them guess the grammatical functions of words.

After being trained, they became more aware of using context observation to identify various aspects of target words as well as trying to spot context clues for meaning deduction. At the middle stage, the data from the teacher's field notes revealed that the students became more familiar with the method and made more use of concordance contexts than ever. They began to identify types and functions of some words by observing their suffixes. For example, with the hints from the teacher, they could indicate that '*define*', '*defines*', '*defining*', and '*defined*' were verbs whereas '*definition*' and '*definitions*' were nouns. As they knew the meaning of the root '*define*' in the proceeding activity, it was not difficult for them to guess the meaning of the others.

It was also found from the interview that their ability at the end of the study improved noticeably in making use of concordance contexts to quickly identify recurrent collocations of the given keywords. The interviewees could identify word parts, types and functions as in the following example.

- T: When the results appear on the screen like this, (shows the illustration) can you tell how many word types of '*depend*' there are?
- S1: Yes. Six. (Points to each type and count) 1-2-3-4-5-6.
- T: Right. Anyway, can you identify which type is a noun and which type is a verb?
- S1: Yes, this one. (Points to the keywords '*depending*' and '*depended*'.) It is a verb.
- T: How do you identify it?
- S1: The verbs often end with '*-ing*' and '*-ed*'.
- T: Is that all?
- S1: Err.. no. With '*-s*', too.
- T: Then, from this column of the keywords, which one is the root verb?
- S1: The first one. (Points to '*depend*'.)
- T: Is it easy to observe word types in a concordance format?
- S1: Yes, quite simple.
- T: If you search other words, can you specify the verbs like this?
- S1: I think so. Just spot the endings of the keywords – whether they end with '*-ing*' or '*-ed*'.

According to the questionnaire data, Item 2 in Table 4.8 illustrated that more than half of the students could make use of context observation to identify various aspects of words i.e. words' grammatical functions, chunks and regular collocations as well as to find corpus information to complete the tasks. However, most of them were unsure whether they could identify key context clues and deduce word meaning from contexts.

Table 4.8: Analysis of students' performances in identifying various aspects of words (1)

Items with 'yes-unsure-no' questions in Part 3 of Questionnaire II	Percentages		
	Yes	Unsure	No
2. Can you use concordance information to do the following activities?			
* Identify parts of speech of keywords from contexts.	58	35	7
* Identify chunks of the keywords.	65	31	4
* Identify regular collocation of the keywords.	54	46	-
* Find some examples or information to complete the tasks.	54	46	-
* Identify key context clues.	46	54	-
* Deduce word meaning from contexts.	39	61	-

(Note: N = 26)

Their abilities to perform these skills varied because the results in Table 4.9 illustrates that nobody rated their performances on these skills as very quick, about 12 – 25% rated as quick, about 35-34% rated as average, about 26-46% rated as slow, and only one student (4%) rated as very slow. Based on these results, it can be concluded that about 60% of them could perform these skills moderately fast whereas the others (about 40%) were slower than their peers. It was also noted that

the skills of identifying key contexts clues and deducing word meaning had the least rating on very quick. These results indicated that the students' skills in dealing with the concordance input had improved noticeably although they were not fully mastered at the end of the study, especially those of identifying key context clues and deducing word meanings. This was due to the fact that the skill of deducing word meaning took more time to be acquired after the students could properly identify various parts of words and context clues for facilitating their word-meaning deduction.

Table 4.9: Analysis of students' performances in identifying various aspects of words (2)

Scaled items in Part 3 of Questionnaire II	Percentages				
	5	4	3	2	1
3. How quick can you do the following activities					
* Identify parts of speech of keywords from contexts.	-	23	39	39	-
* Identify chunks of the keywords.	-	23	46	26	4
* Identify regular collocation of the keywords.	-	31	35	35	-
* Find some examples or information to complete the tasks.	-	27	39	31	4
* Identify key context clues.	-	12	54	31	4
* Deduce word meaning from contexts.	-	15	35	46	4

(Note: N = 26, 5 = very quick, 4 = quick, 3 = moderately quick, 2 = slow, and 1 = very slow)

Consistently, details of these performances from the teacher's field notes and interview suggested that their abilities in specifying word chunks and collocations improved substantially, compared to at the beginning of the study. The teacher found at the middle stage that the students could spot regular recurrent patterns of such keywords as '*classified*', '*equal*', '*addition*' etc. before inferring their typical collocations. Moreover, they could find specific information from the corpus to complete the given concordances rather quickly. When being asked how they find information to complete the gaps in the given concordances, some students replied that they observed the contexts of the gaps and used one or a few of words in context as keywords to be searched in the corpus before inferring word meanings, functions or collocations. Since the gapped concordances were frequently included with words recycled from earlier lessons, the students reported that such repetition of encountering words helped them in reading a lot of concordance lines comprehensibly. As to the question of whether they read and interpreted such concordances, they said they did and could somewhat get the overall meaning of each concordance. In addition, some students reported that, without being assigned, they

were motivated to find more contexts of some words instead of reading fragments in concordances by referring to full sentences or source texts to read in passages and found that they could get the overall meaning of those passages.

This evidence is supported by the interview data that the concordance contexts were mostly utilized for spotting any recurrent patterns of the keywords. After the concordance output appearing on the computer screen, they usually looked at the keywords and then observed which words often co-occurred with the keywords. One student, for example, explained how he initially dealt with concordance texts as follows.

- T: When the concordance output first appeared on the screen, which parts of the concordances do you look at?
 S9: This. (Points to the column of the keywords in the illustration.)
 T: And then?
 S9: I observed the contexts to see which words often come before or after the keywords.
 T: Why?
 S9: To find regular co-occurring words or to locate word chunks.

In addition, the following interview script confirmed that the students could cope with the concordance texts well enough to infer the use of typical collocations of '*depend*' and '*refer*'.

- T: From this illustration, (Gives the illustration of '*depend*' concordance output.) do you think the output was sorted by the left or right contexts?
 S10: It might be sorted by the right contexts since the words '*on*' and '*upon*' were rearranged together.
 T: Can you immediately notice that these keywords are often followed by '*on*' or '*upon*'?
 S10: Of course. A lot of them immediately come after the keywords.
 T: Let's switch the illustration. (Gives another illustration of '*reference*' concordance output.) Can you identify which patterns often co-occur with these keywords?
 S10: With its right-sort, the word '*to*' always comes after the keywords.
 T: What about the word '*as*'?
 S10: '*As*' also often comes after '*to*'. In the case of searching for information, I think I should use an advanced search because both '*to*' and '*as*' could narrow the relevant output.
 T: But in this case, I would like to know why some keywords of '*refer*' are not followed by '*to as*' and why some are?

S10: (Looks at the illustration and thinks.) Well, the word 'as' will follow 'to' when the word 'refer' ends with '-ed' ...umm.. when it functions as a past participle.

T: Do you also observe the contexts in front of the keywords?

S10: Yes.

T: What do you find then?

S10: (Thinks.) Um. The phrases 'referred to as' often have 'is', 'are' or 'was' in front of them.

T: Good. Then, what can you learn or infer from such information?

S10: (Think.)

T: When the verb to be such as 'is' or 'are' comes together with a past participle, what can this verb phrase function?

S10: Passive form, right?

T: Well done. Now, what can you infer from this information.

S10: Can I say 'to' always comes after all types of 'refer' whereas 'as' will come after 'to' when 'refer' is in a passive form.

More details in teacher's field notes revealed that these interpretative and deductive skills were occasionally found at the middle stage of the study. Despite being unable to properly deduce meanings of all given words, with hints from the teacher, the students could somewhat deduce the meanings of some words such as 'automation', 'artificial', and 'intelligence' using the contexts to match the words with the given definition correctly. In addition, students' logs reported that they could somewhat make some use of context observation in deducing word meaning, despite being unsure of the accuracy of the guessed meanings. Two students recorded in their logs as follows.

S8: I could interpret some concordances and tried to interpret other difficult concordances by discussion with friends. Sometimes, I could not exactly tell the meaning of some concordances but I think I could get their overall meaning.

S5: Today I could observe the contexts in concordances better and could somewhat deduce the meanings of some words such as 'artificial intelligence'. Based on its various contexts of computer engineering, I realize that such a collocation must have a particular meaning concerning computers, rather than referring to the thinking processes.

One finding on students' dealing with concordance information was concerned with the difficulty of authentic concordance texts. This difficulty was due to students' unfamiliarity with concordances as well as their inadequate vocabulary knowledge. Students frequently complained in their

logs at the beginning stages that their limitation of vocabulary knowledge inhibited them from interpreting the texts properly. One sample is as follows.

S2: I could somewhat make use of the context observation but I still did not know many words in the context. A lot of unknown words in a context made me unable to deduce the meaning of the keywords and consequently I became discouraged. My main problem was the limitation of my vocabulary. If we don't know a lot of words in contexts, the guessing of the keywords' meanings becomes difficult or impossible.

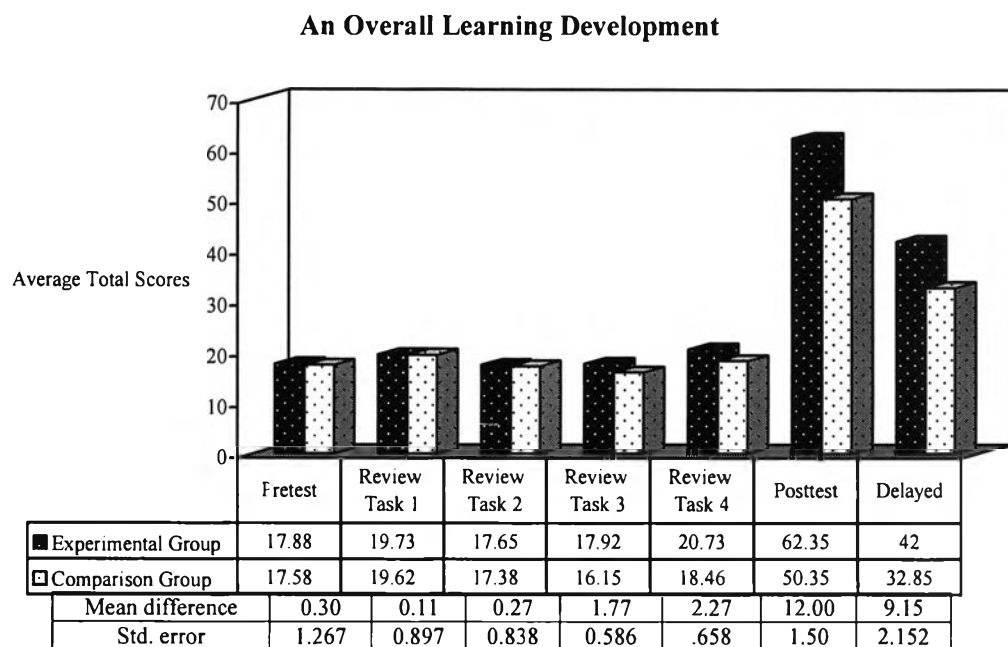
Although such a problem was frequently mentioned in students' logs at the beginning stage, it was less recorded in the later stages. The teacher assumed that the less complaint might be due to their vocabulary expansion which helped them cope with the text difficulty better. This assumption was supported by the questionnaire data which showed that 65% of the students rated the problem in dealing with concordances as average and 23% replied they had very few problems. Only three students thought that there were many problems in dealing with concordances.

To summarize the findings on students' processes in dealing with concordance information, it was consistently found from all relevant data that the students were gradually able to deal with concordance information in order to learn vocabulary by identifying various parts of words for facilitating their text interpretation and deduction of word meaning. These performances in text interpretation and deduction of word meaning were improved noticeably, compared to those at the beginning of the study. However, students' ratings of their performance as moderate signified that these performances were not inadequate for properly interpreting texts and deducing word meaning, and longer training was suggested in the open-ended questionnaire as necessary for them before being able to use the method independently. One problem concerning the difficulty of texts was found from dealing with the concordance information. However, it was not a main obstacle since the students could cope with them better at the later stage after their vocabulary size gradually expanded. Therefore, the problem in dealing with the method was rated as moderate by the students.

4.3.3 Overall learning development

An overall learning development was tracked to overview the trend of their learning gain in different stages from the beginning through to the end of the study. This finding was used to supplement or confirm other findings on the learning process in order to assess how learning gains from such processes were developed as well as to indicate at which stage the differences between the experimental group and the comparison group occurred. Learning development was revealed by comparing the data from students' average total scores of the experimental group and the comparison group in all measures of vocabulary knowledge as illustrated in Figure 4.3.

Figure 4.3: Average total scores on all measures of vocabulary knowledge



(Note: Total scores in the pretest, the immediate posttest and the delayed test = 101 scores
Total scores in each review tasks = 30 scores)

It was found that at the beginning of the study both groups similarly obtained very low scores at about 17 with the mean difference of 0.30. In the subsequent measures, however, the mean differences between scores were constantly greater by 0.11, 0.27, 1.77, and 2.27 in Review Tasks 1 to 4 respectively until reaching the peak at 12.00 in the immediate posttest before dropping to 9.15 in the delayed test. Figure 4.3 clearly shows that the differences between groups in both

posttests are distinct with the higher scores belonging to the experimental group. These differences were tested for significant differences by conducting the MANOVA with the results illustrated in Table 4.10.

Table 4.10: The results of tests of between-subjects effects in all measures

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Methods or Groups	Pretest	1.231	1	1.231	0.059	.809	.001
	Review Task 1	0.173	1	0.173	0.017	.898	.000
	Review Task 2	0.942	1	0.942	0.103	.749	.002
	Review Task 3	40.692	1	40.692	9.114	.004*	.154
	Review Task 4	66.942	1	66.942	11.887	.001*	.192
	Immediate Posttest	1872.00	1	1872.00	64.032	.000*	.562
	Delayed Posttest	1089.308	1	1089.308	18.099	.000*	.266
Error	Pretest	1043.000	50	20.860			
	Review Task 1	523.269	50	10.456			
	Review Task 2	456.038	50	9.121			
	Review Task 3	223.231	50	4.465			
	Review Task 4	281.577	50	5.632			
	Immediate Posttest	1461.769	50	29.235			
	Delayed Posttest	3009.385	50	60.188			

* $p < 0.05$

At the beginning of the study, it was found that there were no significant differences between both groups in the pretest, $F(1, 50) = 0.059$, $p > 0.05$, $\eta_p^2 = 0.001$; Review Task 1, $F(1, 50) = 0.017$, $p > 0.05$, $\eta_p^2 = 0.00$; and Review Task 2, $F(1, 50) = 0.103$, $p > 0.05$, $\eta_p^2 = 0.002$. However, significant differences were found in the subsequent four measures with large effect sizes: Review Task 3, $F(1, 50) = 9.114$, $p < 0.05$, $\eta_p^2 = 0.154$ / $d = 0.8$, percentile standing = 79, and % of non-overlap = 47.4%.; Review Task 4, $F(1, 50) = 11.887$, $p < 0.05$, $\eta_p^2 = 0.192$ / $d = 1.0$, percentile standing = 84, and % of non-overlap = 55.4%; the immediate posttest, $F(1, 50) = 64.032$, $p < 0.05$, $\eta_p^2 = 0.562$ / $d = 2.0$, percentile standing = 97.7, and % of non-overlap = 81.1%.; and the delayed posttest, $F(1, 50) = 18.099$, $p < 0.05$, $\eta_p^2 = 0.266$ / $d = 1.2$, percentile standing = 88, and % of non-overlap = 92.2%.

4.4. Learners' Attitudes

Apart from learning effects and processes, learners' attitudes towards the application of the concordance-based method were also explored in the study. Learners' attitudes were concerned with learners' opinions towards the application of the concordance-based method in terms of its usefulness, level of difficulty and students' level of preferences for the method. These attitudes were assessed by the data from students' logs, questionnaire and interview. In general, findings from the questionnaire revealed that students' attitudes towards the application of the concordance-based method were positive. According to Table 4.11, all means concerning students' attitudes were found at above the middle point of 3 in the five-point rating scales.

Table 4.11: Analysis of learners' attitudes

Part	Scaled items in Questionnaire II	Percentages					Means
		5	4	3	2	1	
2	7. Confidence in using the concordancer	-	46	50	4	-	3.42
	8. Preference in using the concordancer	8	46	42	4	-	3.58
3	6. Usefulness of a concordance format in identifying word chunks	-	65	35	-	-	3.65
	7. Usefulness of a concordance format in identifying collocations	-	50	50	-	-	3.50
4	1. Usefulness of the concordance-based method for studying English	-	50	50	-	-	3.50
	2. Ease or difficulty in using the method for studying English	-	31	65	4	-	3.27
	3. Preference in using the concordance-based method	4	46	50	-	-	3.54

(Note: N = 26, 5 = very much, 4 = much, 3 = moderate, 2 = little, and 1 = very little)

More findings on students' opinions in terms of the usefulness of the concordance-based method, ease or difficulty of its application, and problems and suggestions are presented respectively as follows.

4.4.1 Opinions on the usefulness of the method

Students' opinions were generally given on the usefulness of the concordance-based method for studying English. According to Table 4.11, it was found from the questionnaire that all students considered the method as being useful for studying English: half of them rated it as '*much*' useful whereas the other half rated it as '*moderate*'. Moreover, its usefulness for identifying word chunks and collocations were also rated: more than half (50-65%) of them regarded the method as '*much*' useful whereas the other rated it '*moderately*'.

Findings from the students' logs and interview provided more details on the usefulness of the method for studying English. According to students' logs, students considered that the method facilitated vocabulary learning in finding linguistic information, observing words in contexts, identifying various aspects of words, drawing their active involvement, enhancing memorization, and self-studying. The following extracts reflect these opinions.

S7: A concordancer helps me to quickly figure out the typical collocations of particular words and then study the specific use of these collocations.

S4: The method makes it convenient to find information on the keywords as well as to observe the surrounding contexts. I enjoyed searching the information from the corpus and I could learn a lot of vocabulary. Studying with this method helps me to memorize words well and it also encourages me to learn more from the corpus.

In addition, one student thought the method could be useful for self-study. According to him:

S5: The method was very interesting when I knew how to use it. I think it can be used for self-study at home.

Findings from the interview also confirmed this evidence. The interviewees gave reasons to support the fact that the method increased their observation skills and utilization of word contexts and this enhanced their memorization of the studied words. One sample is in the following interview transcript.

T: From these illustrations, now we can learn that '*depend*' is often followed by '*on*' whereas '*refer*' is often followed by '*to*'. Does this make you closely observe word collocations? I mean, when you find these words somewhere else such as in textbooks or advertisements, do you try to verify whether '*on*' will come after '*depend*' or '*to*' will come after '*refer*'?

S6: Yes. I make more observation and pay more attention to such collocations in order to test whether these words will co-occur or not. If I find these collocations very often, I should recognize them.

T: So you think it helps you memorize words, right?

S6: That's right.

T: Before studying with this method, have you ever made use of context observation like this?

S6: No, never. I had never used a computer to study like this, either. I just studied from paper-based textbook.

In comparing the usefulness of the concordance-based method with the other teaching method, the findings from students' logs and interview were consistent in revealing that the students considered the method better than the others as reflected in two students' logs as follows.

S3: The method encouraged students to learn more actively than the traditional paper-based one in which some students may not fully attempt to do so.

S2: The concordance format is very helpful for clearly distinguishing between the use of two collocations such as '*different from*' and '*similar to*'. Previously, I used to study these collocations by memorizing the patterns given by the teacher. However, the concordance-based method can verify these typical uses so very well that I get insight, not by being told. Therefore, I am impressed with its usefulness and I get much insight by such learning.

According to the interview, when being asked to compare the method with other normal paper-based ones, the students also indicated more advantages of the concordance-based method. The interviewees mentioned that the method could draw their attention to word frequency whereas normal reading could not. Knowing frequency information encouraged them to learn more since they felt assured that the words being studied would likely be met often in their further reading. Apart from motivating them to learn, the method could also facilitate word memorization. The following interview transcript clearly reflects these details.

T: Let's compare learning through reading in concordances with those in normal paper-based reading. What do you think?

S7: Normal reading does not provide frequency information of particular words or collocations. Therefore, I have never paid much attention to how often such words or collocations are used.

T: Right.

S7: After reading, we may not pay attention to particular words found in reading since there was no guarantee that those words may or may not be found again. With the concordance-based method, I see a lot of recurrent patterns. This draws my attention to the frequency

information of words and encourages me to learn more about those words. I think the more the frequency of words we find in the corpus, the more likely we will find them in other texts. Moreover, when we re-encounter these words in any reading, we can better remember them.

Another student compared the concordance-based method with the method he had been exposed to previously.

T: Supposing that we do not use this method but I give you a wordlist for memorizing the meaning of words. Which method would make you learn words better? And which one do you prefer?

S8: I prefer studying with the concordancing method. With the memorizing method, we just look at words and try to memorize their meanings. With the concordance-based method, we don't have to memorize words but we learn by dealing with them. We learn from the corpus information and we see a lot of authentic examples, not by being told. Frequent dealing with particular words makes me learn those words and remember them without trying to memorize them.

T: So you think the method is useful, right?

S8: Certainly. It is very useful and user-friendly. I can learn a lot of collocations. Formerly, I was taught that 'different' would co-occur with 'from' whereas 'similar' would co-occur with 'to'. I just learnt by memorizing the patterns. Now, the concordance-based method gives me ample evidence to get insight into these collocations frequently used.

T: Does this motivate you to learn?

S4: Yes. The method makes it possible for me to verify what we have learnt in classes. Such verification seems to make me feel as if I have discovered new knowledge by myself, not by being told.

Apart from increasing word memorization, the students mentioned that the method increased their amount of reading and they thought their reading proficiency was much improved.

T: Do you think the method increased the amount of your reading?

S9: Certainly. I read much more than ever now. While reading, I try to observe as many aspects of words as possible. When I found the collocations we studied in classes, I am encouraged to practise interpreting them and I am glad to find that I can really interpret them better than I have ever done.

4.4.2. Opinions on level of difficulty of the method

The results from the questionnaire illustrated in Table 4.11 revealed that the concordance-based method was considered at a moderate level of ease or

difficulty. The majority (65%) rated it at an average level of difficulty whereas 31% of them thought the method was easy and only one student (4%) thought it was difficult. This evidence was supported by relevant data in students' logs and interview. The students thought that dealing with a concordancer was very easy but dealing with the corpus information was rather difficult. On the one hand, students' computer concordancing skills were found to be at a good level, as discussed in 4.3.2.2. Therefore, most students mentioned that it was very easy for them to operate the concordancer for specific purposes and the method was very convenient for use for searching words and observing contexts.

On the other hand, most students agreed that the difficulty was with the concordance information as well as the utilization of the results from context observations. Although it was evident that the students' language concordancing skills were much improved, these skills were still inadequate and needed to be developed further before they could deal with the method more efficiently. The following transcript was one example of the students' opinion on the ease or difficulty of using the method.

T: Do you think using this method is easy or difficult?

S9: Compared to other computer programs, I think the concordancing program is not difficult to use since the instructions were not many and not complicated. The output format facilitates the observation.

T: So, you think it is easy, right?

S9: Umm... It's neither easy nor difficult. Although operating the computer concordancer was very easy, dealing with corpus information was rather difficult. Sometimes the concordance lines were so long that they look discouraging. My limited vocabulary inhibited me from properly interpreting concordance texts.

T: Then, how do you deal with this problem?

S9: I just interpret only the chunks in focus and guess for getting the overall meaning. By doing this, I can somewhat cope with such information. It is difficult but challenging.

It was also found from students' logs near the end of the study that the method seemed to become easier, compared to its use at the beginning.

S2: The lesson today is most likely easier when compared to the first lesson since I can integrate all the knowledge and skills learnt in the earlier lessons for use in this last lesson.

S5: I think the lesson today seems simpler since I am more familiar with the method.

S9: Today I can operate the concordancer to access the corpus without waiting for the teacher's instructions and I can do it more quickly than ever. I feel the method seemed easier for me to find word information.

4.4.3 Preference for the application of the method

The results illustrated in Table 4.11 in 4.4.1 show that the students liked dealing with the concordance-based method to a great extent. The words '*like*', '*interesting*', and '*challenging*' were often used in their comments on the method and these words were continually found in the students' logs from the beginning through to the end of the study. For example:

S1: I like studying with concordances since it helps me to observe word functions more clearly with more understanding.

S6: I like searching the corpus information to infer word meanings. I used a simple search more often than an advanced search. I do not think I have problems now since I can adapt myself to the method."

Similarly, all interviewees also mentioned their preferences in dealing with the method, but to different degrees. Two students reported that although they were very discouraged at the beginning stage, they started to enjoy dealing with the method when they were more familiar and able to cope with the method better. One of these two students wrote about this in the questionnaire whereas the other mentioned it in the interview as follows.

S10: In the earlier lessons, I disliked the concordancer since I did not understand how to use it. However, after dealing with it in succeeding lessons, I thought the program was easy to use and started to enjoy using it.

S11: I was, at first, very discouraged since I thought I could not study with this method. However, after I seriously tried to deal with it, I changed my mind and liked using it.

T: Yes, I saw that you enjoyed the activities and could find the information very quickly. Do you think you can use it independently?

S11: Yes, I'm sure I can use it by myself.

The students were also pleased with the content relating to the themes concerning engineering fields. They thought that the vocabulary in focus was very interesting and could be really applied in their academic situations because such language inputs were closely related to their fields of study. Three students commented as follows.

S11: I like this lesson since the vocabulary is concerned with technical drawing. The words studied today are very interesting since they could be applied to my engineering study.

S8: The words studied today are words often found in my engineering study so I think they are important and interesting.”

Interestingly, despite being slower than his friends, one student also expressed his motivation as follows.

S3: Today, I tried to do the activities by myself rather than depending on my friends. Although I am quite slower than them, I found that I could observe the concordance contexts and deduce the meaning of some words. When I started to fulfill some points of the activities, I felt challenged. Now, I realize that the use of the concordance-base method is not too difficult for me to use, but it is not easy, either.

Regarding their confidence in dealing with the method, it was found in the questionnaire results in Table 4.11 that nearly all of them were moderately confident. The interview data also supported this evidence. Finally, when being asked both in the questionnaire and interview whether they would continue to use the concordance-based method for their self-study, most students (96 %) responded positively. They stated that the method was very useful for studying various aspects of words since it facilitated searching and observing words in various contexts with plenty of language examples.

4.4.4. Comments and suggestions

The problem frequently mentioned was that of crammed lessons which allowed little time for practice of each activity. The students suggested reducing the content in each lesson. However, they were aware that all activities were interesting and useful for them so they thought that it was

necessary to have longer training with the concordance-based method on vocabulary learning before they could cope with it more independently and with more confidence.

Another problem mentioned was their inability to properly interpret the concordance texts. Although all students thought that their vocabulary knowledge as well as reading skills was much improved, some of them still worried that their language proficiency was inadequate for dealing with the concordance information. These students said that their inadequate proficiency inhibited them from using the method effectively. One student suggested that the weekly wordlists should have been given for them to look up word meaning in advance in order to reduce unknown words found in the class activities. Accordingly, during class activities, they could have more time studying other aspects of the target words by dealing with the concordance-based method.

Apart from these two problems, a few students suggested making the lessons more interesting. They proposed more variety of input presentation by including more figures or illustrations in the handouts such as in the lessons dealing with advertisements.

4.5. Summary

In this chapter, the results of the study were presented in three main areas: learning effects, learning processes and learners' attitudes. Regarding learning effects, the average scores of the experimental group were found to be significantly higher than those of the comparison group in all measures with higher retention rates. In addition, the magnitudes of these differences on the measures of transferable knowledge were greater than those of definitional knowledge both in the posttest and the delayed test.

With regard to learning processes, although the concordance-based method was completely new to the students, they quickly became familiar with the computer concordancer and learned to operate it very well. However, it took a longer time for them to acquire the ability to deal properly with concordance information, especially

at the beginning stage. Their skills in interpreting concordance texts and deducing word meaning gradually improved at the subsequent stages of the course. Although the students did not master some necessary skills, the findings on learning development showed their potential. Based on the ongoing assessment, the difference between both groups became apparent in the middle stage of the study. As can be seen, the average scores of the experimental group became significantly higher than those of the comparison group on all the subsequent measures. Despite having a different level of confidence, the students mentioned that they would be able to utilize the method properly for their language study if the training was conducted for a longer period of time. More support and more time for practice were still needed before they would become skillful and confident enough to utilize the method independently after finishing the EAP courses.

In terms of the students' attitudes, it was found that their attitudes were very positive towards the method. The students considered the method very useful for studying language and its difficulty level was rated as '*average*'. Although they faced some difficulties, the students regarded such difficulties as challenging and interesting, rather than completely discouraging. Despite being only moderately confident, the students liked dealing with the method a lot. Recognizing its usefulness, all students mentioned that they would continue to utilize the method for their own self-study.