DIRECT AND INDIRECT ACCESS TO CORPORA: AN EXPLORATORY CASE STUDY COMPARING STUDENTS' ERROR CORRECTION AND LEARNING STRATEGY USE IN L2 WRITING

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Studies on students' use of corpora in L2 writing have demonstrated the benefits of corpora not only as a linguistic resource to improve their writing abilities but also as a cognitive tool to develop their learning skills and strategies. Most of the corpus studies, however, adopted either direct use or indirect use of corpora by students, without comparing the effectiveness between the two applications. This case study seeks to develop new lines of inquiry by comparing the effectiveness and learning strategy use in corpus-based writing revision. Four Korean EFL students used introspective and retrospective research instruments in an investigation of the effects of corpus use on error correction, error correction patterns, and learning strategy use between the two approaches. While we caution about drawing a conclusion from this small case study, the needs-based approach to corpus use in L2 writing was found to be effective for restructuring the learners' errant knowledge about language use. The approach drove students to actively adopt cognitive learning strategies by performing as "language detectives." Different effectiveness and learning strategy uses were also observed relative to the corpus use contexts as well as according to student proficiency levels. We also found pedagogical implications, which will be discussed, in relation to the two different corpus applications.

INTRODUCTION

An ever-expanding body of work has demonstrated the benefits of corpus-based activities in second language (L2) writing pedagogy (e.g. Charles, 2007; Gaskell & Cobb, 2004; Gilmore, 2009; Kennedy & Miceli, 2010; Lee & Chen, 2009; Lee & Swales, 2006; O'Sullivan & Chambers, 2006; Sun, 2007; Yoon, 2008; Yoon & Hirvela, 2004). Those studies have generally shown the positive effects of corpus use on the development of students' linguistic and rhetorical aspects of L2 writing. Given that the linguistic domain often leaves a major challenge even for advanced L2 writers (Lee & Chen, 2009; Yoon, 2008), corpus-based learning can provide learners with a valuable resource to deal with chronic linguistic problems. Many corpus studies in L2 writing have exploited corpora as resources to educe feedback on learners' writing (Gaskell & Cobb, 2004; Gilmore, 2009; O'Sullivan & Chambers, 2006). For example, Gilmore (2009) showed how learners are able to integrate corpus observations into the redrafting stage of writing to improve the naturalness of writing.

In addition to the benefits of corpus use as a linguistic tool, corpus-based studies have also observed the contribution of corpus investigation as a cognitive tool to develop learners' thinking skills in the learning process (O'Sullivan, 2007; Sun, 2003). The analysis of students' corpus examples is widely known as "data-driven learning" (DDL) (Johns, 1991). DDL is said to not only raise students' awareness of

conventional language patterns in L2 but can also develop strategies for learning the language and thus encourage inductive learning. O'Sullivan (2007) argues that DDL inevitably involves the focus on the learning process, which enhances learners' mental activity, cognitive abilities and metalinguistic knowledge. With the growing recognition of corpora as a learning tool, there has been increased attention to the integration of corpus activities into the language classrooms as part of L2 instruction.

Corpora can be accessed in the language classrooms in two different ways: students' direct use of concordancing software, i.e. computer-based activities, and the presentation of teacher-prepared concordance data in handouts, i.e. paper-based activities. Researchers have used these respective labels for the two techniques: hands-on concordancing (Cobb, 1997) and corpus-printouts (Stevens, 1991), hard and soft version (Gabrielatos, 2005), direct and indirect consultation of corpora (Chambers, 2007), deductive and inductive DDL (Creswell, 2007), teacher-corpus interaction and learner-corpus interaction (Römer, 2008), and teacher-led concordance-based activities and learner-centered corpus-browsing projects (Mukherjee, 2006). For the sake of convenience, this study will label the techniques "direct corpus use" and "indirect corpus use."

In direct corpus use, learners have direct access to concordancers to find language rules for themselves. If the concordances do not offer enough clues, learners can get more texts by typing another key word or clicking on an additional button. The sheer volume of corpus studies has examined the direct use approach. Those studies demonstrated the potential of corpus use in a wide variety of implementations in writing classes, including students' corpus use to improve their knowledge about common usage patterns of words and to increase confidence in L2 writing (Yoon, 2008; Yoon & Hirvela, 2004), enhancing students' awareness of lexico-grammatical patterning and rhetorical functions in EAP writing classes (Charles, 2007), writing revisions based on the corpus information (Gaskell & Cobb, 2004; Gilmore, 2009), evaluating apprenticeship in corpus use (Kennedy & Miceli, 2001; 2010), examining students' evaluations of, and changes in, the use of lexical and grammatical features in writing (O'Sullivan & Chambers, 2006), for proofreading activities centering on students' learning processes and strategies using a web-based concordancer (Sun, 2003), using a web-based scholarly writing template to enhance students' genre-specific language use (Sun, 2007), and using direct observation methodology, i.e. computer tracking, to examine learners' use of corpus data (Pérez-Paredes, Sánchez-Tornel, Calero, & Jiménez, 2011).

On the other hand, voices have raised concerns about the difficulties students encounter in the direct use of corpora. St. John (2001) commented that especially lower-level students are challenged by the daunting amount of concordance examples, even for frequent words, which can easily become too numerous and even meaningless. Charles (2007) stated that teacher control can help students manage the onerous quantity of data and help them to gradually develop a better sense of corpus use without affecting the original meaning of discovery learning. Boulton (2010a) argued that without losing the essential characteristics of DDL, "the use of published materials can help DDL to reach a wider audience of teachers and learners" (p.44). In this respect, where DDL is a new concept to new learners using computers, corpus work in the familiar paper format can make the activities more accessible to harvest long-term learning benefits. In other words, indirect corpus use is "a compromise in an attempt to reconcile the extraordinary (DDL) with the ordinary (published materials)" (p.43).

In indirect use of corpora, the teacher has access to a concordancer and prints out examples from the corpus. Here teachers can edit the concordances that may be too difficult for the learners. Then the learners work with these edited concordances (Bernardini, 2004; Tribble, 1997; Tribble & Jones, 1990). A relatively fewer number of studies have been reported on the implementation of indirect use of corpora in the classroom. Stevens' (1991) study was the first attempt to explore concordance-based vocabulary exercises as a viable alternative to the traditional gap-filler. He found that students showed better performance on concordance-based exercises in contrast to those deployed with gap-filler exercises. Tian's (2005) experimental study of 98 Taiwanese university students determined the distinctive

effectiveness of DDL relative to learning tasks and proficiency levels. The study adopted paper-based corpus activities that were considered more feasible with the large class size. The results found that the DDL group outperformed the control group in their learning of grammar and syntactic features of news headlines, except for learning word usage, while there was no significant difference in learning outcomes between students' proficiency levels.

In more recent studies of indirect corpus use, Boulton (2008, 2009, 2010b) conducted several sequenced studies to test the effects of corpus printed materials in language learning. He was mostly interested in the effectiveness of paper-based corpus materials especially for teaching and learning phrasal verbs to lower-level students (2008), linking adverbials (2009), and 15 language items (2010b). He consistently found that indirect corpus outputs were more effective than traditional references such as bilingual dictionaries and grammar manuals. Boulton (2010a) argued that printed materials provided the conditions for "individual exploration later on with the accompanying benefits of greater autonomy, learner centeredness, and life-long learning" (p.44).

However, indirect use of corpora also has come under criticism for its limited access to the corpus data. We do acknowledge Boulton's (2010a) point that use of paper-based materials can be a transitional step to train learners to become successful hands-on corpus users, but the teacher-edited limited sample of data can restrict learners' own discoveries – so-called "serendipitous learning" (Bernardini, 2000). Furthermore, it is difficult to ensure the representativeness of the sample in terms of frequency in the editing process (Gabrielatos, 2005).

While direct and indirect corpus use have distinctive advantages and disadvantages as discussed above, most of the studies have examined either approach exclusive of the other in L2 instruction. Earlier, Chambers (2005) called for a comparative study on "the benefit of direct consultation of corpora by learners as opposed to consultation of concordances provided by teachers" (p.121). Nevertheless, Boulton (2010a) still noted that "no studies to date directly compare the benefits of hands-on corpus consultation with those of prepared materials" (p.25). We need those comparative studies to understand pedagogical effectiveness in writing development depending on the different use contexts. If either method can differentially affect how L2 is taught and learned, it would have implications for course design and material development. Following Chambers' (2005) and Boulton's (2010a) suggestions, thus, this study aims to demonstrate both methods' respective influences on students' error correction in a writing class.

It is tempting to succumb to a technological-determinist view that the most advanced technology is the most effective tool for learning, i.e. direct corpus use. However, a critical pedagogical issue is *how* students process the corpus information, relative to corpus use type, to deal with their linguistic problems. For example, Zimmerman and Martinez-Pons (1988) found a high correlation between learners' use of self-directed learning strategy and learning achievements. That is, using the appropriate learning strategy can lead to higher learning outcomes. Conversely, in order to obtain successful learning experiences in corpus pedagogy, there should be an understanding of learning strategy, which can cultivate the motivation of active learners. Consequently the important questions to examine in corpus investigation are the strategies learners use to analyze the corpus data, whether there is a more effective strategy, and whether there are differences in strategies relative to student proficiency levels and the two corpus use settings.

Only a few studies have investigated learner strategies in corpus use and concordance analysis (Kennedy & Miceli, 2001; 2010; Sripicharn, 2004; Sun, 2003). Kennedy and Miceli (2001) conducted a detailed qualitative analysis of how students progressed towards becoming independent corpus users in Italian writing instruction. They identified four steps in learners' corpus execution: formulating the question, devising a search strategy, observing the data and selecting examples, and drawing conclusions. The study found that students had problems in all the steps mainly due to the lack of knowledge in L2. Sun (2003) used a think-aloud protocol to analyze the learning process and strategies used by three English as

a foreign language (EFL) students when accessing the corpus data to proofread texts with grammar mistakes. She identified four factors that influenced learners' investigations and strategies: learner's prior knowledge of the language, cognitive skills, concordancer skills, and the teacher's intervention. Sripicharn (2004) conducted an interesting study that compared strategies used in concordance investigations between learners and native-speakers. The results showed that while the learners mainly adopted data-driven strategies such as concordance-based generalization and hypothesis testing, the native speakers depended more upon their intuitive knowledge, and they generalized beyond the concordance output.

While those innovative studies are very instructive, it is critical to garner more insights into the sorts of strategies learners use to comprehend and process the information in corpus-based contexts. Learning strategies are "specific actions taken by the learner to make learning easier, faster, more enjoyable, more self-directed, more effective, and more transferable to new situations" (Oxford, 1990, p. 8). The need for teaching the student learning strategy, i.e. to learn how to learn, has been front and center in L2 pedagogical research since Rubin's (1975) seminal investigation of good language learners' behaviors. More generally, learners' approaches are contextual; they employ specific strategies to approach their specific task and to achieve their particular purpose depending on the learning environment in which they occur (O'Malley & Chamot, 1990; Oxford, 1990; 1996).

The notion of enhancing "discovery" or "learner autonomy" in learning strategies has played a pivotal role in the pedagogical investigations of corpus-based approaches to language learning. Numerous analyses have found that concordances can contribute to the development of students' cognitive skills and learning strategies (Cheng, Warren, & Xun-feng, 2003; Kennedy & Miceli, 2001; O'Sullivan, 2007; Sun, 2003). Many researchers have argued that corpus-based activities give learners more control over their language learning process, which in turn promotes inductive learning and learner autonomy (Chambers, 2005; O'Sullivan & Chambers, 2006; O'Sullivan, 2007). Given the premises shared in the literature of learning strategy and corpus pedagogy, situating corpus-based activities within the theoretical framework of learning strategy research is wholeheartedly legitimate and relevant. Nevertheless, very few attempts have been made to integrate corpus-based research findings into the general classifications of learning strategies used in L2 education literature such as those developed by O'Malley and Chamot (1990) and Oxford (1990). This is the critical missing link that should be established for corpus-based learning in the whole framework of L2 pedagogy. Chambers (2005), who asked for a comparative study between direct corpus use and indirect corpus use, also calls for further study on "the learner strategies used in corpus consultation and analysis, and the teacher's role in providing guidance" (p.121). Studies such as these are essential for directing instructors to teach students how to exploit corpora more effectively and to devise corpus-specific strategy training for teachers.

In short, we designed this study to examine a) the sorts of results that learners achieve in error correction depending on the corpus use context, i.e. direct or indirect, and b) to investigate the sorts of learning strategies students employ in either context.

The study is guided by three main research questions:

1. Can corpus-based writing revision improve the students' grammatical and lexical accuracy?

2. What are students' error correction patterns relative to direct and indirect corpus use, and is there any difference in the effectiveness of such patterns?

3. What learning strategies do the learners employ in direct and indirect corpus use?

This study is original in two novel attempts to a) explore possible differences in students' correction behaviors in concordance analysis relative to corpus use settings, and b) incorporate corpus-based activities into the general framework of L2 pedagogy by analyzing learners' cognitive processes in concordance investigations in relation to the language learning strategy literature. Given its exploratory nature, the study adopted a case study methodology in order to obtain in-depth insights into the topic of

investigation.

METHODS

Participants

Four freshmen EFL students were chosen to participate in this study from a mid-sized university in Korea in accordance with their different levels and degrees of interest in English writing. These students participated with a self-professed interest to improve their English writing skills. Table 1 provides an overview of the learners' background information considered relevant to this study.[1]

Table 1. *Overview of the Participants*

Students	Age	Gender	Pre-test: grammar	Pre-test: lexis	Level of English	Interest in English writing
Young	20	F	20/20	18/20	High	Intermediate
Joon	20	M	19/20	17/20	High	Very high
Hyun	20	M	15/20	12/20	Intermediate	Very low
Min	20	F	14/20	12/20	Intermediate	High

The participants were two females, Young and Min, and two males, Joon and Hyun, all aged 20. Their language proficiencies were determined by administering a pre-test consisting of 20 questions each for grammar and lexis respectively, followed by a personal interview. Based on the results, Young and Joon were considered high-level, and Hyun and Min were intermediate-level students.

The interviews showed that the participants regarded English writing as fairly difficult relative to other English skills. They began studying English at ages 10 or 11, and were educated by rote methods focusing on grammar and reading. However, their interest in English writing varied greatly. Joon and Min had a higher interest because they desired to study abroad, make foreign friends, and explore American culture. On the other hand, Hyun emphasized no interest in English as did Young, who had relatively good writing skills. Additionally, none of the four participants knew about a corpus, thus we can assume that lack of prior exposure would produce no spurious effects.

Data Collection and Procedures

The main data set of the study includes a collection of students' writings, and introspective and retrospective reports from the students to establish their writing strategies. Table 2 demonstrates the overview of the procedures for the data collection.

Table 2. *Procedure of Data Collection*

Pre-meeting	Experiment		Post-meeting
• Interview	•Indirect corpus use	•Direct corpus use	• Interview
• Pre-test	•Five week in-class writing	•Five week in-class writing	• Post-writing
• Pre-writing	•Think-aloud protocol	•Think-aloud protocol	
	•Students ' learning journal	•Students ' learning journal	

The experiment took place over 10 weeks, from March 28 to May 30, 2011. At the beginning, we oriented the students about the purpose of the study and corpus-based learning, and then trained them about how to utilize a corpus. We chose a free online corpus source, "Lextutor," because of its easy accessibility and

operation. Lextutor is among the most well-known Web-based programs (www.lextutor.ca), which has a built-in concordancer. A variety of corpora such as Brown, BNC, and other small-scale corpora can also be accessed through this Web site. Students' basic command of the software did not seem to be at issue because Lextutor is quite simple to use.

The participants then took the grammar and vocabulary pre-test to determine their general English proficiency. The pre-test required students to select 10 correct grammar items and to identify 10 grammatical errors. The lexical portion required students to fill in 15 blanks with appropriate words and to supply five synonyms to a word list. They were also asked to write an essay on the topic, *"Why do you have to learn English in 21st Century?"* on which no feedback was given. Finally we conducted an individual interview to gather personal information and to corroborate the pre-test results.

During the experiment, the class met weekly for one and a half hours. Each class consisted of three tasks: error correction, writing, and reflection. The in-class writings were returned with errors underlined, and the participants corrected the errors by using concordance examples for 40 minutes. The students were then asked to write 150-word essays within 30 minutes without consulting peers or dictionaries. The in-class writing topics were limited to opinion essays about general issues, such as *"Where do you prefer to live in the country or in the city?"* and *"What is the most important quality of a good reader?"* Finishing their essays, the students reflected by writing about the lesson in Korean in their learning journals. This lasted 10 to 20 minutes.

After each class, the second author, who worked as a teacher in the experiment, evaluated the students' in-class writing with a native speaker teacher. We worked together to identify grammatical and lexical errors in each student's writing. Indirect use of corpora was implemented for the first five weeks in order to familiarize with the students to the concordance and to raise their DDL awareness. During the lessons, error-underlined writings were returned to the students with five to 15 pre-edited concordance examples related to their errors. The errors and concordances were numbered and given as a one-page handout. The concordances for grammatical errors provided answers for correct usage, while the handout for lexical errors provided examples of two or three synonyms relative to the target word (Figure 1).
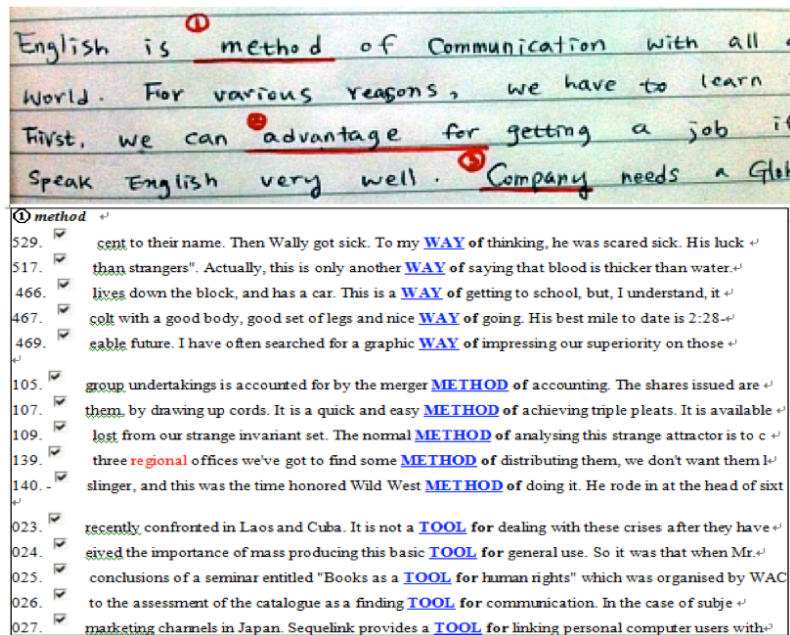

Figure 1. An example of concordance-based feedback of lexical errors

The last five lessons were designed to develop student self-discovery. The sessions met at the multimedia classroom so each participant could access a computer to use the concordancer. Students were given their error-underlined writings and access to Lextutor to search concordances to investigate their errors for a solution.

The final procedure of the whole experiment required the participants to repeat the pre-writing essay on the same topic. Ten weeks were considered enough time to avoid the sensitization effects of the topic. These samples were evaluated to compare error rates in order to assess improvement in grammatical and lexical knowledge.

Students' subjective feedback was gathered by using introspective and retrospective types of instruments. An introspective instrument is a think-aloud protocol in which participants verbally report their thoughts during process-oriented tasks. The think-aloud protocol allowed the researcher to identify learning strategies in using the corpus. A practice session demonstrated to students how to verbalize their thoughts so they could easily perform think-aloud tasks. Other subjective-feedback instruments deployed were retrospective reports: students' learning journals and interviews. Those instruments have the advantage of not interfering with the writing process, though the data may be distorted because they reflect the best recollection of the subject (Roca de Larios, Murphy, & Marín, 2002). The participants also wrote thoughts in learning journals, and interviews gave them the opportunity to express their evaluation of the lesson, their perceptions of corpus use and any attitudinal changes. These reports allowed the researcher to note affective aspects as well as learning strategies they used.

Data Analysis

Pre- and post-writings were analyzed to investigate the students' overall improvement of grammar and vocabulary use. Accuracy was evaluated by measuring the frequency of errors per 100 words (Chandler, 2003). A reduced error rate in the post-writing was regarded as an improvement.

The 10 in-class writings and the students' introspective feedback were analyzed to understand individual progress and error correction patterns. Any differences between the patterns and any effects of error correction were sought relative to the first five lessons of indirect corpus use and the last five lessons of direct corpus use. The students' grammatical and lexical errors were coded by referring to the classification used by O'Sullivan and Chambers (2006).

Different types of feedback resources were deployed respective to the first five and the last five sessions. Voice recordings were used and analyzed for the first five lessons, because listening to their voices was sufficient for identifying the participants in indirect corpus use as they were working with pre-edited concordance examples. Video recordings were available for analysis of the last five sessions, so the researcher was able to watch the students operating concordancers while concordantly listening to their think-aloud reports. One camera was installed per computer to access each student's computer-screen. The voice and video recordings were transcribed, and every learning strategy was identified by referring to the categories that were adopted from O'Melley and Charmot's (1990) and Oxford's (1990) classifications.

FINDINGS

The findings are categorized in the order of the three research questions: a) learners' overall improvement of grammatical and lexical knowledge, b) error correction patterns in indirect and direct use of corpora, and c) use of learning strategies according to the two corpus use contexts.

Overall Improvement of Grammatical and Lexical Knowledge

After exposure to direct and indirect use of corpora, the students' overall grammatical and lexical knowledge increased, as evidenced by pre-writing and post-writing evaluations of the same writing topic.

Table 3 provides the results on the error rates in pre- and post-writing.

Table 3. *Number of Errors in Pre- and Post-writing*

Grammatical errors	Pre-writing					Post-writing				
	Young	Joon	Hyun	Min	Total(%)	Young	Joon	Hyun	Min	Total(%)
Preposition	2	2	3	4	11(18.6)	2	3	3	3	11(28.9)
Noun agreement		2	1	2	5(8.5)	1		2	1	4(10.5)
Verb form/mood	3	1	4	4	12(20.3)	1	1	3	2	7(18.4)
Article	3	4	5	3	15(25.4)	1	2	1	2	6(15.8)
Pronoun		1	2	1	4(6.8)	2	1	2	3	8(21)
Use of negative		1		1	2(3.4)					0(0)
Elision	1		3	2	6 (10.2)			1		1(2.6)
Conjunction			3	1	4(6.8)					0(0)
Total	9	11	21	18	59(100)	7	7	12	11	37(100)
Words in writing	136	159	169	131	595	137	152	161	140	590
Rate of grammatical errors (%)	6.6	6.9	12.4	13.7	9.9	5.1	4.6	7.5	7.8	6.3
Lexical errors	Pre-writing					Post-writing				
	Young	Joon	Hyun	Min	Total(%)	Young	Joon	Hyun	Min	Total(%)
Word choice/ inappropriate vocabulary	3	7	7	4	21(95.4)	2	4	3	3	12(100)
Informal usage		1			1(4.6)					0(0)
Total	3	8	7	4	22(100)	2	4	3	3	12(100)
Words in writing	136	159	169	131	595	137	152	161	140	590
Rate of lexical errors (%)	2.2	5	4.1	3	3.7	1.5	2.6	1.8	2.1	2

The rate of grammatical errors decreased from 9.9 percent in pre-writing to 6.3 percent in post-writing, and lexical errors decreased from 3.7 percent to 2.0 percent, illustrating that the learners' overall knowledge of grammar and lexis increased.

In pre-writing, there were individual differences in the number of grammatical errors, but all learners were weak regarding uses of article, verb form/mood, and preposition. There also were some differences in the frequency of lexical errors because Joon and Hyun tried to use new vocabulary and various lexical constructions. Despite the errors, their initiative and motivation is apparent in their effort to try novel constructions on their own. This is evidence of self-directed learning.

After the experiment, the learners corrected many errors in the pre-writing, especially the uses of article and verb form/mood. Originally, the misuse of articles and verb form/mood accounted for more than 45 percent of the errors, but the students greatly improved by using concordance resources to make corrections. In contrast, the rate of preposition and pronoun errors increased in the post-writing. In interviews, the participants revealed they tried a variety of expressions using prepositions because the more they wrote, the more they gained confidence. Again, as earlier argued, the commission of errors is a positive sign of self-directed learning.

In summary, although learners made more mistakes for certain grammatical error types in the post-

writing, their grammatical and lexical knowledge increased overall. This comports to previous findings that showed the positive role of corpus activities in error correction (Gaskell & Cobb, 2004; Gilmore, 2009; O'Sullivan & Chambers, 2006). We argue that students made more improvement as they made more errors because they received immediate feedback from the corpus to correct errors. There is also a cultural counterpoint given that East Asian pedagogies are based on rote learning methods following a Confucian philosophical ethic. Students are expected to comply with the instructor who is considered the master of the teaching material (Shi, 2006). However, corpus can be used to set students toward self-directed strategies that this study shows are demonstrably effective.

Learners' Error Correction Patterns in Indirect and Direct Corpus Use

Our study begs the question about the effectiveness of indirect corpus use relative to direct use. This section gets at the answer in regards to students' error correction patterns relative to the two types of corpus use. Table 4 provides correction patterns and rates for each student according to the two uses. After 10 in-class-writings and corpus-based revisions, three major patterns were found. They are self-correction using concordance data (Pattern A), correction with teacher assistance (Pattern B), and no correction (Pattern C).

Table 4. *Correction Frequencies in Indirect and Direct Corpus Use*

		Indirect Use						Direct Use			
		Pattern A: Self Correction		Pattern B: Correction w/teacher assistance		Pattern C: No Correction		Pattern A: Self Correction		Pattern B: Correction w/teacher assistance	
Young	G[a]	35/40[c]	(88%)	5/5	(100%)			30/34	(88%)	4/4	(100%)
	L[b]	13/18	(72%)	4/5	(80%)	0/1	(0%)	19/24	(79%)	5/5	(100%)
Joon	G	32/38	(84%)	6/6	(100%)			25/39	(64%)	14/14	(100%)
	L	16/28	(57%)	8/12	(67%)	0/4	(0%)	10/26	(38%)	16/16	(100%)
Hyun	G	56/66	(85%)	10/10	(100%)			36/59	(61%)	23/23	(100%)
	L	18/27	(67%)	9/9/	(100%)			12/25	(48%)	13/13	(100%)
Min	G	52/57	(91%)	5/5	(100%)			34/66	(52%)	32/32	(100%)
	L	14/20	(70%)	6/6	(100%)			7/17	(41%)	10/10	(100%)
Total	G	175/201	(87%)	26/26	(100%)			125/198	(63%)	73/73	(100%)
	L	61/93	(66%)	27/32	(84%)	0/5	(0%)	48/92	(52%)	44/44	(100%)

Notes: * [a]: G – Grammar, [b]: L – Lexis, [c]: number of correction/number of errors

Overall, the rate of self-correction was higher in the indirect use than in the direct use. In the indirect use of corpora, the learners corrected 87 percent of the grammatical errors and 66 percent of the lexical errors by using concordance data on their own (Pattern A). The learners could not correct the rest of the errors by themselves, so they asked for the teacher's help. The teacher's intervention helped the learners correct most of the errors successfully (Pattern B). However, not all students followed the teacher's advice. A pattern emerged in which these learners rejected the suggested corrections and deliberately continued their lexical errors (Pattern C).

On the other hand, the self-error correction rate was lower in the direct corpus use than in the indirect use for most learners (Pattern A). When they could not find the relevant examples, students were able to correct all their errors with the help of simple interventions by the teacher (Pattern B).

Reproduced in italic below are examples of students' writing with errors underlined, as well as introspective thoughts (translated from Korean to English) within quotation marks following think-aloud protocol.

- *butter, sugar and <u>white powder</u>*: "I didn't know the word for 'flour', so I just wrote 'white powder.' According to the examples, 'flour' is the correct word I'm trying to say." (Min, third composition, indirect corpus use)

- *<u>nonhuman</u> lifestyle in Korea*: "In Lextutor, I can't find any examples of 'nonhuman'. I want to say 'it is not human.' Is it unhuman? inhuman? or not-human? Well, I will type containing 'human', then I can find negative prefix... Ah, I think [humane] is the right word I'm trying to say. I will type containing [humane] again." (Joon, seventh composition, direct corpus use)

Regardless of direct or indirect use, the students did not need to look over all the relevant examples because the resources were understandable and compatible with their knowledge. In the case of indirect use (1), Min successfully analyzed the error with translation though she did not know the word 'flour.' She was able to correct the error with only a few examples. In the case of direct use (2), Joon typed 'human' and detecting the relevant examples, he realized that he really wanted the word 'humane.' He returned to the start-up page to look up 'humane,' after which he found the negative prefix to correct the error. Students generally took much longer to correct errors in the direct use of corpora, but while discovering examples, they seemed to naturally acquire new language information. The corpus investigation enabled the learners to experience "serendipitous learning" (Bernardini, 2000) as well as giving them opportunities to develop their cognitive skills (O'Sullivan, 2007).

Although direct corpus use can promote self-directed learning, students did need the teacher's assistance to find examples and correct errors. Below is a case of how Min described how she negotiated an error:

<u>In young people case</u>, they are willing to stay...: "Is it a word choice error of 'young people,' or a grammatical error? Which word do I need to type in the concordancer? … There is usually a possessive form between 'in' and 'case.' Is that right? … (Min, ninth composition, direct corpus use)

As a result of the teacher's scaffolding, Min found the right examples. The teacher typed in the clue 'case' preceded by 'in' to the left side, so Min was able to analyze it correctly. She also found more examples for 'in the case of' than 'in + possessive + case,' and thus she correctly changed it to 'in the case of young people.' While the teacher's guidance was also helpful in the indirect use, a certain degree of teacher's intervention is also crucial in the direct use, which challenges a popular techno-deterministic assumption that computers will replace teachers in the classroom. In contrast, we observed that computer use requires continued teacher vigilance and attention for learners' successful experiences with corpus activities (Chambers, 2005; Sun, 2003).

Like Min, the other learners often asked for the teacher's help, but Young, the highest level student, spent much time exploring examples herself and did not need as much from the teacher. Young became very skilled in scanning. She was in no hurry to find the answers, and she was able to winnow appropriate examples among excessive data. This single case cannot be generalized, but it begs further exploration to establish if direct corpus use appeals to learners who are patient, analytic, and fast enough to read and scan the data.

Other interesting findings concern lower-level students' successes in using both types of corpora. The lowest level student, Min, got the highest rate of self-correction (91 percent) for grammatical errors in indirect corpus use, while exhibiting the lowest correction rate (52 percent) in direct corpus use. Another lower-level student, Hyun, showed a similar pattern: a higher rate of self-correction comparable with higher-level students in indirect corpus use. We cannot generalize from these few cases, but it may be

worth exploring whether lower-level students benefit more from the teacher-edited corpus materials.

Although high-level students analyzed errors successfully with pre-selected examples in indirect corpus use, we observed that they were not easily convinced if it conflicted with what they thought was a standard grammatical rule. In these cases, a rule was overapplied to a special case that required a different answer. The learner's prior knowledge required the teacher's assistance to make new generalizations to teach new knowledge. An example is Young's error and what she described:

> *English <u>as the</u> second language*: "According to the concordance data, it tells me 'as the' should be corrected to 'as a', right? But while writing, after I had thought of selecting the usage "as a", I came up with an idea that I have to put "the" to the left side of the ordinal number. That's the reason I wrote 'as the' instead of 'as a'. I need your explanation rather than these examples." (Young, first composition)

Young was not persuaded when the teacher gave her seven examples including an idiomatic expression, 'as a.' Young needed the teacher's protracted and insistent explanation why it was wrong. The teacher's persistence finally convinced Young to correct the error. This case reflects why the rate of Pattern A for high-level students was lower in indirect corpus use. High-level students tended to defer to their prior knowledge even when it conflicted with the concordance examples. In contrast, a lower-level student, Min, satisfactorily corrected her errors based on the examples. This case is hard to generalize, but it is worth further investigation about the effectiveness of indirect corpus materials for lower-level students relative to higher-level students. This can be related to the previous finding that not all users adopted data-driven strategies in concordance-based investigation (Sripicharn, 2004). The present study found a similar pattern in high-level learners as did Sripicharn, i.e. native speakers tended to rely upon their existing knowledge.

Interestingly, high-level students only exhibited their resistance to corrections (Pattern C) for lexical errors in the indirect corpus use. All learners corrected grammatical errors after receiving the concordance feedback and the teacher's help, but some learners wanted to leave lexical errors as they chose. Joon especially was not afraid of creating words. He deliberately left 33 percent lexical errors thus resisting the teacher's explanation:

> **<u>not-well</u> planned building arrangements*: "According to the data and your explanation, it is more natural to change from 'not-well' to 'poorly,' right? But I want to emphasize the negative meaning. 'Poorly' doesn't fully cover my intention. It is not grammatically wrong, so I want to put it this way." (Joon, fifth composition)

Although Joon analyzed the error successfully, he stuck to his original expression. He commented in the post-interview:

> I like creative expressions or using brilliant words. The concordance just has expressions many people use, so there is no way to find creative uses of words. Different expressions are not wrong usage, I think. (Joon, 5/31/2011)

Joon was upset that his novel expressions were found to be incorrect according to the concordance data. In contrast, students who directly accessed the concordancer were agreeable to the usage as a result of their own search through the data. Given the few numbers of participants, it is difficult to draw a firm conclusion from this study. But in this particular case, the proficient students rather easily changed their preconceived errant knowledge when they pursued the data through direct corpus access, implying the effectiveness of direct corpus consultation for high-level students with conflicting errant knowledge.

Finally, although most participants were more successful in correcting errors for themselves in the indirect use, they overall preferred the direct use of corpora. The participants were much interested in finding the right answers with their own efforts, and they were very delighted that they could actually discovered the rules. Below are excerpts from the interviews in the post-meeting.

> Although it takes long to find examples, I prefer the direct use of Lextutor. As there is not only one way to express ideas in language use, I can find a variety of different answers during the process of searching this and that. Also I want to use it in writing later. (Young, 5/31/2011)

> When I started directly using the concordancer, I fumbled around. But with the teacher's little help, I could have fun learning English and not be bored by using the computer. I prefer the direct way. (Min, 5/31/2011)

This section demonstrated different error correction patterns and effects in corpus-based revisions between the indirect and direct corpus uses. While the ratio of self-correction was higher in the indirect use, most learners were more interested in the direct use as they liked to be a "language detective." This implies that students' interest and motivation are not always reinforced by positive learning experiences. While cautious in making generalizations from this case study, we found that direct corpus use seemed to suit high-level students; they willingly changed their knowledge only when checking data on their own efforts. On the other hand, indirect corpus use was satisfactory enough for lower-level students even when the limited number of examples conflicted with their knowledge.

Learning Strategies in Indirect and Direct Corpus Use

As mentioned, we employed think-aloud protocols, learning journals, and observation notes to collect qualitative data on student learning strategies through corpus use. Each learning strategy was identified, classified into four main categories, and further sub-categorized. We identified different learning strategy use patterns relative to the corpus use techniques and the participant's English proficiency levels. Table 5 shows the frequency of learning strategies for each category.

Table 5. *Classification of Learning Strategies Used in the Two Corpus Use Contexts*

Category	Detailed strategy	Indirect use		Direct use	
		Frequency	(%)	Frequency	(%)
Metacognitive strategy	Self-evaluation/monitoring	28	(4.9)	21	(2.5)
Cognitive strategy	Making use of materials	217	(38.1)	378	(45.5)
	Association	112	(19.7)	61	(7.3)
	Grouping	41	(7.2)	64	(7.7)
	Translation	57	(10.0)	78	(9.4)
	Note-taking	2	(.4)	6	(.7)
Affective strategy	Lowering anxiety	7	(1.2)	16	(1.9)
	Self-encouragement	12	(2.1)	12	(1.4)
Social strategy	Question for clarification	78	(13.7)	187	(22.5)
Others		15	(2.6)	7	(.8)
Total		569	(100)	830	(100)

Learners adopted learning strategies appropriate for the particular task in the new learning situation. This is a very personal experience to the learner who finds novel and individual ways to improvise strategies, fortunately giving us an intimate "insider's" window to how the learner adjusts to the material. The total frequency of strategy use, depicted in Table 5, is much higher in the direct corpus use, implying that

learners used an array of cognitive and affective skills to solve problems while engaging them in self-directed activity.

Table 5 shows that cognitive strategy was the most frequently used main category, in both corpus settings, which is not surprising given the nature of corpus activities. In indirect use, students used more metacognitive strategy (4.9 percent) than in the direct use (2.5 percent), which seems be related to their handling of novel type of learning. This appears to be evidence that participants seemed to "coordinate their own learning process" (Oxford, 1990, p.136) more consciously at the first five weeks when faced with a new type of learning, i.e. concordancing. But once they adjusted to the type of learning, they moved to use other substantial strategies such as cognitive strategy. Of particular interest is that social strategy was the second most frequently used learning strategy in both the corpus use settings. Clearly the students needed the teacher's guidance and mediation to continue their corpus analysis to solve their language problems. This also conflicts with popular ideas that computer use reduces, and may even eliminate, the need for teacher support in the classroom. If other studies uphold our finding, the evidence will weigh in favor of a continued, active presence of teachers trained in corpus methodologies.

Now let us compare the use of the four sub-categories of strategy: making use of materials, association, question for clarification, and translation. All of these, except for translation, were chosen because they show the largest differences (over 5 percent) between the rates relative to the two corpus contexts. The translation strategy was an unexpected result, because it was only a 0.7-percent difference. We had anticipated a higher rate in the direct use where there are many more examples to translate from the concordance outputs. The anomalous result was determined to be worth additional investigation.

Resourcing: Making use of materials

The adage, "if at first you don't succeed, try, try again" describes the "making use of materials" strategy. In this strategy, the learners applied additional steps after their initial search process was unable to secure answer. The frequency of this strategy varied between the direct (45.5 percent) and indirect (38.1 percent) corpus use, which seems to be natural given the type of materials available in each setting. Indirect use only made five to 15 corpus examples available. If the students were unsuccessful with this resource, they moved on to other strategies to solve problems. In other words, they may or may not have been able to solve the problem. In direct corpus use, if the learners failed to find appropriate examples, they returned to the corpus start-up screen and typed another word to solve problems, rather than trying other strategies. This is evidence that the resource itself is significantly important in the direct corpus use, and it implies that the teacher can strengthen students' learning skills by taking time to train them in concordancer operations. It again exemplifies that the teacher's role is critical to student's successful corpus use.

Application of prior knowledge

When students could not correct errors using the initial resourcing strategies, they shifted to acquired knowledge and logical reasoning. However, the frequencies and types of association with prior knowledge differed between the two techniques. In the direct use (7.3 percent), the learners used the concordancer until finding relevant data, rather than revert to their own knowledge. However, in the indirect use (19.7 percent), students resorted to their prior knowledge because the data was too limited for them to find answers.

Concurring with Sun (2003), we observed three manners of applying prior knowledge. First, when learners produced the apt prior knowledge, they easily corrected mistakes and moved to the self-evaluation strategy (metacognitive strategy), while cogitating *"Why did I get it wrong?"* or *"I will never make the same mistake next time."* In this case, just a few examples persuaded them to correct errors, as illustrated in the following writing example:

   *..they live in the city, <u>where is</u> the center of the culture...(Young, 3rd composition)

Young said she already knew the grammatical difference between 'where' and 'which.' After using the given example to satisfactorily correct the error, she said:

> If I have a chance to produce a sentence including 'where' or 'which is' next time, I will never make the same mistake. I already knew this grammar and I got it right on a multiple-choice exam before. Once making this mistake, I feel I didn't fully understand it before I actually produced it.

Second, when the learners have incorrect prior knowledge, they could not correct errors for themselves, so they tended to ask for the teacher's intervention or for more examples to re-generalize. Here is an example based on a writing sample:

> * Less <u>densed</u> population will also remove stress… (Joon, 3rd composition)

The teacher gave Joon eight examples where the word 'dense' is used as an adjective. While correcting the error, he said:

> In the data, every 'dense' word is used as an adjective. But I think it is used not only as an adjective but also as a verb. I remember I wrote 'densed' before. I need more examples.
> Can I look it up in the dictionary? Or can you give me an explanation?

Joon's knowledge had become fossilized, i.e. solidified and impervious to change, even though the concordancer supplied eight examples. It took the authority of a teacher's explanation to persuade him of his errant knowledge.

The third case was when the learners had no relevant knowledge to the issue at hand. This instance only occurred in direct corpus use. In this case, the teacher's intervention was necessary to find the right examples:

> * These <u>phenomenons</u> are dangerous...(Hyun,8th composition)

Hyun did not realize that 'phenomena' is the plural form of 'phenomenon.' Without the teacher's intervention, the right examples would have eluded him because the concordancer feature would have required him to type 'phenomena' to access the correct usage. Or the learner could have found the plural form 'phenomena' by typing 'phenomen' with the search option "starts" selected instead of "equals" in the concordancer.

With limited data in the indirect use of corpora, the learners had to apply their prior knowledge when they were not satisfied. This suggests that the number of examples can be a powerful attribute to compel students to amend their errant knowledge in corpus-based contexts. Student's fossilized knowledge defied the influence of only a few examples. For indirect corpus use, then, it appears the teacher should consider providing profuse examples when adopting the materials into classroom activities.

Translation strategy

The rate of translation strategy use differed little between direct (9.4 percent) and indirect (10.0 percent) corpus use. This defied the researchers' initial assumption that more differences would be apparent because there were significant differences in the number of examples between the indirect (five to 15 examples) and direct method (maximum of 5,000 examples). Learners tended to first skim the data to choose sentences they could easily understand or thought were most relevant to their errors regardless of the number produced in the data. In both sorts of corpus use thus the number of translation strategy uses was about the same.

A consequence of the indirect use was that learners lost interest in translation because the corpus cut off the beginnings and ends of example sentences. Learners were confounded by the context because they were forced to concentrate only on the target word without the whole sentence to convey meaning.

However, the direct use presented a different challenge that resulted in similar student indifference. Learners were frustrated by the pressure to sort through the sheer volume of examples to translate. These are technical issues in corpus presentation that need to be addressed for effective deployment of either corpus type in the classroom. If corpus advocates seek to replicate a naturalistic learning environment, then certainly the indirect use should reflect the natural written language that is likely to be produced in full sentences. As for the direct use, it defies comprehension that a foreign speaker would ever need to confront every form of language use in a native setting. On the other hand, perhaps more vigilant teacher preparation is required to winnow through relevant corpus materials to select those appropriate to the learning context that students would expect to face in the particular exercise.

Questions for clarification

The types and frequency of questions that students posed varied between the two corpus use settings. In indirect corpus use, most learners corrected errors after using various strategies. It was only after they failed to properly analyze the errors that they would finally ask for the teacher's explanation. Here is an example:

> * *To achieve <u>be satisfied life</u>*: "Looking in the right pattern of 'achieve,' there is always a noun form. Isn't 'be satisfied life' a noun?" (Min, 5th composition)

After analyzing the data, Min did not recognize her errant knowledge. She then consulted the teacher who explained the difference between the passive form and the noun form, which helped to repair Min's knowledge.

On the other hand, the learners asked many questions in direct corpus use because they often needed the teacher's simple scaffolding to search for right examples relevant to their errors. Once they found the examples, they could solve most of their errors. Here is Joon's error and what he described:

> * *I have lived in <u>the metropolitan</u> in Korea*: "Is it the error of grammar or the word 'metropolitan'? …Do I look at the right or left pattern?" (Joon, 9th composition)

In the process of finding relevant examples, students propounded many questions such as *'What type of error is it?,' 'Do I have to look at the right side of the word or left side?,'* but they did not tend to ask for explanations about the answer.

The frequency of questions in indirect corpus use is less than in direct use because the questions are the final method of correction, whereas the frequency is higher in direct corpus use as it occurred in the process of finding examples (Figure 2).

[Indirect corpus use]

[Direct corpus use]
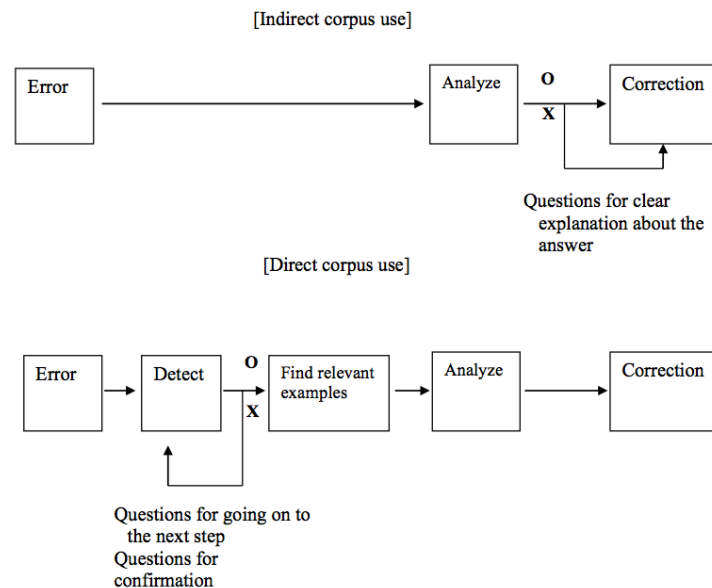
Figure 2. The patterns of questions for clarification in corpus analysis

As the teacher was in charge of the steps to 'detect' and 'find relevant examples' in indirect use, the students asked for explanations only when answers confounded them. In contrast, students had more control over the data in direct use, so many questions arose while detecting examples. In the process, they realized the nature of their mistake and how to correct it. Through this process they acquired language information, and once they found relevant examples, they corrected most errors. This exemplifies that direct use can engage learners more actively in the language searching, which in turn can lead to development of learners' cognitive skills and self-directed learning.

In addition to the findings regarding the application of corpus to the different contexts, the study also found that the learners reacted differently in corpus analysis according to their English levels. The high-level students, Young and Joon, occasionally defended their mistakes and explained their convictions for writing that way. Joon was extremely strong-willed, so it was hard to reform his prior knowledge. Whenever Joon realized he was wrong, he self-evaluated his prior knowledge by commenting "*Why did I make this kind of mistake?*"

On the other hand, middle-level students Hyun and Min used question strategies as a way to trim their anxiety and to elevate their confidence. They trusted the concordance data more than their preset knowledge, so their questions were not defensive, but rather concerned their understanding about how to find examples or to confirm the correction. Many researchers found that high-level students are more prone to question and seek help from the teacher and their peers (Newman, 1991; Newman & Goldin, 1990; Zimmerman & Martinez-Pons, 1986). This single case study is difficult to generalize across the board, but it does support the literature that middle-level learners tend to seek help from the teacher in similar small-scale corpus classes, while high-level students were more willing to solve problems for themselves with corpus materials.

In summary, this section demonstrated that learners had many opportunities to use a wide range of learning strategies in concordancing activities. When their deployment of a certain strategy turned fruitless, they appropriated other types of learning strategies as active language learners. Through the process, they learned how to monitor their knowledge and to modify learning strategies to the situation. Accordingly, the corpus consultation developed their metacognitive, cognitive, and socio-affective strategy skills to a positive effect.

CONCLUSION

This case study investigated how learners corrected errors, and the strategies they employed, in L2 writing relative to indirect and direct access to concordance software. The indirect use involved teacher-prepared concordance handouts supplied to students, while the direct approach gave students actual access to the corpora. By integrating the corpus work into the revision stage of writing, students actively found answers to correct their errors while testing out their linguistic hypotheses. This needs-based approach (Aston, 1997; Braun, 2007) was especially effective for learners who made frequent linguistic mistakes because the concordance data gave them instant feedback, which reinforced their learning.

Concordancing also served to develop students' cognitive and metacognitive abilities by motivating discovery learning, which enhanced autonomous learning (Johns, 1991; O'Sullivan, 2007). As O'Sullivan (2007) argued, process-oriented corpus activities lead learners to monitor and regulate their cognitive work by using a variety of learning strategies. As our study showed, learners can rework their writing and process the linguistic input from corpora. To this effect, students acquired rules of language use and restructured their prior, erroneous knowledge, which facilitated their acquisition of linguistic knowledge. Consequently, corpus-based writing feedback can open a new way of learning language in a writing class (Sun, 2003; Gilmore, 2009), especially in the revision stage of a process-oriented writing.

We concede our findings are tentative due to the exploratory nature and small sample size of this study. Yet, our unique design--comparing indirect to direct corpus use--provided meaningful findings, so it may well serve as a worthy model to emulate for future studies. This contrasts to the usual method that examines only one corpus method in the classroom. While previous studies have been inconsistent about the relationship between proficiency levels and the effect of corpus use (e.g. Kennedy & Miceli, 2001; Gaskell & Cobb, 2004; McCay, 1980; Tribble, 1991; Tribble & Jones, 1990; Yoon & Hirvela, 2004), this study revealed that corpus-based instruction can benefit different levels of students if we consider their different patterns and strategies relative to the two corpus applications. Again, the small numbers involved in this study may prejudice a firm conclusion, but the indirect use of corpora appeared to have greater effectiveness in error correction for most learners. Still, the learners preferred the interactive aspect of direct corpora use, which also raised their learning awareness. If these findings are replicated, then it can reassure teachers with less-endowed technological infrastructures--particularly in developing countries-- that indirect use can still benefit students' linguistic acquisition in L2 writing.

Our study may have pedagogical implications because we identified specific ways that teachers can regulate the classroom environment to enhance the learning experience of either direct or indirect corpus use. Future studies may want to address: accuracy of students' prior knowledge, levels of student proficiency, level of research skills, students' learning styles, the degree of teacher's intervention, and accessibility to corpus resources, to name a few. Our findings suggest that indirect deployment of corpus requires the teachers to consider intrinsic factors such as students' prior knowledge, language proficiency and learning styles. The direct deployment of corpus requires evaluation of not only intrinsic factors but also extrinsic factors such as the teacher's intervention and accessibility to corpus resources. Limited accessibility to the resources and corpus programs may impede direct use of corpora, but we mitigated this drawback by employing a free online corpus, which may be readily accessed on the World Wide Web. The Lextutor Web site not only enabled students' easy access to corpora, but they easily handled the data with minimal training. We argue that the use of Web resources can minimize the effects of the digital divide that particularly confronts developing countries (and even in some economically depressed areas within advanced economies) whose educators are tasked to prepare students for a hyper-competitive world economy in which English is the lingua franca. Furthermore, indirect corpus is still available to teachers, even if students lack the individual concordance resources due to fewer computer resources. Use of either approach makes for a win-win situation for teachers and students wherever corpus-based instruction is employed.

The literature shows that corpus size can be a considerable matter in terms of teachers' time management (St. John, 2001) in using indirect corpus. A teacher can spend substantial time selecting appropriate outputs from an immense number of examples based on the target errors and students' levels. Frequency of occurrence may not be generalizable when the amount of examples is relatively small. However, small-size corpora may not only be valuable for learners' language discovery but can also familiarize learners to use larger corpora appropriately (Aston, 1997). It is not possible to claim conclusively on the basis of our small-scale study, but we were struck by how a relatively few examples were able to satisfy learners if the error was simple or inadvertent. However, it was apparent that more examples are needed to correct fossilized erroneous knowledge especially for high-level students who resisted corrections. To manage this situation, the teacher must determine the levels of students' proficiencies and the linguistic items in the inquiry in order to select the amount of data for concordance examples. On the other hand, while indirect corpus use is often recommended as a transitional step to moving to direct corpus use or to independent concordance usage (Gaskell & Cobb, 2004; Johns, 1997), this study showed that indirect corpus use can be a great learning method for lower-level students in its own right, thus assuaging any deleterious effects of the digital divide where direct access may not be easily available in less-developed countries. In any event, indirect use can also prepare these students for direct use if they should transfer to a country with more advanced facilities, or if their institution's facilities should be eventually upgraded.

A more crucial issue for direct corpus use is training students about how to utilize the concordancer. In light of the results on the frequency of strategy use, the learners used almost 50 percent of "making use of materials" strategy in the direct corpus use context, which means that students rely on the material the most. Students well-trained for using online corpora are likely to engage in "autonomous browsing" (Bernardini, 2002), leading to discovery learning. This supplants the teacher as the subsequent mediator of corpus materials and leads to student-directed learning as a "true linguistic researcher" and as an independent L2 writer. This method can be rewarding for the teacher who finds it difficult to teach highly confident students who resist correction of erroneous knowledge. Since they access concordance resources with their own effort, they may be more likely to repair their knowledge. Our observation comports to Chambers and O'Sullivan (2004), who argued that corpus consultation is "good for unlearning errors" (p.168).

Regardless of the type of corpus use, the study found that teacher's guidance and scaffolding was crucial in helping to lead learners to successful experiences in corpus analysis. In this sense, we stress that teachers must receive basic training in accessing corpora and evaluating concordancers in order to foster a DDL-friendly environment. As Sinclair (2004) noted, "a corpus is not a simple object, and it is just as easy to derive nonsensical conclusions from the evidence as insightful ones" (p.2). When training familiarizes teachers with the corpus-based environment, they can facilitate students' autonomous learning and make them become active language detectives.

In conclusion, this study provides an in-depth but preliminary understanding of EFL students' learning processes and strategies they will likely apply in two different uses of corpora. At the very least, we hope our research design will be a useful model for future inquiry into this area, and that our observations may be useful in interpreting the experiences so obtained. Corpus applications have great potential as a learning tool as well as a linguistic resource to improve learners' knowledge of language use and to enhance discovery learning. The findings from our small sample should be carried over to a study of a larger number of students to confirm its implications. In future studies, the teacher could select typical types of linguistic errors most students make after essay writing and give corpus-based feedback to the class. In this way, students can experience inductive learner-centered error correction with their own or classmates' errors. This study introduced the indirect approach and moved to the direct approach to make students familiar with the corpus approach. We suggest that future studies should alternate the approaches weekly to investigate the effects. Learning from the indirect approach might accelerate the learning in the direct approach in this study, so future studies should verify any extent, if at all, of this possible effect.

Finally, other studies may wish to emulate our design by expanding beyond Lexitutor as a concordance resource. There will be other Web-based resources which may be more easily accessed with less-advanced computing facilities in developing countries. In this way, an effective language-teaching tool can enhance the learning of those who seek it.

NOTE

1. Pseudonyms were assigned to each participant in order to protect their confidentiality.

ACKNOWLEDGEMENTS

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