

Corpus Informed Writing for Science and Engineering

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Abstract

The purpose of this study is to investigate how corpus-based exercises can help students improve their writing accuracy. Two groups of technical writing students at a Japanese university used both paper-based and computer-based corpus exercises to explore specific writing conventions and sentence fluency in science and engineering corpora. Noun phrases in pre- and post-writing samples were compared, and student feedback on the use and usefulness of corpora was collected and analyzed. The efficacy and efficiency of a corpus-based approach in engaging students and stimulating learning is discussed, and practical suggestions for using this approach in the classroom are profiled.

Keywords: Academic Writing, Concordancing, Corpus Analysis, ESP, Text Analysis

1. Introduction

The use of corpora and corpus tools are gaining ground in L2 classrooms and have been shown to be effective (Kennedy & Miceli, 2001; Hunston, 2002; Bernardini, 2004; Granath, 2009; Nishigaki et al., 2010)^{1),2),3),4),5)}. In addition, a number of concordance-informed approaches to English for Specific Purposes (ESP) essay writing have been reported. Thurstun and Candlin (1998)⁶⁾ used a concordancing program to teach academic English; Weber (2001)⁷⁾ used concordances to teach law undergraduates to write formal legal essays; Chang & Kuo (2011)⁸⁾ developed online teaching materials for writing research articles for computer science graduate students; and Chujo & Oghigian (2008)⁹⁾ used corpus-based exercises successfully for teaching basic grammar (noun and verb phrases) to beginner level engineering students. Interestingly, Flowerdew found

that science and engineering students were generally more successful and more easily engaged with using corpora than business students who had more difficulty with both the software and the concept (2001: 376)¹⁰⁾. Targeting science and engineering students, Oghigian & Chujo (2010)¹¹⁾ and Oghigian & Chujo (2011)¹²⁾ developed a series of computer- and paper-based corpus science writing exercises focused on grammar basics such as the construction of noun phrases and verb phrases and reported overall positive course evaluations from students.

The purpose of this paper is to explore the efficacy of using computer-based and paper-based corpus tasks to improve specific writing aspects such as the accurate production of noun phrases, and to report student feedback on the use of corpora and tasks. This paper describes a university-based technical writing case study in the first section, giving a description of the background of the writing course, the participants, the corpora used and specific types of tasks

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completed. The following section provides details on the analysis of noun phrases in pre- and post-writing samples and the feedback given on an end of term questionnaire. The final section provides a discussion on the effectiveness of these types of tasks, and suggests future modifications.

2 . Case Study

In this article, we report a case study to teach academic writing to undergraduate science and engineering students. Technical Writing 1 (TW1) and Technical Writing 2 (TW2) are one-semester courses open to all third and fourth year undergraduate students in science and engineering at Waseda University. These are the first writing-focused courses offered in the science and engineering English program, although students in the first year write lecture summaries as part of a note-taking course, and second year students do a written research project as part of a concept building and discussion course. Technical Writing 1 is offered only in the spring semester ; Technical Writing 2 is offered only in the fall semester. Students are not required to take TW1 before they take TW2 but this is strongly encouraged. Although these are elective courses, students need additional English credits and many register for at least one or the other.

The goal of TW1 is for students to write a general 2,000-word paper in English, using IEEE (The Institute of Electrical and Electronic Engineers, Inc., http://www.ieee.org/publications_standards/

[publications/authors/author_tools.html](http://www.ieee.org/publications/authors/author_tools.html)) cited and referenced secondary sources and following a template of title, affiliation, abstract, keywords, introduction, method, results, discussion and references. The IEEE formatting style is similar to APA style (American Psychological Association, <http://www.apastyle.org/>), and is often used in science and engineering. The goal of TW2 is for students to write a specialized (technical) 2,000-word research-based article that follows the submission guidelines of a target journal.

2.1 Technical Writing 2

This case study is based on two TW2 classes held in the fall of 2010. The classes met weekly for 90 minutes for a total of 15 weeks for one semester. The class was lecture-based, meaning that during class time students took notes or followed written material about understanding research and the purpose, structure, organization, flow and style of research papers. In addition to constructing their own papers over the course of the term by identifying a topic, scope, method and significance, and developing their ideas using an outline, they completed weekly homework tasks. The goal of the homework was for students to begin to explore technical vocabulary related to their topics, to observe these in corpora and to develop original sentences using common noun, verb and prepositional phrases that they observed.

2.2 Participants

A total of 14 students in the two classes had Test of English for International Communication (TOEIC) scores varying from 430 to 945 ; varying prior writing

Table 1 TW2 Students in Groups Showing TOEIC Scores and Departments

Groups	Student	TOEIC	Department
A	S1	945	computer science
	S2	900	photonic & electronic systems
	S3	900	applied mathematics
	S4	750	resources & environmental engineering
	S5	705	intellectual property engineering
B	S6	600	civil engineering
	S7	595	civil engineering
	S8	555	photonic & electronic systems
	S9	500	civil engineering
	S10	430	civil & environmental engineering

experience, meaning some took TW1 in the previous semester and some did not ; varying ability in writing, meaning some students were able to construct well-formed sentences and paragraphs and some were not ; and varying ability in listening and speaking, meaning some were fluent or nearly fluent and others had difficulty discussing their topics with the teacher in class in English. In order to minimize the number of variables and isolate the potential effect of the corpus tasks, only data from ten students who had taken TW1 in the previous semester were included. Students in Group A had advanced level TOEIC scores (705-945). Students in Group B had intermediate level TOEIC scores (430-600). The students, listed as S1 ~S10, their TOEIC scores and their departments are shown in **Table 1**. All students were male except for one female (S2).

2.3 Corpora and Corpus Tools

Students were taught how to use three online corpora (2.3.1, 2.3.2, and 2.3.3) on the first day of the course and were taught to use a software-based corpus tool (2.3.4) toward the end of the semester. The three corpora are all free and web-based ; the corpus tool is a free downloadable software program. These are Exemplar (<http://www.springerexemplar.com/>), The Corpus of Contemporary American English (COCA) (<http://www.americancorpus.org/>), the Professional English Research Consortium (PERC) (<http://www.corpora.jp/~perc04/>), and Antconc (<http://www.antlab.sci.waseda.ac.jp/software.html>). Students were introduced to more than one corpus because some corpora are easier to use than others, so more advanced students had additional options, and all students could chose the corpus that seemed most relevant to their fields and topics.

2.3.1 Exemplar

This is a corpus and concordance tool. The corpus is based on over five million science books and journal articles, and specific sub-corpora can be chosen by subject or publication type so that search terms appear in more appropriate contexts. The language of the concordance lines is technical. The purpose of using this tool was to look at the search term in a truncated context and identify common collocates, for example, articles or the absence of articles, and common prepositions, adjectives, and adverbs.

2.3.2 COCA

COCA is also a corpus and concordance tool and is

based on 425 million words of general American English. Although not based entirely on technical journal articles and books, this tool allows users to choose a specific register, for example, to search and show results and concordance lines from only academic sources. In addition, it is possible to do simple wildcard searches on COCA. This means that it is possible to search for specific words or specific types of words appearing before or after the search term. For example, a search term of **term** will result in a list of phrases showing one word before and one word after the term. For example, a search of **calculate** will give a list of phrases including *to calculate the*, *to calculate how*, and *to calculate a*.

2.3.3 PERC

PERC is a 17 million word corpus and concordance tool and is free to registered users. Like Exemplar, it also based on technical science and engineering documents, has high level language, and offers users the option of choosing 22 sub-corpora. For example, if searched only in a civil engineering sub-corpus, the words and phrases produced to the left and right of the keyword (KWIC : keyword in context) are more applicable and therefore more readily understandable examples for the civil engineering students. Like COCA, it is possible to do wildcard searches.

2.3.4 Antconc

The corpus tool shown to students was Antconc, which is a tool only ; users must upload their own corpora. This program was demonstrated to students in a computer room and they were given a mini corpus to upload and search.

2.4 Tasks

Seven grammar-based homework tasks were given during the first eight weeks ; in the latter half of the term, students were focused on developing drafts of their papers. Of the seven tasks, three were computer-based corpus activities and two were paper-based. Each task was given on a worksheet and these were collected, corrected and returned but were not graded. Students received specific feedback on writing errors, and the teacher was able to assess each student's strengths and areas for improvement.

2.4.1 Computer-based Corpus Tasks

The first task was to write down ten technical words and search these in a corpus to observe and record collocates. The purpose of this exercise was for students to begin to collect technical vocabulary in

Table 2 Task 1: Exploring Technical Vocabulary in a Corpus, with Sample Answers.

	technical term	collocates
1	bridge	a bridge/ the bridge suspension bridge, river bridge, stone bridge, bay bridge, railroad bridge, street bridge bridge project, bridge site, bridge builders, bridge design, bridge collapse
2	global warming	o - article international gw, human-induced gw, gw treaty, gw emissions, gw debate
3	robot robotics roboticist	humanlike robot, humanoid robot, remote-controlled robot, robotic arm
4	nanotube	carbon nanotube, single-walled n-, multi-walled -, TiO ₂ - nanotube device, nanotube system, nanotube patterns

... Global warming	is one of the most significant and ...
... specific actions might be at reducing	global warming, their willingness to undertake the ...
... and anthropogenic activities involving	global warming and climate change. ...
... of astroturf organizations in the	global warming context, wherein large corporate ...
... behavior in the context of	global warming and climate change. ...
... Global warming	has become a highly concerned issue in ...
... Biofuels At the beginning of a unit on	global warming, Dr. ...
... activities on climate change and	global warming have experienced a remarkable ...
... of current scientific knowledge about	global warming issues, we developed a mapping ...
... Translating public concern for	global warming into effective action requires ...
... literature examining public opinion on	global warming, an important science-based ...
... summer monsoon associated with a	global warming of 2°C with respect to pre-industrial ...
... on matters related to the gravity of	global warming, reported that 2005 was the warmest ...
... those who would later be labeled "	global warming skeptics" (Bryson and Murray, 1977), ...
... with climate change, including	global warming ...
... of the greenhouse effect and	global warming ...
... environment, the extent and impact of	global warming on the earth and its inhabitants, and ...

Fig. 1 A Screenshot of *global warming* as a KWIC Using the Exemplar Corpus

their fields and to understand what articles are used, and how these words commonly appear in noun (NP), verb (VP), and prepositional phrases (PP). An example of this task is shown in **Table 2**, and a screenshot of the Exemplar corpus showing *global warming* as the

KWIC is shown in **Fig. 1**. The examples reflect types of responses from students in various departments; the actual student work would show a list of related terms specific to their fields and research topics.

In the second task, students searched these same (or

additional) nouns to observe these words used in noun phrases. On a worksheet, they wrote a common or useful NP and then wrote an original sentence using that NP. They were asked for four NPs and sentences. In the third task, students were asked to search for verb phrases and write original sentences

using these VPs. Examples for the NP task are shown in **Fig. 2**; a corresponding corpus screen shot is shown in **Fig. 3**. Examples for the VP task are shown in **Fig. 4**; a corresponding corpus screen shot is shown in **Fig. 5**.

PRACTICE 1) Look at the list of technical words that you began in *Writing Task 1*. 2) Choose four words and search them in the COCA, PERC or Springer corpus. 3) Locate the most common (or one common) noun phrase using each word. 4) Write the phrase below. 5) Next, write a sentence using each phrase.

Example: *ozone [n*]* (COCA) → ozone depletion
CFCs impact the environment through ozone depletion and UV radiation.

- traffic congestion
Highways have been designed to ease traffic congestion.
- the global surface
According to an Intergovernmental Panel on Climate Change (IPCC) report, the temperature of the global surface is 1.1 to 6.4° C higher compared to that of one hundred years ago.
- silicon Schottky diodes
To make silicon Schottky diodes, the silicon and gold must be washed in an ultrasound acetone bath to remove impurities.
- a weather forecast
Mathematical models and computer simulations are being used more and more for weather forecasts.

Fig. 2 Task 2: Observing and Using NPs, with Sample Answers

The screenshot shows the COCA Corpus search interface. The search string is "traffic [n*]". The results table shows the following NP results:

Rank	NP	TOT
1	TRAFFIC CONGESTION	41
2	TRAFFIC FLOW	40
3	TRAFFIC ACCIDENTS	37
4	TRAFFIC JAMS	32
5	TRAFFIC LIGHTS	31
6	TRAFFIC SAFETY	31
7	TRAFFIC LIGHT	27
8	TRAFFIC CONTROL	26

The concordance lines section shows the following results:

Rank	Year	Genre	Source	Context
1	2010	ACAD	AnthropolQ	A B C the call of retail developers only to find that they were plagued by crime, traffic congestion , four-lane highways, and
2	2010	ACAD	ForeignPolicy	A B C way for a mass transit system in Luanda, essential to ease the capital's traffic congestion . # Finance: An important co
3	2009	ACAD	Commentary	A B C generation of conventional pollutants like smog and the productivity losses and accident costs associated with traffic co
4	2008	MAG	USAToday	A B C delight--Los Angeles have launched or are considering BRT systems. # Some cities are reducing traffic congestion and
5	2008	MAG	USAToday	A B C Mayor Bertrand Delano, when elected in 2001, faced some of Europe's worst traffic congestion and air pollution. He d
6	2008	ACAD	EnvironHealth	A B C and development have also forced Delaware County to deal with poor air quality caused by traffic congestion . New de
7	2008	ACAD	EnvironHealth	A B C ages and types of vehicles; designs, grades, and distributions of roads; traffic congestion and driving habits; and diffi
8	2008	ACAD	EnvironHealth	A B C environmental health official will focus on air quality, and the planner will focus on traffic congestion . -- Using GIS wit

Fig. 3 A Screenshot of a Search for *traffic [n*]* in the COCA Corpus, with NP Results and Concordance Lines for *traffic congestion*

PRACTICE 1 Search *clearly* [v*] in the COCA corpus and write four sentences using four different VPs.

1. The parameters are clearly defined in Table 1.
2. This result clearly shows that the ratio depends on the length of time necessary to cool the tablet.
3. It was clearly demonstrated that the length of time needed to cool the tablet is essential.
4. The data clearly indicate that both Tablet 1 and Tablet 2 are superconductors and not insulators.

PRACTICE 2 Think of four AWL verbs that you might use in your paper. Check these in the COCA corpus to see examples of how these are written. Write sentences using these VPs.

Example: *calculate/ were calculated using/ The results were calculated using Equation 1.*

1. measure/ The magnetization of the samples was measured using a magnetometer at room temperature.
2. consist/ The diode consists of a semiconductor and a metal.
3. show/ The values for X_p , X_d and X_w are shown in Table 1.
4. define/ The value on the equilibrium curve is defined by X^* .

Fig. 4 Task 3: Observing and Using VPs, with Sample Answers

The screenshot shows the 'CORPUS OF CONTEMPORARY AMERICAN ENGLISH' search interface. The search string is 'clearly [v*]'. The results table lists various verb phrases and their frequencies:

CONTEXT	TOT
1 CLEARLY DEFINED	378
2 CLEARLY STATED	134
3 CLEARLY SHOWS	123
4 CLEARLY DEMONSTRATED	109
5 CLEARLY UNDERSTOOD	107
6 CLEARLY IDENTIFIED	106
7 CLEARLY INDICATE	106

Below the table, there is a 'KEYWORD IN CONTEXT DISPLAY' section showing concordance lines for the top result, 'clearly defined', with example sentences from the corpus.

Fig. 5 A Screenshot of *clearly* [v*] in the COCA Corpus Showing a List of VPs and Concordance Lines for *clearly defined*

2.4.2 Paper-based Corpus Tasks

There were two paper-based tasks. In the first, students studied a list of 30 research paper titles. They were first asked to identify three hanging style titles, and to circle or highlight three NP+PP style titles, and three VP+PP style titles. Next, they were asked to create titles for two short research descriptions. Finally, they were asked to write three titles for their

own papers, using each style (hanging, NP+PP, VP+PP). A worksheet showing sample answers is given in Fig. 6, and the worksheet showing the titles is shown in Fig. 7.

In the second paper-based task, students looked at two sets of printed concordance lines from the COCA corpus. The first showed results for *the purpose of this* and the second showed results for *in this paper*. For

PRACTICE 1

Look at the attached list of titles for TW papers written by science and engineering students.

1. Identify three that use a hanging style. Circle or highlight them on your list of titles.
2. Identify the noun phrases and prepositional phrases in at least five titles. Underline or highlight these in a different colour.
3. Identify at least five verb phrases. Place a box around these or highlight in another colour.

PRACTICE 2

Read each short description and write a title for each.

The purpose of this study was to identify a chemical that has a lower boiling point than water which can be used in the safe extraction of geothermal heat at relatively short depths of two kilometers below the earth's surface.

Chemical-Based Safe Extraction for Geothermal Heat in Shallow Depths

The purpose of this study was to identify the electromagnetic chemical processes in DNA.

Identifying the Electromagnetic Chemical Processes in DNA

PRACTICE 3

Write at least three possible titles for your research paper. Use each style (hanging, NP+PP, VP + PP).

- A. Global Warming: An Investigation of Chemical Causes
- B. An Investigation of the Chemical Causes of Global Warming
- C. Investigating Chemical Causes of Global Warming and Implications for the Ecosystem

Fig. 6 Task 4: Observing NPs, VPs, and PPs in Titles, with Sample Answers

TW1 2010 Student Research Paper Titles

1. An Investigation of Cell Phones: Functions, Distribution in Japan and Influences on Society
2. How Greenhouse Gases Impact our Planet: An Investigation of Greenhouse Gas Effects
3. An Investigation of City Livability
4. **An Investigation of the Benefits and Limitations of Computer-Assisted Drug Design** Compared with Traditional Methods
5. **Causes and Preventions of Lifestyle-Related Diseases**
6. **An Investigation of the Workings of the Earthquake Early Warning System in Japan and Implications for Engineering**
7. *Investigating the Ethical Issues of Artificial Intelligence: The Relationship with Mankind*
8. **Burj Khalifa: An Investigation of the Structure of the World's Tallest Building**
9. **An Investigation of the New Application of Nanotubes to Agriculture and Implications for Energy Production**
10. *Learning Strategic Thinking through Game Theory*
11. *Is Electromagnetic Radiation Dangerous? Investigating the Potential Risks*
12. *Investigating Alternative Sources of Energy Using Internet Website Resources and Implications for the Future*
13. *The High Potential of Electric and Plug-in Hybrid Vehicles with Traction Control*

Fig. 7 Task 4, List of Titles with Sample Answers (Hanging Style Titles Underlined; NPs+PPs in Bold; VPs in Italics)

the first set of concordance lines, students were asked to observe what noun or noun phrase followed the determiner *this* and to write several examples found on the list. For example, these included *this article, this forum, this study, this essay, this paper, and this research*. Second, they were asked to observe the verb phrases which followed the noun or noun phrase noted earlier. Examples included *to briefly describe, to provide, to examine, to determine, to show, and to analyze*. Looking at the second list of printed

concordance lines, they observed the subjects and verbs that followed *in this paper*. These included: *In this paper, I discuss ...; In this paper, we argue that ...; and In this paper, we report on ...*. Finally, students were asked to write two statements of intent for their papers, one using *in this paper* and one using *the purpose of this*. Portions of the task worksheet are shown in **Fig. 8**, and excerpts from one of the two paper-based concordance lines are shown in **Fig. 9**.

1. Write a statement of intent for your research paper using *The purpose of this study/research/paper*. (You can choose any noun from these choices.)

The purpose of this study is to identify the immediate and contributing structural engineering causes for the collapse of the I-3SW Mississippi River Bridge.

RESULTS OF CONTEMPORARY AMERICAN ENGLISH KAT-O

WORD: THE PURPOSE OF THIS STUDY

COMPARE RESULTS: COCA COHA TIME BNC

History | Lists | Profile | Log

KEYWORD IN CONTEXT DISPLAY

Help / Information / Contact

CONTEXT	WORD	FREQUENCY
ACAD_SchoolCounsel	to high school (Newman et al.; Reyes et al.). The purpose of this article is to review the literature related to the process of transitioning from	1
ACAD_InstrPsych	issues and discussions related to these topics abounded during the 1970s and 1980s. The purpose of this article is to briefly 1) describe the current revival of interest in	1
ACAD_InstrPsych	! But this time, with several new twists which will be explained. The purpose of this article is to provide a brief history of dyslexia, scripted reading instruction	1
ACAD_InstrPsych	the perceived panacea for all reading ailments in the early 21st century. # The purpose of this article is to briefly 1) describe the current revival of interest in	1
ACAD_ReoperReview	tool to connect the instructional efficacy of teachers to student learning outcomes. # The purpose of this article is to share validation data on a new scale -- to judge	1
ACAD_PSAJournal	A Discussion Community for PSA Members # Welcome to the EID On-line Forum. The purpose of this forum is to act as a conduit for all PSA members in the	1
ACAD_PhysicalEduc	review that specifically outline the critical elements of climbing movement. # Therefore, the purpose of this study was to examine the effects of verbal performance cues on the perfor	1
ACAD_PhysicalEduc	for female students has gained a considerable amount of attention in recent years. The purpose of this study was to compare high school aged females and males opportunities to parti	1
ACAD_PhysicalEduc	and interact with teachers in physical education settings, further investigation is needed. The purpose of this study was to examine high school students' opportunities to participate and	1
ACAD_PhysicalEduc	part so it looks good for the team. * Discussion and Implications # The purpose of this study was to determine the implications on students' learning and motivation of	1
ACAD_PhysicalEduc	20450 The purpose of this study was to examine whether the number of individuals pictured on the covers	1
ACAD_PhysicalEduc	it appeared that the media continued to favor European American males. Purpose # The purpose of this study was to examine whether the number of individuals pictured on the covers	1
ACAD_PhysicalEduc	then information is warranted on what PETE programs are currently doing regarding dispositions. The purpose of this study was for Physical Education Teacher Education (PETE) faculty	1
ACAD_PhysicalEduc	of these dispositions are critical to being successful in the teaching profession. # The purpose of this study was to determine which dispositions Physical Education Teacher Education (PE	1
ACAD_StudiesNovel	novel, given that both are concerned with the control of the poor. The purpose of this essay is to show how the novel is poised between a nation in	1
ACAD_HealthSocialW	and stigma (Maunder et al.). PURPOSE AND RESEARCH QUESTIONS # The purpose of this study was to elucidate social workers' experience during the SARS outbreak.	1
ACAD_CritNursing	In these cases, prompt and aggressive treatment is critically important. Therefore, the purpose of this article is to review the pathophysiology of acute iron poisoning in children and	1
ACAD_ChurchHistory	fourth and early fifth centuries Christians laid claim to the land of Palestine. The purpose of this paper is to analyze the investment of the land of Palestine and its	1
ACAD_Surgery	either from aortic saddle embolism or from thrombosis of an atherosclerotic abdominal aorta. The purpose of this study is to report the management of acute aortic occlusions and to ai	1
ACAD_Pathology	meningiomas and in other dural-based spindle cell tumors has not been elucidated fully. The purpose of this study was to determine whether immunohistochemical staining for claudin-1	1
ACAD_Pathology	junction-associated protein that recently has been shown to be expressed in anaplastic meningiomas. 2 The purpose of this study was to compare claudin-1 staining with other markers	1
ACAD_Cardiology	greatest effect on reducing mevalonate and CoQ10 among the reductase inhibitors. # Therefore the purpose of this study was to determine the effect of 2 different HMG-CoA reductase	1
ACAD_AsthmaAllergy	many of the results of these studies were based on subjective measures. # The purpose of this study was to determine what practicing allergists do when treating dog allergic patients.	1
ACAD_ThirdWorldMed	ensured, and that every finding would be treated with utmost confidentiality and for the purpose of this research only. All work was performed according to the international guidelines I	1
ACAD_SchoolCounsel	comprehensive school counseling programs and for school counselor education and development. Therefore, the purpose of this study is to survey principals who are known to be supp	1
ACAD_SchoolCounsel	. The Instrument: Structured Interview Questions # The structured interview questions developed for the purpose of this study resulted from a thorough review of the literature exami	1
ACAD_SchoolCounsel	collaborative discussion among all readers. 100% inter-rater agreement was achieved. RESULTS # The purpose of this study was to examine the critical incidents that positively affecte	1
ACAD_FamiliesSystem	. p = .031) made significant contributions to PIP difficulty. DISCUSSION # The purpose of this study was to explore developmental aspects of disease-related parenting stress for caregi	1

Fig. 8 Task 5: Examples of Statements of Intent

2. Write a statement of intent for your research paper using *in this paper*.

In this paper, we identify and report on the immediate and contributing structural engineering causes for the collapse of the I-3SW Mississippi River Bridge.

RESULTS OF CONTEMPORARY AMERICAN ENGLISH KAT-O

WORD: IN THIS PAPER

COMPARE RESULTS: COCA COHA TIME BNC

History | Lists | Profile | Log

WORD IN CONTEXT DISPLAY

Help / Information / Contact

CONTEXT	WORD	FREQUENCY
DrugIssues	none have provided guidance specific to longitudinal substance abuse research. Our purpose in this paper is to summarize challenges unique to attaining the IRB approval necessary to conduct i	1
DrugIssues	: CONCLUSION Variability exists across IRBs and time, and the information presented in this paper was collected from a limited set of researchers at one university who discussed experiences r	1
DrugIssues	issues relevant to the medical field and related disciplines that are not covered in this paper . However, the researchers who contributed to this paper are affiliated with a large	1
DrugIssues	able to do with patients... # L: DISCUSSION Our interest, in this paper , is to describe perspectives on the place of adoption within the CTN, using	1
TheologStud	Hexameron (where the fourfold division bears a different meaning), later in this paper . For an account of Bonaventure's doctrine of wisdom in precisely these three categories	1
InstrPsych	education system can help international students successfully adjust by implementing the recommendations presented in this paper . #	1
ReoperReview	provided to parents, teachers, and psychologists by the multiple perspectives considered in this paper . There is no single adequate definition, and there are no procedures, or	1
AnthropolQ	legacies of weapons production increased and remained secret throughout the Cold War. In this paper , I discuss the cultural and environmental legacy of Oak Ridge and then draw on	1
AnthropolQ	for their comments and suggestions, and the generous time of those cited in this paper and countless residents and former workers of the Oak Ridge facilities for their kind and	1
AnthropolQ	, and all other informants other than those speaking publicly who are quoted in this paper , are pseudonyms. # (n4) This statement, for which I've	1
FocusGeog	Iran vs. Persia: Literature Review # Most of the references used in this paper are popular, general, and recent, often with interesting titles. Available literature	1
AmerIndianQ	applied humanities and the wisdom of American Indian cultures, at various points in this paper I will develop specific suggestions that can be used to assist the new corps of	1
AmerIndianQ	# The borders of each of these constructions, which we will explore in this paper employing discourse analysis, remained porous, frequently overlapping throughout 1974. However, local	1
AmerIndianQ	First Nations gear and technology in any meaningful sense. (n7) # In this paper we argue that a reintroduction of ecologically appropriate traditional fishing gear is one path toward	1
InstrPsych	them a behavioral repertoire filled with the " Wrong Stuff " instead. In this paper the components of each will be explained, and some ideas will be offered that	1
InstrPsych	that is the intent here. " Critical thinking, " as used in this paper , refers to a set of basic and generic reasoning skills. These skills include	1
ThoracicCardio	can be reserved for unstable patients or those with specific indications. # In this paper we report an unusual penetrating neck trauma in zone III with a penetrating device and	1
ThoracicCardio	the neck is a difficult problem in the emergency department I. # In this paper a 10 year old girl is presented with penetrating neck trauma of Zone III,	1
EnvironHealth	lead to a successful project and satisfied citizens. The cooperative project described in this paper , was conducted in the town of Simpson, North Carolina, and was designed	1
EnvironHealth	on the analysis of data, such as the mosquito surveillance data reported in this paper , they can give more rational and predictable outcomes to community changes. In addition	1
EnvironHealth	side effect of a small wetland construction project such as the one discussed in this paper . # As seen in the data on mosquito species and abundance, the composition	1
EnvironHealth	experiments were also conducted, but the results are not discussed or reported in this paper . The cost of switching to beebased floor strippers was assessed and compared with	1
EnvironHealth	under the TUR planning strategy. Materials and Methods # The investigation reported in this paper is part of a larger study, that was conducted at the Surface Solutions Laboratory	1
EnvironHealth	select products for technical-performance tests, the results of which are not reported in this paper . Products that had previously performed well technically were selected and assigned points for	1
EnvironHealth	authors are not directly or indirectly associated with any product or company named in this paper . Mention of a product or company by name is not an endorsement. The	1
Intelligence	not adequately understood people's own culturally determined indicators of resilience. # In this paper we report on the qualitative findings of a 14-site, 11-country study of resilience among	1
AnthropolQ	and relatedness. In order to avoid some of the pitfalls of abstraction in this paper , I found my consultations in some rather particular ethnonyms of kinship. I look	1

Fig. 9 Task 6: Printed Concordance Lines Showing *in this paper* Given as a Paper-based Task

2.5 Data Collection

There were two goals for this study. The first was to isolate one writing aspect (NPs) and measure the effectiveness of the corpus tasks through an analysis of the total number of NPs used versus the number

used correctly in pre- and post- writing samples. The second was to obtain feedback from students on their perceptions of the usefulness of the corpora and the corpus tasks.

3 . Results and Discussion

3.1 Analysis of NPs

All participants submitted their TW1 final papers at the beginning of the course to be used as pre-writing samples. At the end of the course, their final TW2 papers were used as post-writing samples. The titles, introduction sections and statements of intent in student drafts generally received a lot of teacher feedback and correction, so these were not included as writing samples for the analysis. Not all students included abstracts so these were discounted as well. In order to use comparable samples, the analysis focused on the Method section (usually one or two paragraphs in total) and the first paragraph only of the Results section. Some targeted journals require that the Results and Discussion sections be combined, so by limiting the sample to the first paragraph, only “results” type of information is given.

The operational definition of a noun phrase was taken from the *Longman Grammar of Spoken and Written English* as “a noun as a head, either alone or accompanied by determiners and modifiers” (Biber et al., 1999)¹³. In the analysis, first all noun phrases in the method and results paragraphs were identified with highlighting. Next, a check mark was placed above

each correctly written NP, or a bracket was placed around each incorrectly written NP. An NP was counted as incorrect if the article, preposition, adjective, conjunction, plural/singular form, capitalization and/or spelling were incorrect, or if the noun given was the wrong form or wrong word. Each NP was counted as correct or incorrect only once regardless of the number of errors it contained. In addition, each noun phrase is counted separately, for example two prepositional phrases such as [*for the length*] [*of time*], and nouns joined by a conjunction would be counted separately, for example, [*Fig. 1*] [*and Fig. 2*]. **Table 3** shows patterns of NPs and correct and incorrect examples.

3.2 NP Analysis Results and Discussion

Table 4 shows the data for the pre- and post-writing samples for Group A. The numbers in the “Pre-” and “Post-” columns are the number of correctly written NPs in the sample divided by the total number of NPs, and this is expressed as a percentage in final column. From this table, first we can see that the overall percentages for the correct use of NPs for the advanced students is generally quite high; nearly all students are writing NPs with at least 90% accuracy; and the average number of NPs students used increased slightly. Three of five students showed modest gains. Interestingly, the two

Table 3 Noun Phrase Patterns with Incorrect and Correct Examples

	NP Pattern	Incorrect Example	Correct Example
1	[art+adj+n]	[<u>a</u> central <u>ideas</u>]	[the central idea]
2	[prep+art+n]	[<u>in</u> the slope]	[on the slope]
3	[prep+n] [prep+n]	[<i>in</i> the end] [<i>of</i> the year]	[at the end] [<i>of</i> the year]
4	[n] [conj+n]	[Table 1] [<i>and</i> <u>table</u> 2]	[Table 1] [<i>and</i> Table 2]
5	wrong word (ww)	[these problems]...[<u>it</u>]	[these problems]...[they]
6	word form (wf)	[the <u>necessarily</u>]	[the necessity]

Table 4 Results for NP Analyses of Pre- and Post-Writing Samples from Group A

	Pre-Writing Sample			Post-Writing Sample			Gains
	correct NPs	total NPs	%Correct	correct NPs	total NPs	%Correct	
S1	76	79	96%	57	61	93%	-3%
S2	87	91	96%	87	92	95%	-1%
S3	90	97	93%	79	84	94%	+1%
S4	124	130	95%	91	95	96%	+1%
S5	135	156	87%	80	90	89%	+2%
Average	102	111	92.6%	79	84	93.4%	0%

Table 5 Results for NP Analyses of Pre- and Post-Writing Samples from Group B

	Pre-Writing Sample			Post-Writing Sample			Gains
	correct NPs	total NPs	%Correct	correct NPs	total NPs	%Correct	
S6	55	86	64%	46	67	69%	+5%
S7	31	58	53%	47	60	78%	+25%
S8	22	32	69%	112	152	74%	+5%
S9	61	81	75%	56	70	80%	+5%
S10	52	62	84%	103	122	84%	0
Average	44	64	69.0%	73	94	77.0%	+8%

top students in the class (S1 and S2) both made more errors in the TW2 paper than in their TW1 papers. A closer examination of the errors revealed that S1 (TOEIC 945) failed to capitalize the word *Internet* twice, had one wrong word (*a great number of information* instead of *a great deal of information*) and made an article error in a fourth NP (*a journal articles*) which is likely to be a careless mistake. Although the paper written by S2 (TOEIC 900) was also a high level paper, she made two errors in a prepositional phrases (*the data of the number of patients* instead of *the data for the number of patients*, and *by the keywords* instead of *using the keywords*), she capitalized *semiconductor* twice unnecessarily, and omitted an article (*The part of the brain damaged by Alzheimer's disease and semiconductor memory both function as a memory so there is [a] possibility that ...*). In both cases, the subtlety of the language choice reflects the difficulty that more advanced level writing students (and L1 students) face, which is often conciseness, avoiding redundancy, and word choice, particularly with easily confused words and cultural-based concepts.

With regard to Group B, three of the five intermediate level students showed reasonable gains, with S7 showing a dramatic gain of 25%, and S10 showing no gains or losses (**Table 5**). In contrast to the way that advanced level students have more difficulty showing improvement in higher level subtle language use, intermediate level students can more easily improve writing by correcting articles, prepositions, spelling, and capitalization. Overall, the student gains suggest that the corpus-based activities may be useful.

3.3 Questionnaire

A one-page questionnaire in English was given to the seven participants in Groups A and B who

attended the final class of the semester. The questionnaire contained 18 Likert-scale questions and three open questions. The questions asked students for general feedback about the course, their perceptions of improvement in their writing ability, if they thought the computer-based tasks and paper-based tasks were useful, and their perceptions of the corpora. Given the small number of participants who completed the questionnaire, using percentages to represent totals may be misleading; therefore responses are given in actual numbers, and these are shown in **Table 6** and **Table 7**. Table 6 shows the results related to the students' feedback to the grammar tasks using corpora. In Table 7, the students' feedback on using particular corpora and their impression of using corpora in general are shown.

Student perceptions of the computer-based corpus tasks in questions 1-3 were nearly evenly divided between "yes/mostly" and "so-so." This result is somewhat surprising and the rather lukewarm reaction may be that the computer-based exercises required much more time to complete, and that students had to directly interface with both computers and software. This speculation is supported by students' more positive responses to the paper-based corpus tasks (questions 4 and 5) in which all students responded with "yes" or "mostly."

Many students seemed to like the COCA corpus more than Antconc (questions 1 and 2); this may be because Antconc requires that the corpus be uploaded, and the mini sample corpora given to them during the demonstration lesson was not pertinent to most students' topics. Finally, as indicated by responses to questions 3 and 4, the fact that most students reported they would or might explore other language issues they were curious about is hopeful, as is the idea that

Table 6 Questionnaire Responses from Students Regarding Corpus-Based Grammar Tasks

Questionnaire Items	Questionnaire Responses				
	yes	mostly	so-so	not really	no
1. Searching for technical words in my field on the COCA website was useful. (Grammar Task 1)	2	2	3	0	0
2. Searching a corpus for NPs using technical words in my field and writing practice sentences was useful. (Grammar Task 2)	2	3	2	0	0
3. Searching a corpus for VPs using technical words in my field and writing practice sentences was useful. (Grammar Task 3)	2	3	2	0	0
4. Looking at a list of titles helped me to write my title. (Grammar Task 6)	2	5	0	0	0
5. Looking at a list of statements of intent helped me to write my statement of intent. (Grammar Task 7)	3	4	0	0	0

Table 7 Questionnaire Responses from Students Regarding Using Corpora

Questionnaire Items	Questionnaire Responses				
	yes	mostly	so-so	not really	no
1. Learning how to use the COCA corpus was useful.	4	2	1	0	0
2. Learning how to use Antconc was useful.	0	4	2	1	0
3. I used a corpus to look for additional writing aspects I was curious about.	2	1	4	0	0
4. I might use a corpus in the future to improve my writing.	2	3	2	0	0

students would use corpora again in the future for improving their writing.

Students' written comments about the corpora and corpus tasks were generally favourable. Two advanced level students commented that it was useful; four remarked that the corpora and tasks were the most difficult part of the course. Another advanced level student suggested that all classes be held in a computer room, but this is not recommended because of the difficulty in engaging all students' attention to the lecture and away from the computer screens when these are not being used.

4 . Conclusion

Because of the small number of participants and great number of variables involved, such as variations in writing, and speaking, listening ability, no broad conclusions are drawn about the use of corpora in writing for science and engineering; however, the modest gains made by most students and their generally favourable feedback suggest that the use of corpora in this context was successful. The more positive response to paper-based corpus tasks

compared to the computer-based corpus tasks is echoed in O’Keeffe and Farr (2003: 411)¹⁴⁾ who suggest that presenting students with paper-based tasks first so that they can focus on the task instead of the computer and software has been more successful. Further modifications will be made for the 2011 TW2, including refining instructions to students, using paper-based tasks for the initial corpus tasks before introducing computer-based tasks, using a computer classroom for students to learn how to use the COCA, PERC and Exemplar corpora rather than demonstrating these, teaching students how to use Antconc earlier in the term so that more advanced level students can create their own corpora, and obtaining immediate feedback from students for each task in the form of one additional question at the end of each task worksheet. Future studies may also include analyses of the use of other language forms such as verb phrases, hedging and transitions.

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コーパスを活用した理工系英語のライティング

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概 要

本研究はコーパスを活用した理工系英語のライティングの指導に関する実証的研究である。指導前と指導後に書いた作文を比較し，その指導効果について考察を行った。被験者は理工系の大学3，4年生10名であり，週1回90分の英作文授業を15週間実施した。教材として，コンピュータ上でコーパスの検索結果を確認しながら発見学習を進めるタスク (computer-based corpus exercises) と，検索結果を紙に印刷したものを観察しながら発見学習を進めるタスク (paper-based corpus exercises) の2種類を用いた。指導前と指導後の作文を，名詞句の使用に焦点を当てて分析するとともに，コーパスの使用に関する学習者のフィードバックを収集した。コーパスを活用した指導法の効果に関する検討がなされ，今後のコーパスの教育利用に関する具体的な提言がなされた。

キーワード：アカデミック・ライティング，コンコーダンシング，コーパス分析，特定目的のための英語，テキスト分析