

The Effect of Corpus-Based Instruction and Thesaurus-Based Teaching on Iranian EFL Learners' Grammatical Knowledge

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ABSTRACT

The purpose of the current research was to explore the effects of corpus-based language learning on Iranian EFL learners' grammatical knowledge by analyzing the learners' writing samples. 60 students from Islamic Azad University, Tonekabon branch were selected and randomly assigned to an experimental group of concordance (n=30) and a control group of thesaurus (n=30) for comparisons. Participants did seven writing samples each over an extended period of time using either the concordance or the thesaurus to augment their writing. The samples were analyzed through corpus linguistic analysis to examine for changes in writing quality.

The results indicated that there were recognizable differences in the EFL writing quality between the groups. There were significant differences in that the concordance group gained more grammatical knowledge than the thesaurus group ($p < .05$).

KEYWORDS: Corpus-based language learning, Concordance, Thesaurus, and Corpus linguistic analysis.

INTRODUCTION

1.1. Theoretical Framework

Since Sinclair (1991) concretized the possibilities of processing and analyzing large quantities of text data through corpus linguistic techniques, the applications of corpus linguistic approaches employing authentic language data and empirical evidence have been widely accepted in language teaching and research. As the applications of corpus linguistics develop, the range of corpus-based language learning has widened the perspectives in second and foreign language education for teaching vocabulary, grammar, reading, and writing. At the same time, corpus-based discourse analysis of written texts has been developed by using quantitative and qualitative evidence from corpus-linguistic approaches.

1.1.1. Corpus-based language learning

A corpus is a large collection of naturally-occurring language text collected in a systematic way that is usually stored and processed electronically. Although corpora existed before computers, the first modern computer readable corpus can be considered the one-million English word Brown Corpus, compiled by Francis and Kučera at Brown University between 1961 and 1964. In the 1970s, the LOB Corpus, a British counterpart, was compiled. Both were assembled primarily for linguistic research. Since then, the sizes of a corpus have become several hundred million words and the possibilities of using corpora have grown beyond simple linguistic research to language teaching and research.

As technology has developed, corpus-based language learning has received an increasing amount of attention from language teachers and researchers who have stated that it is an effective L2 and FL teaching and learning style for course design (J. Flowerdew, 1994; Tribbble & Jones, 1997), teacher development (Allan, 2002; Tsui, 2004), materials (Fox, 1998; McCarthy & O'Dell, 2005; O'Dell & McCarthy, 2008; Willis, 1998), classroom applications (O'Keeffe, McCarthy, & Carter, 2007), vocabulary (Sun, 2000, 2003), grammar (Conrad, 2000; Meunier, 2002), learners' writing skills (Conzett, 2000; Gilmore, 2009; O'Sullivan & Chambers, 2006; Sun 2007), reading (Brodine, 2001), writing feedback (Gaskell & Cobb, 2004) and transferring learned vocabulary knowledge to writing (Kaur & Hegelheimer, 2005). In language education, corpora have been used in order to develop dictionaries, such as the *Collins COBUILD English Language Dictionary*. In addition, they have also been used to develop concordances, or computer programs to be used with ESL and EFL teaching. A concordance, according to Sinclair (1991), is an index to words in a text that provides access to language patterns in a corpus in a systematic way. In addition, a program that generates the concordance line is called a concordance (Sinclair, 1991). The computer generated concordance output can be flexible in length or grammatical boundaries, depending on the settings of the program. Today, thanks to the some corpora and concordances are available online.

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Advocates of corpus-based language learning have proposed the application of utilizing the concordance in designing language teaching syllabuses and materials to be used in L2 and FL education (Cain, 2002; Ciesielska-Ciupek, 2003; Davis & Russell-Pinson, 2004; L. Flowerdew, 2001; Fox, 1998; Lewis, 1993, 1997, 2000; Osborne, 2003; Tribble & Johns, 1997; Wichmann, Fligelstone, McEnery, & Knowles, 1997; Willis, 1990; Willis, 1998). They have claimed that the use of corpora in L2 and FL education can provide not only a means of learning about the language and culture, but also opportunities for using it communicatively, with a focus on situated textual meanings rather than just the linguistic forms. Therefore, they state that using corpora in L2 and FL education can be a beneficial aid of developing reading and writing skills and understanding and producing particular texts and types of texts. From the perspective of the language learner, corpus-based L2 and FL instruction can offer a means by which to increase his motivation and render him more autonomous (Woolard, 2000), while allow him to mine language descriptions through the corpus (Aston, 2001).

The unique sorting function used by a concordance, however, can help learners to uncover those grammar rules systematically using the contexts of the vocabulary. The importance of context when learning vocabulary is evident from observations that a word's meaning varies depending on the context. Therefore, context provides helpful information to learners when attempting to learn vocabulary (Nagy, 1997).

1.1.2 Grammar

It is important to keep in mind that grammar is one of the essential components of writing. Teaching grammar for L2 writing is not intended to develop the language learners' overall native-like proficiency (Pica, 1994). Without grammatical knowledge, language learners are unable to develop a full range of L2 writing. Therefore, for the L2 users who intend to use grammatical knowledge, for example, in academic writing, their grammar instruction needs to be carried out in tandem with vocabulary instruction and academic collocations because grammar learning in contextual and lexicalized chunks are effective (Hinkel, 2004). Research on the Lexical Approach that investigated the effectiveness of teaching grammar with vocabulary also supports Hinkel's (2004) argument (Lewis, 1993, 1997, 2000).

Recently, the importance of vocabulary was widely recognized by language practitioners and researchers and the word frequency has been used as an organizing principle of language teaching courses, while grammar is brought in as support where necessary. This approach is called the Lexical Approach (Johns, 1994; Lewis, 1993, 1997, 2000; Tribble & Johns, 1997; Sinclair & Reunof, 1988; Willis, 1990). For example, students learning English list particular verbs which are typically followed by either a to infinitive a gerund or both. For example, the learners must learn that: the verbs *appear* and *manage* are followed by a to-infinitive only; the verbs *finish* and *suggest* are followed by a present participle only; the verbs *begin* and *like* are followed by either form of gerund or to-infinitive with roughly the same meaning; and the verbs *forget*, *remember* and *stop* have different meanings when used with each grammatical form. When learners learn these types of vocabulary skills, they will remember not only the meaning of each word, but also the grammatical property of how each word fits into English grammar.

In the line of the same reasoning, Schmitt (2000) suggested that lexical and grammatical knowledge are inextricably interrelated in a type of no discrete boundary between vocabulary and grammar, *lexicogrammar*. The view suggests that vocabulary and grammar are closely linked and these two components of language should not be taught separately. The implication of the view is realized in corpus-based language learning for grammar and vocabulary teaching, which relies on the extent of lexical patterning in authentic language use and language databases (Johns, 1994).

1.2. Statement of the Problem

In recent years, researchers have paid attention to ESL (English as a Second Language) and EFL (English as a Foreign Language) (Bogaard & Laufer, 2004; Carter, 1998; Nation, 1990, 2001, 2008; Coady & Huckin, 1997; Schmitt, 2000; Zimmerman, 2009). In respect of the nature of vocabulary knowledge, it can be said that there are two types of knowledge: receptive knowledge and productive knowledge. Nation (2001) described these types of vocabulary knowledge as follows:

Receptive vocabulary use involves perceiving the form of a word while listening or reading and retrieving its meaning. Productive vocabulary use involves wanting to express a meaning through speaking or writing and retrieving and producing the appropriate spoken or written word form (pp.24-25).

Studies showed that researchers have been interested in teaching vocabulary knowledge and its productive realization in ESL and EFL writing.

In spite of increasing attention to the importance of vocabulary knowledge, studies have also showed that the ignorance of vocabulary was due to the deductive rule-oriented Latin grammar in the Age of Reason (Schmitt, 2000) and the GTM (Grammar Translation Method) that considered vocabulary as a complement of teaching grammatical

rules (Zimmerman, 1997a). Even though the history of L2 and FL learning backs to at last B.C. when Roman children studied Greek, the role of vocabulary in language teaching has been neglected, and most of the approaches has not handled vocabulary teaching effectively (Schmitt, 2000; Zimmerman, 1997a). Therefore, in such approaches bilingual word lists are made, and hope the vocabulary would be learned naturally (Schmitt, 2000, p.15). In fact, in the 1980s most of the vocabulary researches were concerned about patterns of the vocabulary, in particular about the advances of computer technology in language teaching methods and the development of electronic text corpora (Schmitt, 2000; e.g., COBUILD project).

There are many approaches, methods, and techniques for L2 and FL teaching and learning (Richards & Rodgers, 2001). When computer technology develops and the internet resources become more available, views on language (approaches) have been changed and consequently, different instructional tools have been made to support class room applications of the views (methods). The use of online dictionaries, which many language learners use them as vocabulary reference is an example. Concordance is another example which provides the words with their contexts from a set of electronically processed texts, and corpus. As an application of the Lexical Approach, and the corpus-based language learning method (Lewis, 1993; 1997; 2000), a concordance has paid attention to ESL and EFL education fields because it uses authentic corpus and accesses the word and its context easily (Cain, 2002; Chan & Liou, 2005; Nam & Wang, 2004; Sun, 2000, 2003, 2007; Sun & Wang, 2003; Varley, 2009).

1.3. Need of the Study

The usefulness of using a corpus and a concordance in a language class room has been recognized and a course design (J. Floweredew, 1994; Tribble & Johns, 1997), materials (Fox, 1998; Mc Carthy & O'Dell, 2005; O'Dell & Mc Carthy, 2008; J. Willis, 1998), and class room applications (Tribble & Johns, 1997; o'Keeffe, Mc Carthy, & Carter, 2007), have been developed based on a corpus-based language instruction. A concordance has been welcome from the learners' point of view. The learners' needs are met by a corpus-based language learning in that it encourages the learners to learn with the authentic examples (Sun, 2007; Yoon & Hivuerla, 2004).

The general aim of corpus research is to provide a rich and large collection of uses of words and word combinations. Also, it provides information about the frequency of use of word combinations. A corpus approach is suitable for teaching second and foreign language reading and writing.

According to Halliday, one of the most important principles of the corpus approach to language description is that vocabulary and grammar are interrelated .i.e. Lexico-grammar, and they are not distinctive from each other. Regarding this issue, there is an emphasis on the occurrence and frequency of word combinations which is called "collocation". This combined focus on lexical input and grammatical function is valuable for learners who are acquiring English as a second or foreign language, as well as for the teachers of ESL and EFL.

In addition to the lexico-grammatical aspect, corpus-based activities are helpful in L2 and FL writing by providing the learners with a rich collection of natural language use. Because corpora provides learners with authentic language use, exposure to the examples of language use can improve the learners' understanding of specific uses of words in different contexts and increase their L2/or FL linguistic repertoire. Since language teachers may select L2/or FL items and vocabularies which are more useful for the learners to learn, it should be explained that empirical analyses of corpora provide a foundation for description of language use.

One of the limitations in the corpus-based writing instruction is that little attention has been paid to the use of corpora from the learners' view point.

The main purpose of this study is to identify how corpus-based language learning would be beneficial in improving the grammatical knowledge of EFL students, and whether corpus-based instruction has any impact on EFL learners' writing ability. The aim of this study is also to examine the learners' attitudes toward the corpus-based writing instruction.

In this study corpus-based language learning was used. This approach is a new approach for teaching writing and is very effective. Because this approach provides the learners with language use in context, it is useful for the acquisition of grammar and vocabulary since they help learners to retain lexicogrammatical usage patterns better. This study has a significance for the learners because they become motivated, and they assume more responsibility for the writing, become more independent writers, and more confident in writing. The corpus-based approach promotes discovery learning. Since in this study corpora have been used, this study gives many opportunities to the learners and teachers to enrich language instruction process.

1.4. Research Questions of the Study

This study addressed the following question:

- To what extent do corpus-based writing instructions change the learners' grammatical knowledge of adjective and preposition usage?

1.5. Research Hypothesis of the Study

The hypothesis of this study is:

There are no differences of lexical diversity and grammatical error between the groups and between the interventions of the vocabulary reference tools.

2. METHODOLOGY

The participants consisted of 150 adult students who studied English as a foreign language at Islamic Azad University, Tonekabon Branch. They were all translation students. The age range of the participants varies from 18 to 26. They were all non- native speakers of English, and their first language was Farsi.

At first, the students were homogenized through an OPT. The criterion for selection of the students was that their score should be one standard deviation above the mean. Then, they were randomly assigned either to the experimental (n=30) or to the control group (n=30). The experimental group used online concordance, and the control group used online thesaurus.

An introduction session was offered for the participants. During the introduction session, the students were informed about the purpose of this study and how to use online concordance and thesaurus. After that, all of the subjects were asked to write a series of writing sample through using different vocabulary references. That is, the subjects were asked to write seven essays about different topics, but in order to evaluate their writing quality and measure the differences in their writing before and after the experiment, the participants were asked to write on the first and last topic without the use of vocabulary reference. The students were not allowed to use other vocabulary references except online concordance and thesaurus.

During the study, the subjects used concordance and thesaurus 11 times. The communication between the subjects and the researcher was conducted via email. In other word, all the subjects submitted their writing via email.

The subjects were asked to write comparisons and opinions about some social phenomena as shown in Table 1.

Topic	Type	Writing Prompt
1	Education; Comparison	Many Iranian students choose to attend universities in Malaysia. Why do you think they decided to study in Malaysia? Use specific reasons and details to explain your answer.
2	Mass Media; Opinion	Do you agree or disagree with the following statement? Opinion Television, newspapers, magazines, and other media pay too much attention to the personal lives of famous people, such as celebrities. Use specific reasons and details to explain your opinion.
3	Education; Comparison	What is the difference between the education in Iran and the one in Malaysia? Use specific reasons and details to explain your answer
4	Technology; Opinion	Some people say that the internet provides people with a lot of valuable information. Others think access to so much information creates problem. Which do you agree with? Use specific reasons and examples to support your opinion.
5	Culture; Comparison	What is the difference between the culture, such as manners and life style in Iran and in Malaysia? Use specific reasons and details to explain your answer.
6	Education; Opinion	Do you agree and disagree with the following statement? It is more important for students to study history and literature than it is for them to study science and mathematics. Use specific reasons and details to support your opinion.
7	Education; Comparison	According to a recent report, there are more than 5000 Iranian students in Malaysia. Why do you think they choose to Study in Malaysia? Use specific reasons and details to explain your answer.

During writing, the control group used the MNS Encarta® Online Thesaurus as vocabulary reference. The experimental group used the VLC Web Concordance ([http://www. Edict.com.hk/ concordance/](http://www.Edict.com.hk/concordance/)). Other vocabulary references were not allowed for either group.

The current research examined EFL writers' grammatical knowledge in regard to their correct vocabulary usage of propositions, adjectives and nouns. The initial writings of the control and experimental groups were evaluated. In order to detect vocabulary errors, mutual information (MI) scores from the reference corpus, *The New York Times* corpus, were used. The MI scores, according to Barnbrook (1996), represent "the amount of information that each of the two words provide about each other by comparing the observed probability of the co-occurrence with the expected probability, assuming that they were distributed randomly" (p. 98). Once the MI scores for all the two

consecutive word sets in *The New York Times* corpus are calculated, the scores can serve as a reference of appropriate word usages.

WordSmith Tools 5 calculated the MI scores for the words in *The New York Time corpus*. The results were then loaded onto a spreadsheet in order to search for possible word combinations.

For each writing sample, all of the adjective-noun sequences and phrases with prepositions were highlighted and compared against *The New York Times* corpus MI score list. Once all of the errors in regard to the adjective and preposition usages were counted for in each initial writing, and then the averages were taken and compared between the groups and within the group. The results of the averaged scores were used to investigate which component of the productive vocabulary knowledge was most affected by the corpus-based vocabulary reference tool.

There are two types of variable in the study: (1) a between-subject variable of the concordance group and the thesaurus group; and (2) a within-subjects variable of seven topic writing engagements with the vocabulary reference tools. The data gained from the hypothesis of the study was analyzed via calculating ANOVA.

RESULTS

The results from the examination of grammatical knowledge improvement after the EFL learners' using the concordance can be an evidence that the vocabulary reference tool provides positive contributions to improve EFL writing and introduces potential benefits for EFL writers. The assumption of current research concerning grammatical knowledge is that it consists of preposition and adjective knowledge. The total number of errors was prepared by the sum of the two types of grammatical errors: preposition errors and adjective errors. The number of error in a given writing sample is likely to be related to the length of the writing sample—the longer the text; the more likely the errors were to occur. In counting the number of errors in the current study, therefore, all the numbers of errors (raw counts) were standardized to the number of errors per 100 words. This allowed for a meaningful comparison between writing samples of different lengths to be made. Table 2 presents the error rates for the concordance group and the thesaurus group by subject and writing topic number.

As shown in Table 2 below, the concordance group seems to have performed better with consistently lower error counts than the thesaurus group throughout the second to the seventh writing topics. However, one of the problems of comparing data from potentially inhomogeneous groups is whether the groups are compared on the same grounds, i.e., whether two groups have the same variables of error rates from the beginning. Without the control of the variables, the periodical error comparison throughout the writings is considered to be meaningless. For example, in Table 3, the error rates for the Topic 1 writings of the concordance group and the thesaurus group are 0.95 and 0.75, respectively. The error rates for the Topic 2 writings for the concordance group and the thesaurus group are 0.46 and 0.70, respectively. Both groups seem to gain reduced error rates. Consequently, it is not fair to compare the error rate differences directly.

Although the data in Table 2 may present the concordance group's lower grammatical errors in writing, the comparison is not valid because the subjects in the concordance group might have had better grammatical knowledge from the beginning. Therefore, repeated measures ANCOVA model was adopted to investigate the effects of using the concordance and the thesaurus in the EFL learners' grammatical knowledge in writing. The model was expected to avoid possible problems that are due to the direct comparison of the data presented in Table 2 and to control the effects of the extraneous variables in the data. Further, it was expected to allow multiple comparisons of significance tests throughout the topic writing sessions, which may have resulted in inflated significance of the comparisons otherwise.

Table 2 Grammatical Error Rates for Each Subject by Topic

Grammatical Error Rates for Each Subject by Topic

Subject ID	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7
CONC1	1.04	0.42	1.05	0.89	0.71	0.66	0.63
CONC2	1.12	0.71	0.00	0.00	0.00	0.86	0.00
CONC3	0.66	0.31	1.89	0.00	0.00	1.03	0.27
CONC4	1.32	0.30	0.00	1.68	0.88	0.38	0.92
CONC5	1.58	0.26	0.36	0.00	1.14	0.41	0.48
CONC6	0.47	1.44	0.77	0.28	0.00	0.00	0.21
CONC7	1.62	0.00	0.32	1.19	0.63	0.68	0.00
CONC8	0.63	0.81	0.29	0.27	0.50	0.29	0.58
CONC9	0.17	0.38	0.20	0.19	0.21	1.22	0.20
CONC10	0.85	0.00	0.00	0.19	0.95	0.00	1.57
Mean	0.95	0.46	0.49	0.47	0.50	0.55	0.49
THES1	1.27	0.00	1.35	0.22	0.00	1.15	2.02
THES2	0.73	0.00	0.31	0.28	0.00	0.63	0.57
THES3	0.41	0.33	0.36	0.87	0.96	0.00	0.88
THES4	0.90	1.55	0.30	0.95	0.94	0.99	0.62
THES5	0.25	0.00	0.00	0.38	0.42	0.45	0.00
THES6	1.03	1.80	1.22	1.20	2.56	0.45	1.61
THES7	0.37	0.47	0.19	0.00	0.34	0.20	0.68
THES8	1.22	0.00	0.24	1.69	1.17	0.29	0.82

Table 4.16 continues

THES9	0.52	1.87	1.03	0.54	1.21	1.10	0.47
THES10	0.75	0.83	1.69	0.00	0.00	1.35	0.00
THES11	0.77	0.89	0.23	0.74	1.74	0.48	1.25
Mean	0.75	0.70	0.63	0.62	0.85	0.64	0.81

Note. Error rates in 100 words per topic. The prefixes for the Subject ID, CONC and THES, denote the subjects' groups, the concordancer group and the thesaurus group, respectively.

Table 3 provides the repeated measures ANCOVA for the grammatical error rate for the concordance group and the thesaurus group.

Table3 Repeated Measures ANOVA for Total Grammatical Error Rate

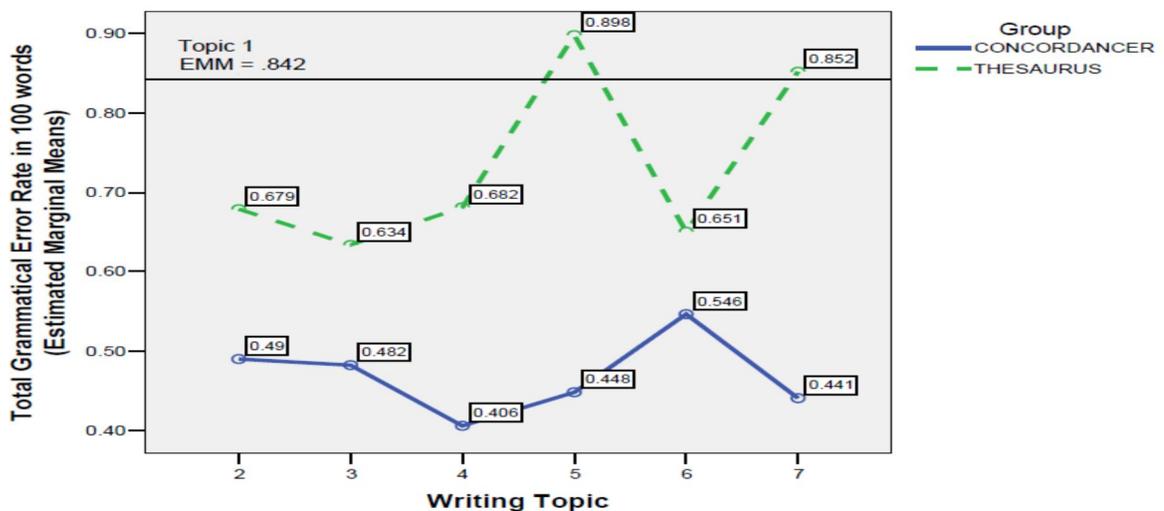
Source	SS	df	MS	F	Sig.	η^2
Tests of within-subjects effects for total grammatical error						
Writing topic	1.355	5	.271	.932	.464	.049
Writing topic *						
Total grammatical error rate in Topic 1	1.792	5	.358	1.234	.300	.064
Writing topic *						
Group	.491	5	.098	.338	.889	.018
Error (Topic)	26.154	90	.291			
Tests of between-subjects effects for total grammatical error						
Total grammatical error rate in Topic 1	1.069	1	1.069	2.361	.142	.116
Group	2.052	1	2.051	4.531*	.047	.201
Error	8.153	18	.453			

Note. Error rates in 100 words. Mauchly's test indicated that the assumption of sphericity had not been violated. Topic 1 is a covariate. Covariates for Total grammatical error rate in Topic 1 = .8419.
* $P < .05$

The results of the within-subjects effects indicate that there was no interactions between writing topic (across the writing sessions) and group, $F(5, 90) = .388$, $MSE = .291$, $p = .889$. This means that the effect of reducing grammatical error in using the concordance and the thesaurus for EFL writing is the same. However, the results of no interaction of across writing topic and both group does not necessarily indicate which vocabulary reference tool is better than the other in terms of reducing grammatical errors. The test results of between-subjects effects for total grammatical error confirmed that there was a significant difference between the groups for overall across all the writing topics at $p < .05$, $F(1, 18) = 4.531$, $MSE = .453$, $p = .047$.

Figure 1 illustrates an overview of how the grammatical errors of the EFL learners' writing for the concordance group and the thesaurus group changed throughout the writing session.

Figure 1 Comparison of the Average Total Grammatical Error



As can be expected from the results of the within-subjects effects, the grammatical error rates of the concordance group and the thesaurus group do not meet anywhere in the coordinate plane. The results of the between-subjects effects indicated that there was a significant difference of error rate between the concordance group

and the thesaurus group at $p < .05$. Figure 1 shows that the difference is due to the lower grammatical error rate of the concordance group and the higher grammatical error rate of the thesaurus group. Along with the confirmation that the concordance group consistently produced lower grammatical error rates than the thesaurus group, it is noteworthy that in the Topic 7 writing, the grammatical error rate of the thesaurus group went back closer to the Topic 1 writing error rate, while the error rate of the concordance group was maintained rather consistently from the Topic 2 writing..

The current research assumed the grammatical error consists of two subcategories of grammatical errors: preposition error and adjective usage error. Since the tests of grammatical error differences in Table 3 is based on the summed error rates of the preposition error rates and adjective error rates, it necessary to identify the characteristics of the grammatical errors in two areas: preposition errors and adjective errors. This also allows for a comparison about how much each area contributes to the total grammatical errors and the differences between the two types of errors. Table 4 presents the repeated measures ANCOVA for the preposition error rate for the concordance group and the thesaurus group.

Table4 Repeated Measures ANOVA for Preposition Error Rate

<i>Repeated Measures ANCOVA for Preposition Error Rate</i>						
Source	SS	Df	MS	F	Sig.	η^2
Tests of within-subjects effects for preposition error						
Writing topic	.585	5	.117	.540	.745	.029
Writing topic × Preposition error rate in Topic 1	.771	5	.154	.712	.616	.038
Writing topic × Group	.522	5	.104	.482	.789	.026
Error(Topic)	19.484	90	.216			
Tests of between-subject effects for preposition error						
Preposition error rate in Topic 1	1.813	1	1.813	6.781	.018	.274
Group	1.274	1	1.274	4.766*	.043	.209
Error	4.813	18	.267			

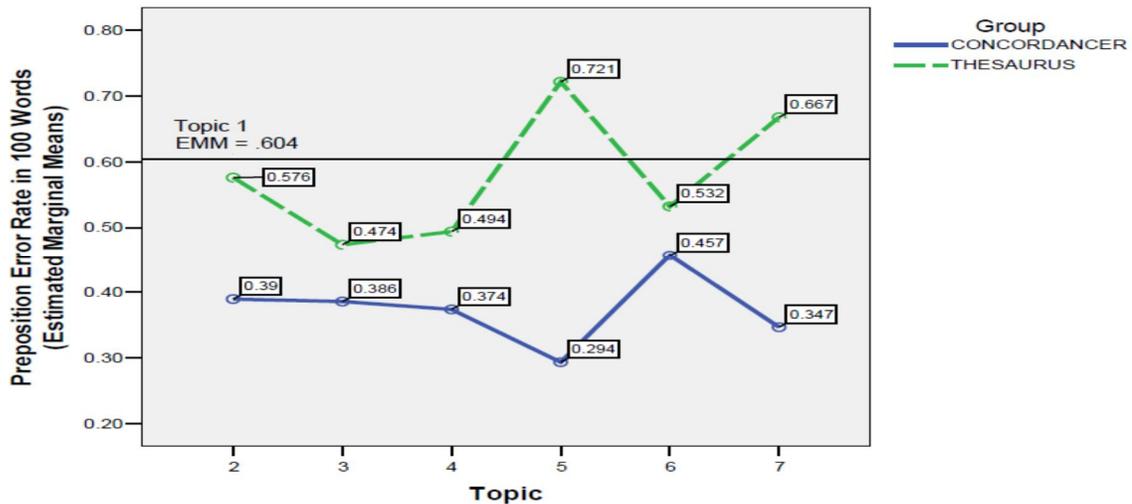
Note. Error rates in 100 words. Mauchly's test indicated that the assumption of sphericity had not been violated. Topic 1 is a covariate. Covariates for adjective error rate in Topic 1 = .604.

* $P < .05$

The results of the within-subjects effects indicate that there was no interactions between writing topic and group, $F(5, 90) = .482$, $MSE = .267$, $p = .789$. This implies that the effect of reducing preposition error when using the concordance and the thesaurus for EFL writing is the same across the writing session. However, as was shown in the results of the total grammatical error comparison above, the results of no interaction of across writing topic and both group does not necessarily indicate which vocabulary reference tool is better than the other in terms of reducing grammatical errors. The test results of between-subjects effects for total grammatical error confirmed that there was a significant difference between the groups for overall across all the writing topics at $p < .05$, $F(1, 18) = 4.766$, $MSE = .267$, $p = .043$.

Figure 2 illustrates an overview of how the preposition error rates of the EFL learners' writing for the concordance group and the thesaurus group changed throughout the writing session.

Figure 2 Comparison of the Average Preposition Error



As can be expected from the results of the interaction between writing topic and group, the preposition error rates of the concordance group and the thesaurus group do not meet anywhere in the coordinate plane. Although there are hills and valleys in the line graphs, they more or less have parallel patterns. The results of the between-subjects effects indicated that there was a significant difference of error rate between the concordance group and the thesaurus group at $p < .05$. Figure 2 shows that the difference is due to the lower preposition error rate of the concordance group and the higher preposition error rate of the thesaurus group. Along with the confirmation that the concordance group consistently produced lower preposition error rates than the thesaurus group, it is noteworthy (similar to the grammatical error patterns in Figure 4.2) that in the Topic 7 writing (the writing samples that were composed without the vocabulary reference tools), the preposition error rate of the thesaurus group jumped above the Topic 1 writing error rate, while the error rate of the concordance group was maintained rather consistently from the Topic 2 writing.

Of the two subcategories of the grammatical errors, the comparison of the adjective error rate shows a bit different patterns from the previous error rates comparisons. Table 5 presents the repeated measures ANCOVA for the adjective error rate for the concordance group and the thesaurus group.

Table 5 Repeated Measures ANOVA for Adjective Error Rate

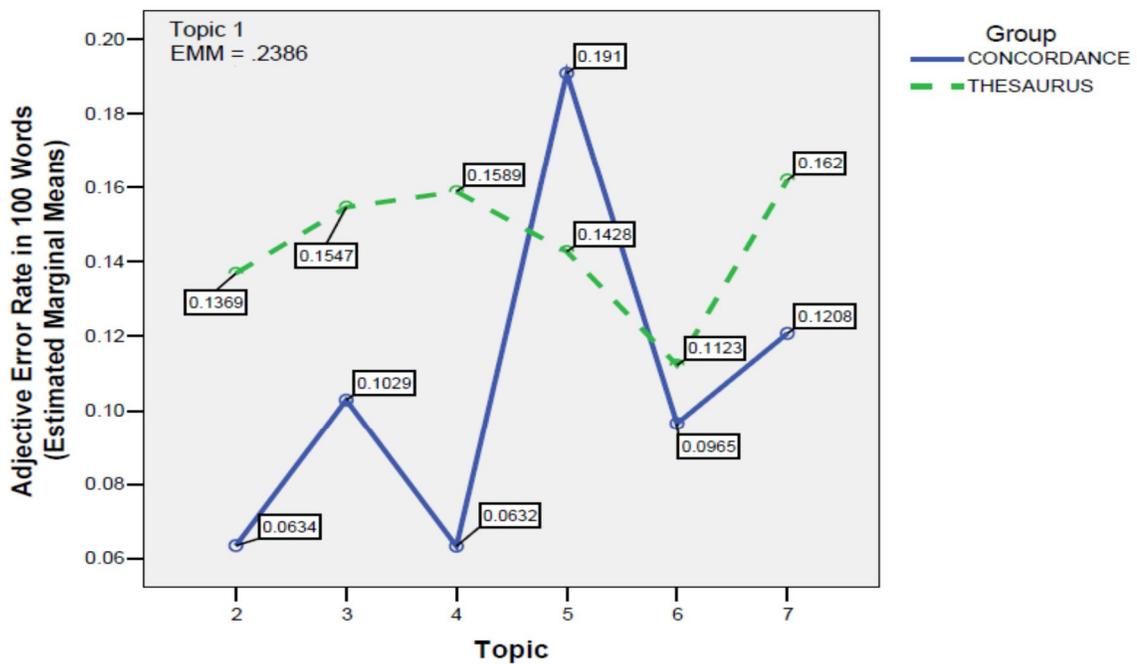
<i>Repeated Measures ANCOVA for Adjective Error Rate</i>						
Source	SS	Df	MS	F	Sig.	η^2
Tests of within-subjects effects for adjective error						
Writing topic	.203	5	.041	.634	.674	.034
Writing topic \times Adjective error rate in Topic 1	.298	5	.060	.932	.464	.049
Writing topic \times Group	.063	5	.013	.196	.963	.011
Error(Topic)	5.752	90	.064			
Tests of between-subjects effects for adjective error						
Adjective error rate in Topic 1	.016	1	.016	.366	.553	.020
Group	.043	1	.043	.985	.334	.052
Error	.793	18	.044			

Note. Error rates in 100 words. Mauchly's test indicated that the assumption of sphericity had not been violated. Topic 1 is a covariate. Covariate for adjective error rate in Topic 1 = .2386.

The results of the within-subjects effects indicate that there was no interactions between writing topic and group, $F(5, 90) = 1.96$, $MSE = .016$, $p = .963$. This means that the effect of reducing adjective error when using the concordance and the thesaurus for EFL writing is the same across the writing session. Being confirmed that there was no interaction between writing topic and group across the series of writing activities, it is also necessary to check the test results of between-subjects effects for adjective error to examine whether there was a main effect that may have caused by the group difference. The test results of between-subjects effects confirmed that there was no significant difference of adjective error between the concordance group and the thesaurus group for overall across all the writing topics, $F(1, 18) = .985$, $MSE = .044$, $p = .334$.

Figure 3 illustrates an overview of how the adjective error rates of the EFL learners' writing for the concordance group and the thesaurus group changed throughout the writing session.

Figure 3 Comparison of the Average Adjective Error



One of the notable characteristics of the adjective error rates comparison graphs in Figure 3, compared to the other two grammatical error graphs, is that the unexpected high error rate in Topic 5 of the concordance group. A close examination of the individual data of the concordance group is needed to answer the unusual error rate pattern. To investigate the irregularities that were found both in the concordance group and the thesaurus group, it is necessary to revisit the actual writing sample data of Topic 5.

4. DISCUSSION

According to the graphic representation of the grammatical error ratio changes between the groups, there might be a grammatical error improvement in EFL writing. The total grammatical error ratio as well as the preposition and the adjective error ratios were reduced immediately after the Topic 2 writing. The reduced error ratio was maintained until the Topic 7 writing. Compared to the results of the concordance group, the grammatical error ratios of the thesaurus group were not reduced as much. Further, for the Topic 7 writing, for which the subjects did not use a thesaurus, the decrement of the error ratios went back to the ratios of the Topic 1 writing, i.e., there was no learning effect.

The statistical significance tests indicated that the total grammatical error improvement in EFL writing between the concordance group and the thesaurus group was marginally significant at $p < .05$. The preposition error improvement was close to the marginal significance, while there was no significant difference in the adjective error improvement. Given the fact that there were only 30 and 30 subjects in the concordance group and the thesaurus group, respectively, the significance test might have different results if the sample size had been greater. The effect size was calculated to investigate to measure the magnitude of the relationship between the grammatical error improvement and each vocabulary reference tool. This way, the results of the significance test were interpreted in terms of the magnitude of each treatment. The results indicated that the magnitude of using a concordance is large in reducing grammatical errors in EFL writing.

The significance test within the group analysis showed that there was no significant improvement of grammatical error in EFL writing after using the thesaurus. The analysis within the concordance group showed that there was a significant improvement of the preposition error reduction in EFL writing after using the concordance, while there was a marginally significant difference in total grammatical error rates ($p < .05$). However, there was no significant difference in reducing adjective error rates. The results imply that the concordance improves EFL writers' grammatical errors, especially preposition errors.

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