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Expansion of EFL Academic Vocabulary for Writing via Web-Enhanced Lexical Instruction

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Abstract

Using web-enhanced lexical instruction based on the Academic Word List in an EFL course, we explored the effects of an eight-week vocabulary intervention (Coxhead, 2000) on the development of twenty-five EFL learners' lexical and writing abilities. Three instructional features were included: (a) explicit academic vocabulary lessons (wordlists, weekly lecture notes and reading) plus concordancing practice, (b) online quizzes, and (c) pair writing and individual lexical logs. Measurement included a vocabulary size test and depth test plus a timed writing task administered before and after the instruction; four weeks after the instruction, the writing task and a questionnaire were given. The results indicate that the learners increased their lexical depth but not the size after the instruction. In the Lexical Frequency Profile analyses of the writing tasks, the learners used more academic words accurately in post-instructional writing compared with their entry level. Positive correlations were found between the learners' post-instructional lexical and writing performances. We believe that web-enhanced lexical instruction is promising in expanding learners' academic productive vocabulary. With advancement in academic vocabulary in writing, EFL learners' academic literacy can be promoted so that they can fully participate in the academic community later.

Key words: Academic Word List, web-enhanced lexical instruction, productive vocabulary

INTRODUCTION

Productive vocabulary capacity has been recognized as one crucial element of L2 writing as it accounts for the greatest variations in writing performances (Astika, 1993; Lee & Munice, 2006). Constrained by their limited vocabulary repertoire, quite a few EFL learners appear to be severely impeded by paying too much attention to word choice rather than the content and organization of their texts (Chao, 2003). Most previous research efforts on vocabulary learning have been devoted to incidental lexical learning (particularly useful for receptive vocabulary) through reading tasks. It is evident that incidental lexical learning in reading can hardly help efficient expansion of L2 productive vocabulary (Lee & Munice, 2006; Lee, 2003). The value of explicit lexical instruction for L2 productive vocabulary learning deserves more attention (Hulstijn 2001; Nation, 2001).

In this article, we examine the effects of web-enhanced lexical instruction on EFL college learners' academic vocabulary and writing abilities. An online course platform was available to upload regular lecture notes and to create corpus-based links (concordancers, dictionaries) for learning the Academic Word List (AWL). The platform then served as a powerful resource center for in-class lexical instruction. In addition, explicit lexical instruction addressing form, meaning and usage of academic words was delivered in regular class with the hope of drawing the learners' direct attention toward productive use of academic words in writing. Our instructional value is carefully measured by the interconnection between learners' academic vocabulary and writing performance.

Explicit L2 Vocabulary Instruction for Writing

Despite the interrelations between L2 lexical store and writing capabilities, the effects of explicit lexical instruction on enhancing L2 writing performance have remained less investigated until very recently. Explicit lexical instruction regards L2 vocabulary as an individual target in language learning rather than a by-product of L2 reading or listening training (Lee, 2003). Hulstijn (2001) defines explicit lexical instruction as drawing learners' focal attention to lexical learning with useful learning strategies. Explicit lexical instruction may combine intentional learning by overt lexical lessons and incidental word learning in reading or listening tasks (Laufer & Hulstijn, 2001). Schmitt (2000) illustrated a number of useful principles for delivering explicit instruction: giving repeated exposure to target words and introducing various independent learning strategies.

Three constructs proposed by Henriksen (1999) for vocabulary development have been widely cited to describe the complex nature of lexical learning. These constructs include: (a) partial to precise knowledge, (b) depth of knowledge, and (c) receptive to productive use ability (pp. 304-306). The partial to precise knowledge dimension mainly indicates the breadth or size of vocabulary knowledge; that is, how precise the lexemes are that learners have in their vocabulary repertoire. The second dimension, depth of knowledge, describes the complexity of vocabulary knowledge such as collocations, the constraints of word use, synonyms, etc. Finally, the operationalization of word knowledge is defined as using words receptively or productively (e.g., recognizing a word meaning; writing a sentence using the word).

Moreover, some lexical measures have been developed to reflect the three major constructs. The Vocabulary Level Test (VLT) for vocabulary size construct reflects receptive lexical knowledge by the matching exercises of target words with their corresponding meanings (Nation, 1990). The Vocabulary Knowledge Scale (VKS) for vocabulary depth construct reflects controlled lexical production in the format of learners' self-perceptions of a target word and their demonstrated abilities of explaining and using the word (Wesche & Paribakht, 1996). Last, the Lexical Frequency Profile (LFP) displays the ratio of general service words and academic words of free lexical production in writing (Laufer & Nation, 1995). These three measures were later adapted to better serve various purposes of vocabulary research. For instance, Schmitt, Schmitt, and Clapham (2001) created a new version of VLT, including the AWL items as one specific level of testing words. Joe (1998) developed an adapted version of VKS by including six options (adding one more to the original 5 options) for learners' self-report of their lexical knowledge. With the extra option, learners can demonstrate their knowledge of English affixation rules in inferring word meaning. Morris and Cobb (2004) put the LFP program online (http://www.lextutor.ca) to provide worldwide access.

Lee and Muncie (2006) evidenced the effects of explicit lexical instruction on 48 ESL learners' productive vocabulary in writing. Forty-two target words were directly addressed by video and reading input, and subsequent explicit lexical teaching. One vocabulary test and an essay-writing test were used in their pretest, posttest, and delayed posttest. Results showed that learners' productive vocabulary in writing had expanded after the experiment. However, Lee and

Muncie did not adequately describe the learners' productive vocabulary in writing, and the relations between the learners' lexical and writing abilities remained unclear. The researchers simply used a self-designed test to assess controlled productive vocabulary and the LFP to quantify word occurrences in free production. In addition, how the taught vocabulary was actually used in essays was under-investigated. Also, the relations between the learners' lexical and writing abilities were unknown, as their writing was randomly rated by native-speaker teachers' perceptions rather than by an analytical rating scale. By using more specific lexical and writing measures and running correlations between these two abilities, more details of ESL or EFL learners' productive vocabulary in writing may be understood.

Furthermore, the needs of advanced learners for academic vocabulary were not addressed in Lee and Muncie (2006). The benefits of lexical learning for academic writing, particularly for advanced learners, are still undetermined. For tertiary education, the Academic Word List (Coxhead, 2000) has been recognized as one essential learning target for L2 learners to develop their academic literacy, as it contains high-frequency lexemes applicable to varied academic disciplines (Coxhead, 2000; Nation, 2001)[1]. As an updated version of the University Word List (developed by Xue & Nation,

[1] Yet, Hyland (2007) contends that a general academic vocabulary list is not useful at all given disciplinary variations. He argues that academic vocabulary should be compiled from discipline-specific corpora, and that context-specific instruction of academic words should be conducted to properly address various words used in diverse fields. However, for undergraduate learners, whose future academic pursuits may vary, the AWL can still serve as basic training in high-frequency academic words.

1984), the AWL has fewer words but higher occurrences across diverse disciplines, and may bring better learning returns to L2 learners. With 570 word families, the AWL has around 10% occurrences of the total words in written academic discourse (Coxhead, 2000). There are ten sub-lists under the AWL. With an initial understanding of the academic word inventory, learners may polish their field-specific academic vocabulary later after they determine their own pursuits.

Use of E-Referencing Tools to Enhance Effects of Explicit Lexical Instruction

Web-enhanced lexical instruction may employ lexical teaching principles of providing repeated language input and autonomous learning with greater ease (O'Sullivan & Chambers, 2006). Utilizing corpora data to develop web concordances and dictionaries is one of the most popular practices for lexical learning, as these e-referencing tools empower learners to directly access rich and authentic lexical usage (Horst, Cobb & Nicolae, 2005; Yeh, Liou & Li, 2007). A concordancer allows learners to enter a key word or phrase in searching frequent collocates, and then it displays a list of sentence examples with discourse information. It is evidenced that using concordance enables some learners to acquire knowledge of collocation patterns and syntactical constraints (Chan & Liou, 2005), while combined use of the two tools (concordancers and dictionaries) enables learners to gain confidence in using newly learned words in writing, and to retain this productive knowledge longer (Horst, Cobb & Nicolae, 2005). Kaur and Hegelheimer (2005) analyzed two aspects of productive vocabulary: the accuracy rate of academic word usage

in cloze and sentence-building tasks, and the degree of using the same set of target words in a take-home essay. In both tasks, the experimental group (n = 9), which was given both an online dictionary and concordancers, outperformed the control group (n = 9), which used an online dictionary. The experimental group was found to use the learned words more accurately in their writing. Similarly, Yeh et al. (2007) introduced a bilingual concordancer for nineteen EFL freshmen English majors in an English writing course. After a semester, the learners could correct over half of the lexical errors in their essays via the help of the concordancer, and they expressed positive attitudes toward concordancing.

To ensure that learners are capable of concordancing, providing guidance and instructional materials may be required. O'Sullivan and Chambers (2006) delivered a concordancing training seminar for fourteen college learners who needed to write a 600-word essay in French. Three phases of corpus consultation were implemented by the use of a self-compiled corpus: preparation, skill-training seminar, and a hands-on correction session. The learners demonstrated a high accuracy rate, and expressed positive intentions toward future concordancing. Designing appropriate instructional units is also feasible to guide learning with e-referencing tools. Yeh et al. (2007) targeted collocational patterns for EFL college learners. They designed online synonym units with gap-filling tasks to see if the learners could acquire synonymous alternatives for overused adjectives. Together with the use of the online concordancer *TANGO*, the learners received the online instructional units for four weeks; the learning effects were evaluated via an essay, a translation test and a gap-filling test. The learners were found to use more accurate adjectives after the instruction.

In sum, two key principles for learning productive vocabulary effectively are suggested from the literature: delivering explicit lexical instruction with ample production practice, and equipping learners with powerful e-referencing tools (Coxhead, 2006; Fuente, 2006). Few studies, however, have explored the effects of explicit lexical lessons on expanding learners' academic vocabulary for writing. Also, to what extent a lexical lesson with e-referencing tools can assist productive vocabulary learning remains unknown. This study aims to examine the effects of online lexical lessons on enlarging EFL learners' academic vocabulary for writing. Three research questions were raised:

1. To what extent do EFL college learners enlarge the size and depth of their academic vocabulary as shown in the tests after web-enhanced lexical instruction?
2. To what extent do learners expand their academic vocabulary use in writing after online instruction?
   (1) Are there any lexical improvements in the essay test of Version 2 (immediate posttest) compared to that of Version 1 (pretest)?
   (2) Are there any lexical improvements in the essay test of Version 3 (delayed posttest) compared to that of Version 1 (pretest)?
   (3) If there are some improvements in the learners' academic vocabulary, to what extent does the learners' overall writing quality advance due to lexical improvements?
3. What are learners' perceptions towards the usefulness of web-enhanced instruction in improving their academic vocabulary ability and writing quality?

METHOD

Context and Participants of the Study

In the present study, an online academic vocabulary syllabus was developed for twenty-five EFL third-year college learners in the in-class instruction. The students had Mandarin Chinese as their first language and English as their major field of study in a public university in Taiwan. They had had at least eight years of English instruction, including junior and senior high school and their first two years at university. The learners had taken required writing courses for two years in college to develop their writing skills and knowledge. These twenty-five learners were taking a required course, "Reading and Writing II," with two periods per week (100 minutes). The course started with explicitly teaching the selected Academic Word List (Coxhead, 2000), continuing with integrated instruction in reading and writing.

The Online Instructional Materials and Referencing Tools

On the basis of eight out of ten of the AWL's sublists, online instructional materials were constructed on a free course management system (*MOODLE*, http://formoosa.fl.nthu.edu.tw/moodle2). The content of our lexical syllabus was offered first with the most frequently used AWL words (from Sublist 1 to Sublist 8), so that the usefulness of these academic words could be maximized (Coxhead, 2006). Several design principles were applied: explicit vocabulary lessons with dictionary information, reading texts with academic words highlighted, concordances for more examples and illustration, and pair writing that followed all instruction procedures for practice of productive vocabulary entries. The online lexical syllabus was

developed with three major features (See Figure 1): (a) explicit academic word lessons including weekly lecture notes; (b) online practice of academic words via quizzes, i.e. gap-filling and crosswords; and (c) student assignments. A textbook designed specifically for AWL learning (Huntley, 2006) was used as the main reading input.

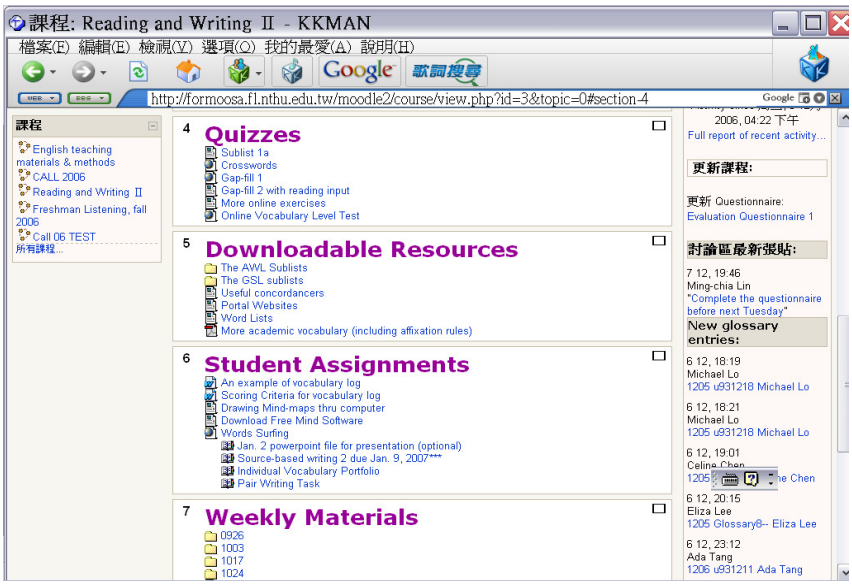

Figure 1
The Overview of the Online Lexical Syllabus

Some dynamic online tools were supplied, such as a web concordancer, the Cambridge Online Dictionary specifically for AWL learning, and the *AWL Highlighter*. A concordancer, *TANGO* (http://candle.fl.nthu.edu.tw/collocation), was adopted; it could display the deductive collocational patterns of keywords by frequency (See Figure 2).

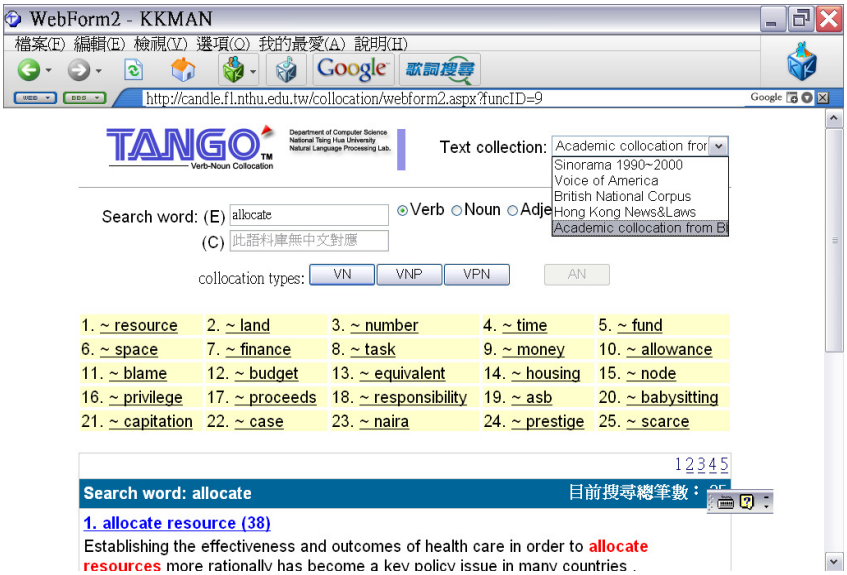

Figure 2
Outcome of the *TANGO* Concordances

The Cambridge Online Dictionary provides specific meanings and usage for academic words. This helps the learners easily access proper lexical information. For the *AWL Highlighter (*http://www.nottingham.ac.uk/~alzsh3/acvocab/awlhighlighter.htm*)*, the learners can enter a text and then choose a sublist to highlight academic words within the entered text (See Figure 3). This can direct learners' attention to the academic words in discourse.

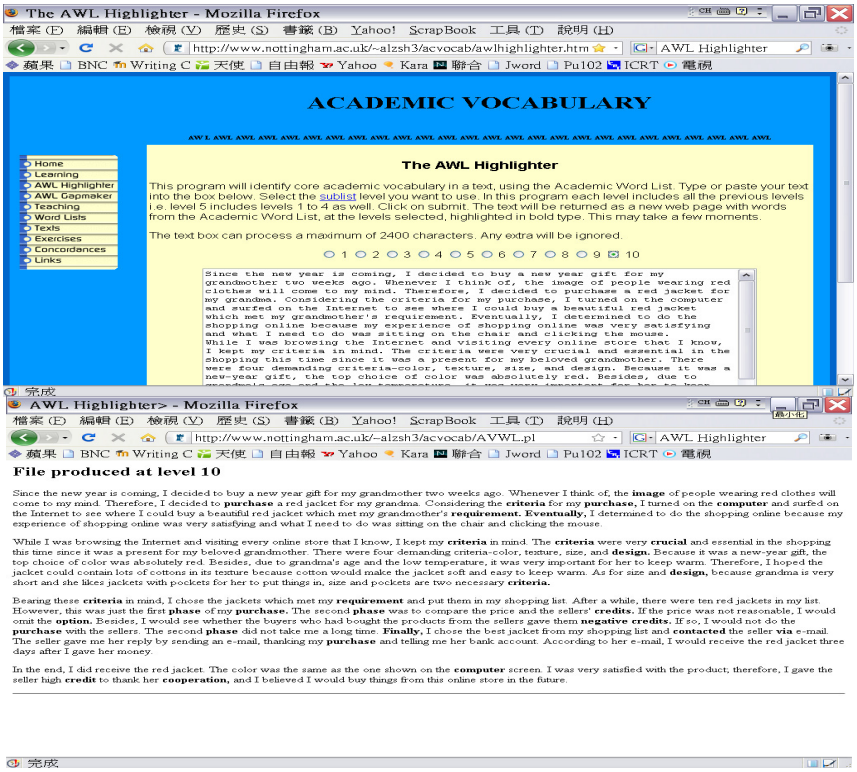

Figure 3
The AWL Highlighter

Teaching Procedures

Eight sublists of the AWL were included as the instructional content. In the first class of eight weeks of vocabulary instruction, an orientation was given for the online materials and tools, the nature of the AWL, and tips for vocabulary learning. Thus, the learners could familiarize themselves with the e-referencing tools to facilitate their lexical learning in the coming lessons. For the following seven weeks, the teaching goal was to enable the learners to use academic words accurately in writing.

A regular class procedure was used throughout the eight weeks. The procedure included: (a) underscoring the weekly target words in reading input; (b) learning collocations by hands-on concordancing; and (c) employing the target words in a pair-writing task (i.e., two learners wrote one paragraph). The weekly target words were first shown to the learners, followed by a reading text with the target words highlighted. Some reading comprehension questions were then distributed for peer discussion. Ten selected target words were given for searching the collocational patterns by pair work (five for each individual search). A pair-writing task that required the learners to use the previous ten words was assigned. Finally, an individual vocabulary log was assigned as weekly homework; the learners needed to provide their learning reflection and create five word entries with form, meaning and usage of the target words. The intent was to assist the learners in monitoring their own lexical learning autonomously and to use their academic words actively. With these diverse lexical-oriented learning tasks, the participants were expected to learn to effectively use the taught AWL items.

Data Collection

To evaluate the effects of explicit lexical instruction on academic word learning, various measures were included: two vocabulary tests, a timed-essay test, and an evaluation questionnaire. The vocabulary tests included a portion of the academic words used in the Vocabulary Level Test (Schmitt et al., 2001), and a version of the Vocabulary Knowledge Scale (adapted from Joe, 1998). The VLT contained thirty test items with no contextual clues, and it required test-takers to select three words out of six in correspondence with

their definitions. For grading, the VLT has a default answer for each item worth two points, amounting to sixty points. To design our VKS, fifteen words addressed in the instruction were randomly selected from the AWL (see Appendix A for a VKS sample item). They were two words from the target seven sublists respectively, but only one item chosen from Sublist 8. Test-takers were required to display their lexical knowledge by writing the meaning and a sentence for the target words. By Joe's criteria (1998), six points were assigned to each of the 15 words if the learners provided a completely accurate response; the total VKS was counted as 90 points (i.e., 15 words x 6 points). To ensure the rating consistency of the VKS, two TEFL graduate students (including the first researcher herself and another MA student) were recruited as raters.

The timed-essay test attempted to evaluate learners' academic vocabulary in free production. An identical prompt of describing a buying decision was used in the pretest, posttest, and delayed posttest (see Appendix B). The students' essays were then analyzed by two measures. The Lexical Frequency Profile (LFP) (Laufer & Nation, 1995) was used to calculate the ratios of the general service words and academic words, and the ESL Composition Profile (Jacobs, Zinkgraf, Wormuth, Harfiel, & Hughey, 1981) was used to rate the overall writing quality. An evaluation questionnaire with twenty-four questions was used to probe learners' perceptions of the instructional effectiveness. Three major categories of the questionnaire items were: (a) the design of online materials, (b) features fostering vocabulary learning and writing, and (c) future vocabulary learning. Most questions were designed in a five-point Likert scale from *strongly*

agree (coded as 5 points) to *strongly disagree* (1 point).

Before the online instruction, the VLT and VKS tests, and the timed-essay test were administered as the pretest. The two vocabulary tests lasted for sixty minutes, while the essay test (in paper-and-pencil format) was given for another sixty minutes. After the eight-week lexical instruction, the two vocabulary tests and the essay test were conducted as the posttest. Four weeks later, the essay test was given as the delayed posttest, followed by the administration of the questionnaire.

Three batches of essays collected in the pretest, posttest, and delayed posttest periods were word-processed. Each writing piece was entered to the online *AWL Highlighter* to locate academic words. Manual analysis was applied to examine if the usage of the academic words was grammatically accurate and contextually appropriate. To ensure the quality of manual analysis, problematic collocations, e.g. "activate my motivation, modify my complexion," were double-checked by a computer programmer and a native-speaking senior professor in the field of Applied Linguistics. First, the programmer compared the problematic expressions with accurate collocations from the British National Corpus (BNC) concordances, so that identifying learners' collocation usage of the AWL items could be more efficient. Second, the professor then reviewed the ruled-out problematic collocations to compensate for the limitation of the BNC since it does not contain all possible English collocations. The academic word misuse, including grammatical and collocational errors, was removed. Proper nouns used in the essays (e.g. Nike) were removed, and spelling errors of non-target words were corrected. Last, the writing piece was analyzed by the *VocabProfiler* (Morris & Cobb,

2004: http://www.lextutor.ca/vp/eng/) [2] to obtain ratios of one-thousand and the next thousand most common words and academic words in the essays.

To assess the overall writing quality, the three batches of essays were rated by an analytical rating scale, the ESL Composition Profile (Jacobs et al., 1981). The scale consists of five sub-scores: Content (30%), Organization (20%), Vocabulary (20%), Language use (25%), and Mechanics (5%) with 100% as the total score. The raters were two trained readers who were senior TEFL graduate students. The inter-rater reliability was calculated.

The evaluation questionnaire with 24 items was used to elicit learners' attitudes toward the Web academic vocabulary instruction under three categories: the design of online materials (1st to 11th items), features fostering vocabulary learning and writing performance (12th to 21st items), and motivation for future lexical learning strategies (22nd to 24th items) (See Appendix C).

RESULTS

The performance of learners' academic vocabulary use at three time points is analyzed and reported, followed by learners' perceptions about the instruction.

Two Vocabulary Tests

The quality of the two raters' scoring of the VKS was

[2] *VocabProfiler*, an online program, can calculate the new version of the Lexical Frequency Profile, by replacing the UWL (used in the old version) with the AWL. All the LFPs were averaged by the three essay versions.

statistically computed to ensure the consistency of rating. For the VKS pretest and posttest, the inter-rater reliability was ensured by one-paired t-test. Each rater's scoring on each item was first tallied (each student had 30 scores on 15 VKS item in both the pretest and the posttest). The raters were then treated as two major variables in one-paired t-test. In both tests, no significant differences were found between the two raters (the pretest, $t = 1.343138$, $p = 0.09 > 0.05$; the posttest, $t = 0.631928$, $p = 0.26 > 0.05$). This shows that the quality of the two ratings is relatively consistent.

The results of the two vocabulary tests measured in pre- and posttests were analyzed via paired-sample t-test (see Tables 1 and 2). The vocabulary depth test (the VKS) reaches a significant difference, while the size test (the VLT) does not. After the instruction, the learners expanded their lexical depth more efficiently, while the improvements in their lexical size seemed to be less marked. Before the instruction the learners already had the capability of recognizing the meanings of most of the AWL items in the VLT ($M = 57.44/60$, 95.7%), while their performance of accurately using the AWL items in sentences for the VKS was less adequate ($M = 69.48/90$, 77.2%). It may be quite challenging to help the participants to reach a higher mean of vocabulary size scores, given the ceiling effect.

The quality of written sentences in the VKS across the pretest and the posttest may provide another piece of evidence for the learners' lexical expansion. In the posttest, the learners were found to produce the target AWL items in sentences more accurately. For example, a student had left a blank for the sentence production of *indicate* in the pretest. She then wrote a sentence in the posttest, "The increasing number of unemployment indicates the decline of

economy." Another student left a blank on the sentence production of *aggregate* in the pretest. She later produced a sentence in the posttest, "You have to aggregate people's opinions and make a conclusion." After the instruction, the learners apparently learned how to accurately employ some of the target words in sentence production.

Table 1
Paired-sample T-test for the VLT Test

N = 25	Pretest (full score = 60)		Posttest (full score = 60)		t-test
Lexical Size	*M*	*SD*	*M*	*SD*	
VLT	57.44	4.3787	58.08	4.4527	-1.154

Note. $p > 0.05$.

Table 2
Paired-sample T-test for the VKS Test

N = 25	Pretest (full score = 90)		Posttest (full score = 90)		t-test
Lexical Depth	*M*	*SD*	*M*	*SD*	
VKS	69.48	10.3082	81.6	7.3256	-9.302*

Note. $*p < 0.05$.

The AWL Use in the Three Batches of the Essay Tests

To address the second question of how far the learners expand their academic vocabulary use in writing after the online instruction, detailed analyses on the learners' three essay versions are reported. The three batches of the learners' essays were carefully evaluated by the Lexical Frequency Profile and the ESL Composition Profile. Thus, the interrelations between the learners' AWL use and their overall

writing quality could be revealed. Qualitative analyses on the AWL usage were conducted as well.

With the outcome of the LFP, ratios of four wordlists (K1, K2, the AWL, and the Offlist words) across the three essay versions were computed by descriptive statistics and a one-way repeated measures analysis of variance (ANOVA). In the default setting of the LFP calculation, K1 and K2 words refer to the first and second thousand most frequently used English words; the AWL refers to the Academic Word List compiled by Coxhead (2000). The Offlist denotes words that go beyond the previous three wordlists. With these four wordlists, a general pattern of word distributions in a text can be exhibited (Morris & Cobb, 2004).

For the descriptive statistics, the total running words for the three essay versions are: 7,625 words for Version 1 (the writing pretest), 10,529 for Version 2 (the immediate posttest), and 10,084 for Version 3 (the delayed posttest). Also, the means of word families[3] across the three test versions in Table 3 indicate that the learners wrote the shortest essays in Version 1 (122.68), included more words in Version 2 (157.36), and used the most words in Version 3 (158.64). Among variations of the LFP ratios, only the AWL ratio increased from Version 1 (M = 2.60%, the range of academic word type = 1-11[4]) to Version 2 (M = 4.99%, range = 2-35), whereas the ratios of the other three wordlists decreased from Versions 1 to 2, as the LFP showed an interdependent ratio of word use in writing (four word

[3] Word family is defined as a set of words with different morphological affixes (Nation, 2001).

[4] The range demonstrates the total occurrences of academic word types in the three essay versions of the twenty-five participants.

bands account for 100 percent in total). From Versions 2 to 3, the ratios of the 2000- word-level, the AWL, and the Offlist all declined, and the AWL showed the smallest decline (Version 3, M = 4.71%, range = 1-34). However, the ratio of the 1000-word-level arose slightly.

Table 3
Descriptive Statistics of the Four Word Lists of the Three Essays

Essay Version	Total Running Words	Mean of Word Family	K1		K2		AWL		Offlist	
			(%)	Type	(%)	Type	(%)	Type	(%)	Type
V1 (N = 25)	7652	122.68	85.05	761	7.55	202	**2.60**	94	4.80	155
V2 (N = 25)	10529	157.36	83.37	885	7.20	267	**4.99**	211	4.44	239
V3 (N = 25)	10084	158.64	84.48	909	6.74	248	**4.71**	206	4.07	207

For ANOVA analyses on the four word lists in the LFP, only the AWL use demonstrated a significant increase among the three versions, $F(2, 72) = 8.5188$, $p < 0.001$. Post-hoc analysis using the Least Significant Difference (LSD) indicated that the AWL ratio in Version 1 was lower than those of Versions 2 and 3 (see Table 4). The data revealed that the learners increased their academic word use in the post-instructional essays (Versions 2 & 3). After a lapse of four weeks, their productive academic vocabulary regressed slightly, but it was still superior to their entry level. Meanwhile, comparison of the other three word lists did not reach statistical significance: the first 1,000 most frequent words-K1, $F(2, 72) = 1.1108$, $p = .3356$, the 2000

words-K2, $F(2, 72) = 0.6583$, $p = .5207$, and the Offlist words, $F(2, 72) = 0.6738$, $p = .5129$.

The ANOVA analyses on the four word lists show that the learners increased their AWL use in writing after the lexical instruction. However, the ratios of the other word lists declined slightly, as the four wordlists were dependent, amounting to 100 percent.

Table 4
Post-hoc LSD of the AWL Ratio

LSD test: AWL	V1	V2	V3
V1		*0.000330	*0.001335
V2	*0.000330		0.666839
V3	*0.001335	0.666839	

Note. $*p < 0.05$

Moreover, detailed analyses were conducted to reveal how many taught AWL items were used across the three versions. Table 5 shows the sixty-six taught AWL items in the present study (taught by word family). In the subsequent analyses, the AWL items were all counted by word family, because this is the way they were taught. Based on these sixty-six taught items, their repeated distributions across the three versions were computed by online programs, such as *Text Lex Compare* (http://www.lextutor.ca/text_lex_compare/) for the word recycle index in the two texts, and *Text-based Range* (http://www.lextutor.ca/range/range_text/) for word recurrences across three or more texts (Cobb, 2007).

Table 5
The Taught AWL Items in the Present Study
(Counted by Word Family)

The AWL items (66-word family)
acknowledge adequate analogy analyze apparent aspect attitude attribute bias communicate community comprise compute consist constitute contrast coordinate create data decline deduce denote design deviate discrete dispose distort domain evaluate exceed exclude facilitate generate goal hypothesis individual infer infrastructure interpret interval intrinsic investigate justify label maintain margin monitor obtain overall perceive positive potential precise priority project qualitative range ratio research resolve respond retain scope select specific survey

With the help of the Text-Compare program from Tom Cobb's website (to calculate a ratio of repeated words across texts), the recycle index of the taught AWL items in the three essay versions was computed. Table 6 displays the recycle index of the taught AWL items across three versions. In Version 1, seventeen taught AWL items were found, and these seventeen items were then divided by the total sixty-six instructed items to have a recycle index of 25.76%. In Version 2, twenty-five instructed items were found, with a recycle index of 37.88%. In Version 3, twenty-eight instructed items were found, with a recycle index of 42.42%. Across the three versions, an increasing frequency of the recycle index of the taught AWL items can be observed.

Table 6
The AWL Items Used in 3 Versions
(Counted by Word Family)

3 Versions	The total AWL items used in 3 Versions	The taught AWL items used in 3 Versions/ the total number of the taught AWL items = The recycle index
Version 1 (Pretest)	98	17/66 = 25.76%
Version 2 (Immediate Posttest)	155	25/66 = 37.88%
Version 3 (Delayed posttest)	155[5]	28/66 = 42.42%

A list of the taught AWL items used across the three versions is displayed in Table 7.

To better trace each individual learner's development of productive academic vocabulary, occurrences of the taught AWL items from each learner's three essays were analyzed separately. By using each learner as an analysis unit, the uses of the taught items in each version are displayed in Table 8. It was found that Version 2 contained the most instructed items (M = 2.28, counted by word family), followed by Version 3 (M = 1.92) and Version 1 (M = 0.8). This tendency generally conforms to the results in Table 3.

[5] The total AWL items in Versions 2 and 3 are not completely different. There are 94 items that recurred in Versions 2 and 3, with a repeated ratio of 60.65%. Yet, there are 61 different items in each version as well.

Table 7

A List of the Taught AWL Items Used in the 3 Versions

Versions (word family)	**The AWL items**			
Version 1	attitude	communicate	compute	create
(17)	data	design	evaluate	exclude
	goal	investigate	obtain	perceive
	potential	range	research	select
	specific			
Version 2	acknowledge	analogy	analyze	apparent
(25)	aspect	attitude	comprise	compute
	contrast	create	data	design
	evaluate	investigate	maintain	obtain
	perceive	priority	range	research
	resolve	retain	scope	select
	specific			
Version 3	acknowledge	analyze	apparent	compute
(28)	consist	contrast	create	data
	deduce	design	dispose	exclude
	facilitate	generate	goal	infer
	maintain	obtain	perceive	potential
	priority	range	research	retain
	scope	select	specific	survey

Moreover, divided by the delivery of the explicit AWL instruction, the occurrences of the taught AWL items can be further categorized as: learners' prior knowledge of the AWL items, and the learned AWL items. In the category of learners' prior knowledge, the learners could use the AWL items accurately in Version 1 before they received any instruction. However, the learners did not use these items very often in their post-instructional essays (Versions 2 and 3). Only a few recurrences were identified (words in boldface in Table 8). In the category of the learned AWL items, the learners could use the taught items accurately after the explicit instruction (words in italics in Table 8). Namely, the items occurred in Version 2 or Version 3, or recurred in both Versions 2 and 3. Meanwhile, Student 15 did not incorporate any instructed items throughout his three essays, although he did use some AWL items (items that go beyond the instructional coverage) in his essays: seven in Version 1, three in Version 2, and eleven in Version 3. The learner may have preferred using self-learned words, or the explicit lexical instruction may not have been effective enough to instruct him to use the target items in his writing. With more details about the developmental changes in an individual learner's uses of the taught AWL items, effects of the explicit lexical instruction may be relatively supported.

Moreover, qualitative analyses were conducted to better understand the learners' collocation patterns. The accurate collocation patterns in the three essay versions are listed in Table 9, while some cases of the learners' problematic collocations are in Appendix E. With both accurate and problematic collocations, more information of the learners' productive academic vocabulary is revealed.

Table 8
Each Learner's Use of the Taught AWL Items across the Three Versions

Students	Version 1 (pretest)	Version 2 (posttest)	Version 3 (delayed posttest)
S1	communicate	attitude	retain
S2	×	×	acknowledge
S3	exclude	aspect	×
S4	×	select	×
S5	×	×	analyze obtain priority
S6	compute	maintain selection	×
S7	×	aspect perceive *compute*	*compute* priority research
S8	investigate goal research specific	priority	survey
S9	range	select	data
S10	compute data	acknowledge aspect contrast evaluation obtain priority research scope	range select
S11	design	comprise *select*	*select*
S12	attitude	*compute* select	*compute* design
S13	**compute** data	*apparent* **compute** evaluate resolve retain scope	*apparent* dispose infer priority
S14	create **perceive**	**perceive** *range scope* select	consist exclude facilitate **perceive** priority *range scope*
S15	×	×	×
S16	select	create *priority*	obtain *priority*
S17	×	*compute* data select	*compute*
S18	×	*analyze*	*analyze*
S19	×	investigate range research scope *specific*	priority select *specific*
S20	×	aspect evaluate specific	contrast goal obtain select
S21	×	analogy resolve	deduce generate
S22	potential obtain	compute range research	select
S23	×	design *maintain*	*maintain*
S24	×	*compute* perceive obtain	analyze *compute* create
S25	evaluate	evaluate	computer exclude potential range
Total	20	57	48
Mean	20/25 = 0.8	57/25 = 2.28	48/25 = 1.92

Note. 1. Counted by word family.

2. Words in boldface are the ones that recur in Versions 1, 2, and sometimes in Version 3.

3. Words in italic are the ones that recur in Versions 2 and 3.

Table 9
Selected Accurate Collocation Patterns in the Three Batches of Essays

Tests	Usage Examples (the AWL items were in italics.)
Pretest	*create* new style, *investigate* the situation, *perceive* a need main *goal*
Posttest	*apparent* reason, *comprise* unknown materials, *creative* idea, *evaluate* product's function and value, *select* the product, *select* two options, *select* the general types, *specify* its usage, top *priority*
Delayed Posttest	turn on the *computer*, *retain* my balance, made a *survey* on, *select* the product, limit the *scope*, top *priority*

The Overall Writing Quality of the Three Batches of Essay Tests

A number of correlation analyses were computed to show the interrelations between learners' lexical ability and their overall writing quality. The overall writing quality of the three essay versions was assessed by the ESL Composition Profile (Jacobs, et al., 1981). The rating quality was ensured by a high inter-rater reliability, 0.9, throughout the three versions. The total score displays a rising tendency from Version 1 (M = 68.88, SD = 3.571), to Version 2 (M = 80.64/100.00, SD = 5.718), and Version 3 (M = 80.14, SD = 5.338).

To detail the changes of students' essays throughout the three tests, ANOVA analyses on the five essay sub-scores (Content, Organization, Language Use, Vocabulary and Mechanics) were conducted (see Table 10). For the four sub-scores (except Mechanics subscores), the variation tendency was similar to that of total scores: the highest scores were in Version 2, the second-highest in Version 3. The sub-score of Mechanics showed the lowest score in Version 3 and

the highest score in Version 2. Moreover, post-hoc analyses of LSD were used on the four sub-scores to identify the variations across the three versions. The scores in Version 1 were generally inferior to those in Versions 2 and 3. The discrepancies between Versions 1 and 2 were higher than those between Version 2 and 3. After the instruction, learners showed the greatest progress on the sub-scores of Content, Organization, Vocabulary, and Language Use, but not Mechanics, yet this progress decreased slightly in Version 3.

Table 10
Results for the Rating of the Three Writing Tests

Sub-scores	Tests	*Mean*	*SD*	*F*	*p*
Content	V1	21.60	1.323	$F(2,72)=42.47$	$p = 0.000$*
	V2	24.88	1.219		
	V3	23.90	1.331		
Organization	V1	13.72	1.251	$F(2,72)=35.76$	$p = 0.000$*
	V2	16.32	0.945		
	V3	15.84	1.248		
Vocabulary	V1	12.96	0.889	$F(2,72)=59.98$	$p = 0.000$*
	V2	16.22	1.444		
	V3	15.84	1.048		
Language Use	V1	16.38	1.063	$F(2,72)=33.008$	$p = 0.000$*
	V2	19.72	2.006		
	V3	19.76	1.843		
Mechanics	V1	4.18	0.675	$F(2,72)=.6620$	$p = .51679$
	V2	4.24	0.561		
	V3	4.04	0.644		

Furthermore, to explore how the learners' academic vocabulary ability relates to their overall writing performance, Canonical Analysis was conducted. According to *Statistica* (a statistical software), Canonical Analysis is categorized under "Multivariate Exploratory Techniques" to compute the correlations between two sets of variables by the weighted sum scores, reporting the largest correlation of the first root for an overall index (*Statistica* Version 7 Electronic Manual). In the present study, the learners' lexical ability was sampled by the VLT (size test) and VKS (depth test) scores, and the writing tasks. Table 11 shows that Canonical R is 0.74314 (p = 0.0541; Lambda Prime 0.3543). Owing to the small sample size, the correlation was not strong enough to reach statistical significance given the p value of 0.0541 (slightly higher than 0.05). Only the first root was found to reach significance. When using the first root, 55.22% of the error rate could be reduced (chi-square tests in Appendix F).

Table 11

Results of the Canonical Analysis

No. of Variables	**Vocabulary**	**Writing**
Variance extracted	4	3
Total redundancy	85.2488%	100.000%
	36.4324%	35.1783%
Variables: 1	Pre VLT	Verison1
2	Pre VKS	Version 2
3	Post VLT	Version 3
4	Post VKS	

Note. Canonical R=74314; Chi2 (12) = 20.753; p = 0.05417; Lambda Prime=0.3543

The correlation root in this study mainly came from the influences of the posttest VKS and VLT in Versions 2 and 3, while the pretest VLT and VKS also had some influences over Versions 2 and 3 (see Figure 4). The posttest VKS (.92215) has stronger influence on the canonical correlations than the posttest VLT (.87793), while Version 2 (0.95839) has stronger influence than Version 3 (0.81066). The Canonical Analysis seems to demonstrate the reciprocal relationships between the learner's lexical (the size and depth of academic words) and writing abilities, particularly in the post-instructional performances. The learners who had better scores in the academic vocabulary posttests tended to have better writing performances in the immediate posttest and delayed posttest. This confirms the relationship that vocabulary ability is a quite crucial construct of L2 writing quality (Astika, 1993).

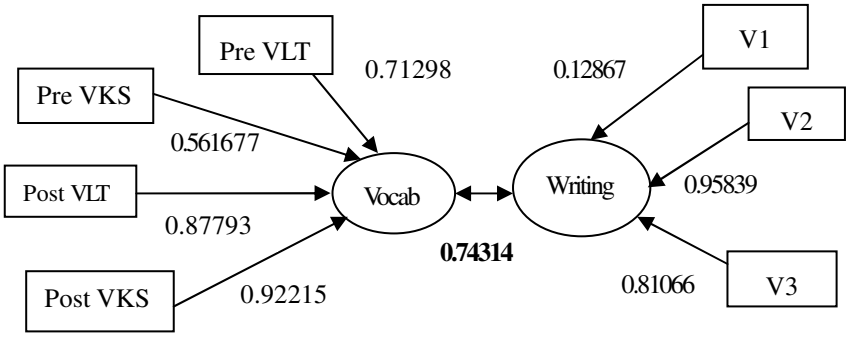

Figure 4
***Factor Structure*[6]**
Canonical Analysis on learners'
Academic Vocabulary and Writing Quality

[6] To interpret the canonical root, factor structure is displayed. Factor structure presents the simple overall correlation of each variable contributing to the respective weighted sum (canonical variate). Canonical Weight pertains to the unique contribution of each variable, calculated by the standardized Z transformed variable in Appendix G.

Results of the Evaluation Questionnaire

The results of the evaluation questionnaire answer the third question (see Table 12). Via the questionnaire, the learners expressed moderately positive attitudes toward the effectiveness of the overall online lexical instruction. The item means were reported concerning three major aspects: the design of online materials (Items: 2, 3, 4, 5, 7, 9, *M* = 3.78/5), features fostering vocabulary and writing learning (Items: 13, 14, 15, 16, 17, 18, 20, *M* = 3.63), and future learning motivation (Item 22, 23, 24, *M* = 3.95). The results of other items referring to the frequency of the learners' use of online lessons (e.g., Item1: How many hours have you used the online lessons per week?) can be found in Appendix D.

For the features of online design, in response to Item 2, the learners perceived the overall online lessons as user-friendly (the sum of *strongly agree* and *agree*, 80%, *M* = 3.76). For features fostering AWL learning, responding to Item 13 (I think the overall academic vocabulary instruction is useless or inadequate.), the learners showed a relatively low agreement (12%, *M* = 2.36). The effects of the lexical instruction on enlarging the size of the learners' academic vocabulary in Item 14 (72%, *M* = 3.8), on deepening the learners' productive vocabulary knowledge in Item 15 (76%, *M* = 3.96), and on expanding learners' productive vocabulary for writing in Item 16 (56%, *M* = 3.52) were generally affirmed. However, the effectiveness of the lexical instruction in enhancing learners' academic writing abilities (Item 18) was recognized by less than half of the learners (45.83%, *M* = 3.46). Regarding motivation of future lexical learning, the learners expressed a strong intention for future use of the concordancer, *TANGO*, in Item 23 (84 %, *M* = 4.24).

Table 12
Results of the Evaluation Questionnaire

Items	*M*	SA	A	U	D	SD
The design of online materials (*M* = 3.78)						
2. I think the overall design is user-friendly.	3.76	0/25	20/25	4/25	1/25	0/25
		(0%)	(80%)	(16%)	(4%)	(0%)
3. I think the academic vocabulary lessons are clear and informative.	4	1/25	23/25	1/25	0/25	0/25
		(4%)	(92%)	(4%)	(%)	(0%)
4. I think the writing center is informative.	3.48	2/25	9/25	13/25	1/25	0/25
		(8%)	(36%)	(52%)	(4%)	(0%)
5. I think the downloadable resources are useful.	4.04	7/25	12/25	6/25	0/25	0/25
		(28%)	(48%)	(24%)	(0%)	(0%)
7. I think the vocabulary quizzes are useful.	3.56	1/25	14/25	8/25	2/25	0/25
		(4%)	(56%)	(32%)	(8%)	(0%)
9. I think the individual vocabulary log is helpful.	3.84	3/25	17/25	3/25	2/25	0/25
		(12%)	(68%)	(12%)	(8%)	(0%)
Items	***M***	**SA**	**A**	**U**	**D**	**SD**
Features fostering vocabulary learning and writing performance (*M* = 3.63)						
13. I think the overall academic vocabulary instruction is useless or inadequate.	2.36	0/25	3/25	6/25	13/25	3/25
		(0%)	(12%)	(24%)	(52%)	(12%)
14. The overall academic vocabulary instruction expands the size of my academic vocabulary.	3.8	2/25	16/25	7/25	0/25	0/25
		(8%)	(64%)	(28%)	(0%)	(0%)
15. The overall academic vocabulary instruction deepens my understanding of the usage of academic vocabulary.	3.96	6/25	13/25	5/25	1/25	0/25
		(24%)	(52%)	(20%)	(4%)	(0%)
16. I learn how to incorporate academic vocabulary productively and effectively in writing	3.52	1/25	13/25	9/25	2/25	0/25
		(4%)	(52%)	(36%)	(8%)	(0%)

Table 12 (continued)

17. I think the academic words selected in the instruction are appropriate and useful.	3.92	1/24 (4.17%)	20/24 (3.33%)	3/24 12.5%	0/24 (0%)	0/24 (0%)
18. The online vocabulary instruction enhances my academic writing abilities.	3.46	2/24 (8.33%)	9/24 (37.5%)	11/24 (45.83%)	2/24 (8.33%)	0/24 (0%)
20. I think using the mind-maps to learn vocabulary is powerful.	3.12	1/25 (4%)	5/25 (20%)	15/25 (60%)	4/25 (16%)	0/25 (0%)
Items	***M***	**SA**	**A**	**U**	**D**	**SD**
Motivation for future lexical learning strategies (*M* = 3.95)						
22. I will continue tracking my own academic vocabulary learning in terms of learning form, meaning, and collocation and grammar aspects of the target words.	3.76	3/25 (12%)	13/25 (52%)	9/25 (36%)	0/25 (0%)	0/25 (0%)
23. I will continue using the online concordancers (i.e., TANGO, Lexical Tutor) for academic writing.	4.24	10/25 (40%)	11/25 (44%)	4/25 (16%)	0/25 (0%)	0/25 (0%)
24. I will continue using the tools (i.e., the *AWL Highlighter*, the Online Cambridge Learner AWL Dictionary, the online AWL quizzes) in our online materials for academic vocabulary learning.	3.84	2/25 (8%)	17/25 (68%)	6/25 (24%)	0/25 (0%)	0/25 (0%)

The learners also demonstrated high intentions of continuing their AWL learning and great willingness to use the online resources in Item 24 (76%, *M* = 3.84). The learners appeared to perceive the usefulness of the lexical instruction in enlarging their academic vocabulary, whereas the instructional effectiveness on academic writing itself was less recognized.

DISCUSSION

With ample opportunities for production and access to e-referencing tools (Schmitt, 2000), learners may learn how to incrementally consolidate their productive academic vocabulary. The subsequent section will discuss the results by addressing the three research questions.

Effects of the Online Lexical Syllabus on Learners' Lexical Size and Depth

Comparing the pretest and posttest score differences of the two lexical tests, the size of the learners' academic vocabulary as measured by VLT did not expand significantly, but the depth as measured by VKS did. Regarding the size of the learners' vocabulary, the mean scores of the pretest VLT was fairly high (57.44 out of 60), suggesting the ceiling effect of the VLT test. The learners could already answer over 90% of the VLT items correctly, whereas the mean scores of the pretest VKS were not high (69.96 out of 90). Before any instruction, the learners' academic lexical size appears to be fairly sufficient, while their lexical depth was comparatively less so. Our findings conform to the observation that lexical depth develops much more slowly than its size, as learners tend to acquire the ability to recognize word meanings before they can produce the word form actively (Laufer & Goldstein, 2004). With this diagnostic indication, there is a gap to be bridged in the learners' academic lexicons. Thus, the subsequent lexical intervention focused on the usage of target academic words with the goal of increasing learners' "free-active" use of vocabulary in academic writing.

After the lexical instruction, the learners showed significant progress in the VKS. This may support the effectiveness of our instruction to some extent, as it directly addressed the active usage of the AWL and strongly encouraged the use of e-referencing tools, such as the AWL highlighter and concordancers. Accordingly, the learners may in the future pay closer attention to the production of academic words, and have instant and open access to the references of word usage patterns in their learning process. As was found in Kaur and Hegelheimer's study (2005), great improvements in EFL college learners' active vocabulary were shown with implementing online concordancers in a lexical lesson.

Effects of the Online Lexical Syllabus on Learners' Academic Vocabulary Use in Writing

The LFP analysis indicates that only the ratio of academic words was found to increase in Versions 2 and 3 (immediate posttest and delayed posttest) compared with that in Version 1, while the ratios of the other wordlists (the first two thousand most common words and words beyond these three lists) declined slightly within an overall interdependent ratio (100 percent in total). The highest academic word ratio appeared in Version 2 (4.99%). This shows that the learners could use most of the academic words accurately immediately after the instruction. After four weeks, part of the learners' productive academic vocabulary remained (4.71% in Version 3). The learners appeared to retain some of the taught vocabulary at least for four weeks, yet they may not have fully mastered all the vocabulary given the declining AWL ratio in the delayed posttest. This tendency is, however, not surprising. Acquiring productive word knowledge

usually takes a long time, as it requires encyclopedic understanding of a word, including the knowledge of form, meaning, collocation, and grammatical constraints (Nation, 2001; Schmitt, 2000). Before the learners completely consolidate their academic vocabulary in free production, more study time and practice may be needed. Moreover, detailed analysis of the learners' AWL production across the three versions reveals their lexical progress after the explicit instruction. In addition to their prior production of the AWL items in Version 1 (M = 0.8), the learners increased the use of the taught AWL items in their post-instructional essays (M = 2.28 in Version 2 and M = 1.92 in Version 3). The explicit instruction apparently helped the learners increase their usage of AWL items in free production. This supports the usefulness of the explicit instruction in enhancing learners' abilities to produce more AWL items accurately and appropriately in their post-instructional writing.

Although the ratios of academic words were only 4% in the students' essays (unlike that of 8.5~10% in academic texts, Coxhead, 2000), the ratio may be satisfactory. Unlike Lee and Muncie's (2006) tolerance of collocation misuse, the present study adopted a strict standard in identifying academic words; the usage had to be completely accurate to be counted in our study. If there were errors in terms of collocational, grammatical, or orthographical misuse, the academic word was removed. To interpret academic word distributions cautiously, the present academic-words ratio was compared to that of other genres in the literature (Nation, 2001). It is reported that academic texts contain 8.5% to 10% of academic words, while newspapers contain 4% and fiction 2%. Newspapers are

recognized as an ideal genre for academic vocabulary learning, as the news is formally written and marked with many academic words (Coxhead, 2006; Nation, 2001). In the present study, the post-instructional essays (Versions 2 & 3) appear to contain a proportion of academic words similar to the newspapers genre (4%). Even after the four weeks of instruction, around 4 percent of AWL production was found, implying the learners' continued retention of AWL items. Based on the learners' increased AWL use, it can be tentatively concluded that our lexical instruction successfully raised learners' awareness of using more academic words accurately and appropriately in writing.

However, it is unclear which instructional factor contributed most to the lexical improvement, since all of the instructional tasks were involved as a circulation. Classroom-based research includes authentic tasks in a sequence to ensure instructional effects. Still, the present study may lend support to the feasibility of delivering explicit lexical instruction (Hulstijn, 2001; Lee & Muncie, 2006), and to the advantages of providing corpus-based referencing tools (O'Sullivan & Chambers, 2006). Learners' productive vocabulary may be expanded effectively if language teachers can bring the benefits of input- and output-based tasks and supply e-referencing tools in lexical instruction.

Effects of the Online Lexical Syllabus on Learners' Overall Writing Quality

With the ANOVA analyses, the learners' overall writing quality appears to demonstrate some progress from their entry level to post-instructional writings. By comparisons with the ESL

Composition Profile ratings, the learners received higher total scores in Versions 2 and 3 compared with those of Version 1. This indicates that generally the learners could provide better content, organization, vocabulary, and language use in their post-instructional essays (Versions 2 and 3), but their ability to use mechanics slightly regressed in the delayed posttest.

From the results of Canonical Analysis, moderate correlations between learners' vocabulary tests (the VLT and the VKS scores in pretest and posttest) and overall writing performance (the scores of the three essay tests) were found. The Canonical Analysis results reflect moderate correlations among various dimensions of the learners' lexical ability, including size, depth, and free production, although the correlations are not significant due to the small sample. Still, it is speculated that the correlations between the lexical posttests and the post-instructional essays may result from the incremental progress in the learners' recognition and production of the taught AWL items.

Learners' Attitudes toward the Effectiveness of the Online Academic Vocabulary Instruction

After the eight-week lexical instruction, the learners generally liked the online materials, and they recognized the instructional usefulness in expanding their academic vocabulary; they also showed willingness to continue using the e-referencing tools.

The learners' perceptions were related to their actual performance. A majority of the learners thought the lexical instruction was effective in expanding their academic vocabulary, but much fewer learners recognized the instructional effects in enhancing their

academic writing. For learning academic words, the learners thought the lexical instruction was more useful in expanding the depth of their academic vocabulary than the size. Compared with their actual performance, the learners also showed larger growth in the lexical depth test. This implies that the learners had an accurate estimation of their lexical abilities and growth. As for using the academic words in writing, only about half of the learners thought they had learned how to incorporate the words in writing. Yet, the learners performed much better in the post-instructional essays (the mean of the AWL usage and the LFP ratio). This suggests that after the lexical instruction, the learners might be more capable of producing academic words accurately than they expected, yet they seemed to be unaware or unsatisfied. For academic writing, half of the learners disagreed that their writing skills had improved. The learners did not feel the improvements in their writing, even though they demonstrated higher writing scores in the post-instructional essays. Either those learners had a higher expectation on their writing performance or their perceptions did not match their performance, thus revealing a possible lack of self-awareness of their own language performance.

The learners held a fairly positive attitude toward their future use of the online concordancer. After the lexical instruction, eighty-four percent of the learners confirmed the future use of the concordancers, though they had just started their first concordancing in this instruction. Unlike previous studies in which college learners did not recognize the advantages of concordancing and preferred to continue using dictionaries after their lexical instruction (Horst et al., 2005; Kaur & Hegelheimer, 2005), the present study shows the feasibility of using corpus-based tools for lexical learning. With

adequate support, concordancers can help learners consolidate their lexical knowledge and foster their learning autonomy (Yeh et al., 2007).

CONCLUSION

After the explicit lexical instruction, the learners were found to have made progress in a vocabulary depth test, but not in a size test given their good entry performance on receptive vocabulary. The learners also performed slightly better in a writing test concerning accurate AWL usage and overall writing quality. This writing improvement was sustained after four weeks. Also, the learners perceived the instruction as generally useful. The explicit lexical syllabus with e-referencing tools seems to be promising in expanding EFL learners' productive academic vocabulary. The learners appear to learn how to deepen their academic vocabulary knowledge to enhance their writing ability. The learning rewards may be attributed to the relative operationalizations of two crucial factors in productive lexical learning: motivation and knowledge (Nation, 2001). The learners demonstrated how to process their productive vocabulary learning effectively through the designed tasks; this may have helped them set clear goals through each sub-list in AWL for vocabulary learning and thus become more motivated. The learners were also supplied with powerful e-referencing tools, and this enabled them to directly access authentic language knowledge.

However, several aspects of the research design may limit the implications of the study. First, the present empirical evidence could

be more convincing if a control group had been involved. Second, the modest sample size of participants who were strongly motivated may restrict us from making generalizations to other EFL contexts. Third, the participants performed extremely well in the pretest of the Vocabulary Level Test (M = 57.44/60 points). This may have had a ceiling effect for further improvements. A different academic vocabulary size measure could be considered in future research.

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Appendix A
A VKS Sample Item

1. indicate

Item	Category
I.	I don't remember having seen this word before.
II.	I have seen this word before, but I don't know what it means.
III.	I haven't seen this word before, but I think it means_____.
IV.	I have seen this word before, and I think it means_____ .(synonym or translation)
V.	I know this word. It means_____. (synonym or translation)
VI.	I can use this word in a sentence:_____.(If you do this section, please also do section V.)

Appendix B
Writing Prompt for the Three Timed-Essay Tests

With **FIVE** phases of the buying decision process, describe your own shopping experiences. Please use **as many academic words as possible**, and keep your writing at the length of **400~500 words**.

Phase	Guided Questions for Writing
1	How do you recognize a need to buy something?
2	What are the possible options for your purchase?
3	What are your criteria for selecting products?
	What is the impact of brand names in your selection?
4	How do you decide on what to buy, when to buy, or not to buy?
5	Are you satisfied with the product or service that you have purchased?
	How will this shopping experience influence your future buying behaviors?

Appendix C
Evaluation Questionnaire

Thank you very much for filling in this Questionnaire that evaluates the effectiveness of our online academic vocabulary instruction. Any responses and comments will be more than welcome.

Date:_____ Name:_____ Gender:_____

SA = Strongly Agree, A = Agree, Undecided, D = Disagree, SD = Strongly Disagree

A. The design of online materials

1. How many **hours** have you used the online lessons per week?

☐ 8~10 or more ☐ 5~7 ☐ 2~4 ☐ 0~1

2. I think the overall design is user-friendly.

SA A U D SD

3. I think the academic vocabulary lessons are clear and informative.

SA A U D SD

4. I think the writing center is informative.

SA A U D SD

5. I think the downloadable resources are useful.

SA A U D SD

6. How many **hours** have you taken the online quizzes throughout the instruction?

☐ 8~10 or more ☐ 5~7 ☐ 2~4 ☐ 0~1

7. I think the vocabulary quizzes are useful.

SA A U D SD

8. How many **times** have you completed the vocabulary logs throughout the instruction?

☐ 8~10 or more ☐ 5~7 ☐ 2~4 ☐ 0~1

9. I think the individual vocabulary log is helpful.

SA A U D SD

10. Things I like or dislike about the Web resources are…, and the most useful online tools are…

_____

_____

11. Please rate the usefulness [**1(the MOST useful)** 2, 3, 4, and **5 (the LEAST useful)**] of the following instructional sections. Suggestions and comments are also welcome:

Academic Word lessons: ___/_____

Writing Center: ____/_____

Quizzes: ____/_____

Downloadable Resources: ___ /_____

Vocabulary Log: ___/_____

B. Features fostering vocabulary learning and writing performance

12. How many **times** have you attended the academic vocabulary instruction?

☐ 8 ☐ 5~7 ☐ 2~4 ☐ 0~1

13. I think the overall academic vocabulary instruction is useless or inadequate.

SA A U D SD

14. The overall academic vocabulary instruction has expanded the size of my academic vocabulary.

SA A U D SD

15. The overall academic vocabulary instruction has deepened my understanding of the usage of academic vocabulary.

SA A U D SD

16. I have learned how to incorporate academic vocabulary productively and effectively in writing.

SA A U D SD

17. I think the academic words selected in the instruction are appropriate and useful.

SA A U D SD

18. The online vocabulary instruction has enhanced my academic writing abilities.

SA A U D SD

19. How many **times** have you drawn the mind-maps for your vocabulary logs?

☐ 8 ☐ 5~7 ☐ 2~4 ☐ 0~1

20. I think using the mind-maps to learn vocabulary is powerful.

SA A U D SD

21. Please rate the usefulness [**1(the MOST useful)** 2, 3, 4, 5, 6, and **7 (the LEAST useful)**] of the following instructional sections. Suggestions and comments are also welcomed

Instructor's Weekly Word Lessons: ___/_____

Peer collaborative teaching: ___ /_____

Hands-on concordancing: ____/_____

Pair-writing & Source-based writing: __ /_____

Peer-reviewing on the AWL use in writing __ /_____

Mind-maps learning strategies: __/_____

Vocabulary Log: __/_____

C. Motivation for future lexical learning strategies

22. I will continue tracking my own academic vocabulary learning in terms of learning form, meaning, and collocation and grammatical aspects of the target words.

SA A U D SD

23. I will continue using the online concordancers **(e.g., TANGO, Lexical Tutor)** for academic writing.

SA A U D SD

24. I will continue using the tools **(e.g., the *AWL Highlighter*, the Online Cambridge Learner AWL Dictionary, the online AWL quizzes)** in our online materials for academic vocabulary learning.

SA A U D SD

Appendix D
Partial Results of the Evaluation Questionnaire

Results of the questions concerning the frequency of the learners' use of online lessons

Times (Hours or Times)	8~10	5~7	2~4	0~1
1. How many **hours** have you used the online lessons per week?	0/25 (0%)	2/25 (8%)	19/25 (76%)	4/25 (16%)
6. How many **hours** have you taken the online quizzes throughout the instruction?	0/25 (0%)	11/25 (44%)	12/25 (48%)	2/25 (8%)
8. How many **times** have you completed the vocabulary logs throughout the instruction?	10/25 (40%)	5/25 (20%)	6/25 (24%)	4/25 (16%)
12. How many **times** have you attended the academic vocabulary instruction?	12/25 (48%)	7/25 (28%)	6/25 (24%)	0/25 (0%)
19. How many **times** have you drawn the mind-maps for your vocabulary logs?	0/25 (0%)	2/25 (8%)	19/25 (76%)	4/25 (16%)

Appendix E
Problematic Collocations in VKS Production

Type	Problematic Collocations
Verb & Noun	modify complexion, target focus, have adaptation, affect conception, encounter dilemma, maintain wit, invoke motivation, maintain desire
Adjective & Noun	brief overlook, dark environment, technical society

Appendix F
Chi-square Tests of Canonical Analysis

Root removed	Canonical R	Canonical R-sqr	Chi-sqr	df	*p*	Lambda Prime
0	0.743144	0.552264	20.75336	12	0.054165	0.354280
1	0.392821	0.154309	4.68234	6	0.585158	0.791269
2	0.253678	0.064352	1.33033	12	0.514196	0.935647

Appendix G
Canonical Weights: standardized variable

Vocabulary	**Root1 (Z score)**	**Writing**	**Root 1 (Z score)**
Pre VLT	-0.224026	Version 1	-0.169852
Pre VKS	-0.462687	Version 2	0.767227
Post VLT	0.531619	Version 3	0.353484
Post VKS	1.033318		

網路輔助詞彙教學對大學生使用學術英文詞彙的能力之影響

摘要

透過網路輔助的學術英文詞彙教學，我們探討此教學對二十五位台灣大學生的單字與寫作能力之影響。教學內容包含：直接的教學與字彙索引、線上小考、寫作與單字練習。評量工具為：單字廣度與深度測驗、寫作測驗，各在教學前後實施一次。四週後，進行第三次寫作測驗和問卷調查。結果指出學生的單字深度增加，廣度則無。根據單字頻率及寫作測驗的分析，教學後，學生於寫作中能正確地使用較多學術詞彙，其寫作能力也有進步。學生對教學成效也大致給予正面評價。因此我們認為利用網路輔助單字教學以擴展學生的單字使用能力是可行的。

關鍵詞：學術英文詞彙　網路輔助的單字教學　單字產出能力