ENHANCING LEXICOGRAMMATICAL PERFORMANCE
THROUGH CORPUS-BASED MEDIATION IN L2 ACADEMIC WRITING INSTRUCTION

A Dissertation in
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by
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This thesis documents a project intended to improve the lexicogrammatical performance of L2 writers in genre-based academic writing. Lexicogrammatical performance refers to the extent to which writers make appropriate choices of vocabulary and syntax in accordance with the expectations of discourse communities. Improving their performance in this regard presents a major challenge to L2 writers. In working to improve lexicogrammatical performance, genre-based pedagogy has focused either on raising awareness through explicit instruction or on enhancing performance through situated learning. These methods, however, have been only modestly successful. This thesis explores an alternative approach—one that uses corpus technology to enhance awareness and performance simultaneously. The research develops a corpus-based system consisting of a genre- and discipline-specific corpus and a companion search engine, the effects of which are evaluated in relation to the lexicogrammatical performance of students in an undergraduate ESL composition course for the duration of one semester. Through working with this system, L2 writers meet their lexicogrammatical challenges in an effective and efficient way. Their interaction with the corpus (Learner-Corpus Interaction, LCI) is a multi-layered process comprising four structural units: consultation, transaction, exchange, and move. Through these units, students engage in intense hypotheses testing to eventually appropriate the target lexicogrammatical items from the corpus. Thus, the primary characteristic of LCI is the dialogic negotiation and collaborative construction of knowledge. The way LCI facilitates the students’ development is strikingly similar to the ways in which an experienced tutor helps a student to advance through the Zone of Proximal Development. The findings
suggest that the writer’s composing process is fundamentally a developmental process and that corpus-based research should focus on maximizing the writer’s developmental potential through collaborative construction of text. LCI raises the exciting possibility that many issues in writing pedagogy (e.g., plagiarism) can be addressed by facilitating micro-scale development through highly focused and situated interaction with a corpus.

To maximize the benefits for students, the thesis suggests that a corpus system should be incorporated into, and coordinated with, the teacher’s instruction and guidance. In identifying guidelines for such coordination and theoretical principles for artifact-mediated writing in this digital era, the thesis offers this conclusion: it posits distributed cognition theory as a conceptual framework for coordinating computational mediation with genre-based writing instruction in contemporary writing contexts—contexts that are increasingly mediated, distributed, and collaborative.
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CHAPTER 1

INTRODUCTION

The goal of this project is to enhance L2 writers’ lexicogrammatical performance in genre-based academic writing. Lexicogrammatical performance refers to the extent to which a writer makes socially appropriate choices of vocabulary and syntax in accordance with the conventional expectations of discourse communities. To be proficient in this area is to have advanced far beyond the mere production of formally accurate sentences toward an awareness of and ability to cope with the socio-cultural practices of discourse communities. As such, developing lexicogrammatical performance presents a major challenge to L2 writers.

Genre-based pedagogy has been only modestly successful in meeting this challenge. While it has been effective in delivering lexicogrammatical knowledge (e.g., through genre exemplar analysis), it has not been as effective in helping writers to use that knowledge in their own performance. This limitation has relegated writing teachers to the obscure and untenable position of giving generic instruction on the principles of lexicogrammar and hoping that students will be able to independently take the vital next step of using those principles in their writing. This thesis offers an alternative. Its goal: to explore ways in which teachers can facilitate explicit learning and development at the same time as L2 writers are engaging in independent writing work. Its means: the use of corpus technology.
1.1. Lexicogrammar in genre pedagogy

A socio-semiotic system that interfaces meaning and expressions (Halliday, 1978), lexicogrammar realizes meaning (semantics) through using basic building blocks (lexicon) and the rules for sequencing them (syntax). Lexicogrammar, thus, has two aspects: one representing the structural sequences (syntagm), the other, the lexical realizations of those sequences (paradigm). By making choices about the sequencing order of lexical items along the syntagmatic and paradigmatic axes, writers realize meaning potential in concrete linguistic form. In lexicogrammar, these axes are systematically and functionally correlated with a potential range of meaning.

Lexicogrammatical performance, then, refers to an ability to make choices among myriads of potential intersections between the syntagmatic and paradigmatic axes.

Lexicogrammatical choice is directed by the social expectations of discourse communities. In conforming to these expectations, lexicogrammar encodes social contexts into texts by correlating contextual variables (e.g., authorial intention and target audience) with certain sets of words and grammatical choices. The correlations are formulated historically through recurrent practices. When the correlation sets are typified by recurrent patterns, members of the discourse community come to recognize them as genres. Genre, thus, represents the functional relationship between lexico-syntax, and discourse semantics, i.e., collective meaning-making activities (Martin, 1992). Through this conventionalized correlation, genres offer members of a discourse community a means through which to efficiently achieve their functional purposes (e.g., writing invitation letters, job applications, or research proposals).
Experienced members of a discourse community (e.g., established writers) are explicitly aware of the conventions inhering in the genres they use. Given this awareness, such expert members are capable of making lexicogrammatical choices consistent with the expectations of the community, and they are, therefore, able to achieve their functional purposes. In academic writing, while lexicogrammar serves as a linguistic resource for these advanced writers, it presents a daunting challenge to novice writers, who are new to the discourse. Unlike simpler, non-academic genres (e.g., greetings, invitations, complaint letters, etc.), some academic genres reflect great variability in their triangular interplay of the author’s intentions, the discourse community’s expectations, and the lexicogrammar. Teaching the lexicogrammar of academic writing, thus, is not so much about simply knowing lexicogrammatical conventions as it is about using them appropriately and resiliently in accordance with the particular genre. Genre pedagogy, therefore, has to cope with two kinds of challenges: enhancing students’ knowledge of the correlation between social contexts and lexicogrammatical patterns (genre awareness) and enhancing their capability to adjust their knowledge to varying rhetorical situations and produce a text accordingly (genre performance).

1.2. Genre-based writing pedagogy: Explicit instruction and situated learning

Genre is defined as socially recognized ways of using language (Hyland, 2007). Flowerdew (2002) identified two broad perspectives on genre: linguistic or non-linguistic. In the linguistic camp are the English for Specific Purposes (ESP) and Systemic
Functional Linguistics (SFL) perspectives, with New Rhetoric (NR) as the non-linguistic perspective. The linguistic perspectives emphasize the formal regularity of text, i.e., its lexicogrammar and rhetorical structure; the non-linguistic perspective defines genre as social action and focuses on the contexts and functions of genres within discourse communities.

Differing conceptualizations of genre are reflected in divergent approaches to teaching genre: ESP and SFL focus on explicit instruction, while NR emphasizes contextualized activities to facilitate situated learning. In the linguistic perspectives, the instructional goal is to render a genre’s linguistic features explicit, i.e., by converting the genre’s features into declarative knowledge. Two primary methods for this are broadly described as exemplar analysis and simulation. Exemplar analysis aims to raise students’ genre awareness by focusing on representative examples of academic genres so that they learn to identify the key characteristics (e.g., nominal style). In this approach, the teacher’s primary job is to explicitly demonstrate the dynamic relationship between these characteristics and the contexts (Swales, 1990; Ventola, 1984). Simulation differs from exemplar analysis, as its focus is transferring genre awareness to writing. Its method is to have students enact target writing situations through activities such as mock conferences and debates (Halleck, 1990; Kamimura & Tjie, 2002; Saliés, 2002).

In contrast, according to the non-linguistic perspective, genre cannot be explicitly taught but only acquired through longitudinal immersion (Freedman, 1993). Thus, the appropriate way to teach genre is not by close examination of its formal characteristics, but by introducing writers to genres through having them participate in discourse
communities. Specifically, the primary means of acquiring genre knowledge is cognitive
apprenticeship, in which expert members share their knowledge of the target discourse
with novice members (Lave & Wenger, 1991). In classroom settings, the non-linguistic
perspective, therefore, primarily aims to facilitate situated learning through ethnographic
activities. For example, the teachers can ask students to explore various writing contexts
of academic activities such as labs and conferences, and to research the relationship
between these contexts and the genres used by the participants of the activities, which
may include lab reports and conference proposals. The teachers can even go further in
adding a sense of reality to students’ writing experiences by having them interview
faculty members, visit relevant sites, and describe the contexts and characteristics of a
given genre.

Despite some anecdotal successes in both the linguistic and non-linguistic
approaches, the effectiveness of their methods has not been empirically substantiated. In
fact, several studies have found that students continue to struggle with lexicogrammar
despite having received explicit instruction in this area (Hansen, 2000; Parks, 2000) and
despite experience participating in relevant specific contexts such as academic contexts
(Schleppegrell, 2004; Swales, 1996). Thus, practitioners of genre pedagogy would do
well to recognize that whereas explicit instruction, focusing on genre awareness, is not
necessarily effective in transferring genre awareness to performance in situated contexts,
implicit situated learning, focusing on genre performance, without explicit teaching may
not be effective in teaching the key linguistic features of genres.
This thesis suggests an alternative: specifically, that we create a method that enhances students’ performance as well as their awareness simultaneously through corpus technology. This new approach aims to enhance students’ performance not only in the classroom but also outside the classroom; and not only during explicit instruction or contextualized activities, but also at the time of students’ independent writing. Drawing on corpus linguistics, the thesis develops a corpus-based system that consists of a genre- and discipline-specific corpus and a companion search engine designed to mediate between abstract genre knowledge and textual realizations.

1.3. Corpus-based approach to writing pedagogy

A corpus refers to a computerized linguistic database with text-processing capability. In our discussion, it is useful to distinguish between the database and the text-processing capability: the database is an electronic collection of texts that constitute the physical contents of a corpus; the text-processing capability is the computational technique to automatically recognize textual forms and patterns. This definition is somewhat narrow, as opposed to the broad definition in which a corpus is simply a (large) collection of texts. In this thesis, two kinds of processing tools are discussed: concordance software and search engines. Two kinds of concordance software (also known as concordancers) have been used in language pedagogy: desktop concordancers installed on the users’ PCs, which store text data that the user can search, and online concordancers accessed via the Internet, which are used for the same purpose. Databases
are described in terms of content and format. Content refers to categorized texts that constitute the database (e.g., research articles and classroom lecture transcripts), while format refers to the encoding convention of the texts (e.g., ASCII plain-text and Unicode). This thesis includes document formats that allow for computational text-processing such as ASCII/UTF-8 plain-text, HTML, and XML, while excluding the formats that do not, such as MS-word, Excel, and any printed materials.

The value of a corpus depends on the quality of the database and of the text-processing capability. The database quality is determined by the number and representativeness of the texts as samples of academic written genres, and the text-processing quality can be evaluated by a set of criteria, including the relevance of the exemplar texts that the processing tools retrieve, the speed with which the texts are retrieved, and the extent to which the tool promotes interactivity with its users (Carroll, 2003).

Concordancer-based studies have yet examined the role of corpus technology in the area of lexicogrammar. As for search engines, there has yet to be an empirical study that investigates their impact on improving lexicogrammatical performance. At the time of writing, there exists one study of some relevance, which suggested that Google might have some potential as an aid to language learning (Chinnery, 2008). Broadly conceived, search engines have competitive advantages over concordance software, as the former offer fast text retrieval, quasi-ubiquitous access, and stable service. These advantages provide a rationale for choosing search engine as a primary corpus search technique in
this thesis. It is an empirical question, however, as to whether these qualities would contribute to lexicogrammatical performance.

1.4. Problem statement

An overarching challenge that this thesis aims to address is the difficulty of enhancing L2 writers’ lexicogrammatical performance. This thesis divides this overarching issue into three challenges in writing pedagogy and research: developing a corpus-based system to provide explicit and situated help, collecting research data on corpus-assisted composing processes, and interpreting the research data.

The obvious problem in the corpus studies is the lack of an effective corpus-based system. In developing such a system, this project employed a custom search engine (Google CSE) rather than concordancer programs. The choice of the search engine is not in accordance with the research literature, which generally recommends concordance software. There are strong theoretical as well as practical rationales for choosing a search engine over both desktop and online concordancer programs: First, based on a tenet of genre pedagogy, writers need to access representative exemplars of the target academic genres. This rules out online concordance services, as they do not allow users to modify the database or point the concordancer to a new database (but see Lu, 2009). Second, contemporary genre theory observes that genres constantly change over time and across discourse communities. This dynamic view of genre disqualifies any kind of offline desktop concordancers, as they cannot reflect changes in the target genre as they occur.
Finally, given that this research aims to be of practical value, it is essential that the tools be designed for real classroom use; that is, teachers should be able to set up a corpus and an engine without knowledge of corpus linguistics or computer programming; likewise, students should be able to access a corpus with minimum training. The requirement of practical use rules out both kinds of concordancer programs, as they involve a considerable learning curve to set up and to use.

As for the research methods and data, there is a definite lack of data with regard to the composing processes of L2 writers. Much research on corpus-assisted writing has relied on participants’ narrative accounts (e.g., stimulated recall interviews). Retrospective narratives, however, are not so much a precise reproduction of the composing process as a reinterpretation of it, through which writers create coherence out of their past composing experiences (Ochs & Capps, 2001). Relying on the participants’ perceptions at face value, thus, can and does undermine the validity of research (Pavlenko, 2007).

Computer-aided techniques offer an alternative method, which records the user’s activities, whether keystroke logging (Miller, 2005; Sullivan & Lindgren, 2006; New, 1999; Thorson, 2000) or screen recording (Geisler & Slattery, 2007; Slattery, 2005, 2007). These methods have the functionality to record and replay the writers’ computer screens as real-time video movies. Real-time methodology, however, has its own shortcomings: it is difficult to make inferences about the writers’ thinking processes by watching the behavior captured in video clips. For example, although the clips may show writers making certain revisions, it is difficult to establish why they make such revisions.
Lacking a means to connect the real-time video to internal cognitive processes, analysis of this kind of data relies on researchers’ intuitions, a position exactly opposite to, and not any better than, the retrospective method, which relies on the participant’s perceptions. Although some studies have suggested supplementing real-time data with retrospective accounts (Geisler & Slattery, 2007; Lindgren & Sullivan, 2006), such suggestions only bring us back to the debate over whether retrospective narratives constitute valid research data. A new answer may inhere in constructing an additional layer of data that reflects, and thus, allows the study of, the cognitive processes underlying the construction of text.

1.5. The purpose of study

The primary goal of this project is to develop and evaluate a corpus-based system to enhance L2 writers’ lexicogrammatical performance. Unlike most previous concordancer research, this study deploys its system in realistic settings in which no corpus activity is mandated to complete course assignments and students use it for ESL and non-ESL writing tasks, with or without a teacher’s presence. The system was developed with instructional as well as research purposes in mind: for instruction, it offers a genre- and discipline-specific academic corpus and fast full-text search via Internet; for research, it automatically records the searches that writers enter in order to consult the corpus.

Within the primary goal of the study, the sub goals in the domains of pedagogy, methodology, and theory are as follows:
• **Pedagogy**: Developing and evaluating a corpus-based system that allows full-text search of a genre- and discipline-specific corpus of academic texts

• **Methodology**: Collecting real-time data and developing an analytical technique to analyze the data in order to make inferences about corpus-assisted composing processes and parallel cognitive processes

• **Theory**: Building a system informed by contemporary writing and language theories, and using it to inform the theoretical direction of future research in terms of designing and implementing a corpus-based system

1.6. Research questions

This thesis seeks to answer the following overarching question: How we can mediate the gap between the abstract components of genre knowledge (e.g., audience communities and target rhetorical situations) and their textual realizations, and thereby enhance L2 writers’ lexicogrammatical performance in academic writing? This thesis offers to answer this question by designing, testing in a one-semester undergraduate writing course, and measuring the results of a corpus-based system that mediates between writers’ lexicogrammatical awareness and performance. Its goal: to simultaneously improve writers’ lexicogrammatical awareness and performance using a system designed for practical classroom application. Improvements in lexicogrammatical performance are operationalized in terms of the (beneficial) role of the corpus-based system in developing L2 writers’ genre knowledge and transferring that knowledge to their written products.
The role of the system is observed in terms of three aspects: the students’ patterns of interaction with the system, its impact on composing processes and written products, and the students’ perceptions of the system. These aspects are examined by answering the following questions:

1. What is the pattern of L2 writers’ interaction with the corpus?
2. What are L2 writers’ lexicogrammatical needs and their strategies for meeting those needs?
3. Does the corpus-based system improve writers’ lexicogrammatical performance? If it does, how?
4. What are the writers’ evaluations of the corpus system based on their narratives and on their voluntary and continued access to the corpus?
5. How could the findings of the above questions inform theoretical and pedagogical advancement of corpus-based mediation in L2 writing?

1.7. Significance of the study

This study is the first attempt to use a search engine and a specialized corpus for L2-writing instruction. The proposed corpus-based system offers broad benefits to students taking courses underpinned by genre-based pedagogy. For explicit instruction, as advocated in ESP and SFL, the system can serve as an extensive store of representative texts that facilitate exemplar analysis. For situated learning, as proposed in NR, a corpus allows writers to look up context-relevant texts while participating in a rhetorical
situation. As for lexicogrammar, the benefits of the system go beyond a simple accuracy check (e.g., correct collocation). Rather, this new system is designed to engage students in intense hypothesis testing, which eventually leads to the development of genre knowledge. For teachers, this approach’s strength resides in its ability to build corpora for their courses. The system allows teachers with minimum experience of a corpus to replicate the system for their own use; it also enables rapid (i.e., within some hours) compilation of the target database and development of a web-based interface.

It is also the first study that explores the potential of writers’ corpus search queries as research data in applied linguistics. The methodological model that this study has developed has the potential to advance methods for interpreting both retrospective and real-time data beyond their current state. For interpreting retrospective data, no study has triangulated students’ perceptions of their corpus consultation with their actual access to the corpus. The study proposes a method for using students’ search query logs during and after the data collection period, and certainly, the log record offers a very strong basis upon which to interpret the students’ reflections. As for real-time data, the challenge is to use real-time video clips to make inferences about internal composing processes. Again, to date, no study in composing-process research has proposed a means by which researchers can base their interpretations on evidence, instead of on their intuition. With its proposal of a concrete technique to track and reconstruct the cognitive processes of writers through analysis of corpus queries, this study should be of use to future research on writing as well as in the field of corpus linguistics.
1.8. Terminology: Learner-Corpus Interaction (LCI)

In this thesis, the interaction between the focal students and the course corpus is referred to as the “Learner-Corpus Interaction” (hereafter, LCI). This term reflects a position that views a student’s corpus consultation as a unique kind of interaction in its own right. During its relatively short history, corpus-based pedagogy has been considered, rather obscurely, as a kind of activity within the area of Computer-Assisted Language Learning (CALL), or a potentially relevant area of user-behavior studies in computational research such as Human-Computer Interaction (HCI). This thesis will show that LCI has distinct characteristics that are different from CALL learning activities and from non-pedagogical computer-user behaviors (e.g., video gaming), in terms of the participants’ objectives, negotiation, and co-constructed learning outcome. In the absence of a term to describe this unique type of interaction between a student and a corpus, this thesis proposes and uses the term LCI throughout the following chapters.

1.9. Thesis organization

The remainder of this thesis is organized as follows. Chapter 2 reviews research on genre pedagogy and writing research. For genre pedagogy, the chapter reviews studies on genre-based writing instruction and the contribution of corpus technology to the area. For research, the chapter discusses issues in interpreting real-time data, i.e., screen recordings and keystroke logging and proposes a new analytical technique that draws on corpus technology. Chapter 3 describes the corpus-based system that this study develops.
The chapter provides a detailed description of its data analysis methodology and presents a sample analysis. Chapter 4 reports the role of the corpus system in enhancing students’ lexicogrammatical performance in an intermediate ESL composition course for one semester. The chapter presents findings from formal and functional analysis of LCI and interprets the students’ perceptions of the system in reference to their reflections, screen recordings, and the corpus query log. Chapter 5 discusses the study’s overall findings and posits answers to the research questions. The chapter emphasizes the dialogism in LCI and the role of the corpus as a cognitive artifact in collaborating with writers to co-construct text. Emerging issues such as electronic plagiarism and textual borrowing in LCI are discussed as well. Finally, the chapter proposes a new theoretical framework for conceptualizing LCI. Chapter 6 concludes this thesis with a discussion of its pedagogical, methodological, and theoretical implications of the findings and directions for future research.
CHAPTER 2
LITERATURE REVIEW

Genre-based pedagogy is an approach to language teaching based on the recognition of genres as conventionalized social practices in discourse communities. By studying genres, we understand the social and cognitive dimensions of a discourse community, e.g., what is considered socially meaningful and what are the preferred and valued ways to express such meaning. To novice members, however, gaining a solid understanding of genres is challenging, as it requires longitudinal enculturation in the target community. Genre pedagogy is one effective way to facilitate genre learning for novice members and has made some progress over the past decades. The progress, however, has occurred mainly in the domains of teaching content and structure of genres, while the challenge of teaching lexicogrammar remains under-addressed. As lexicogrammar is the central means through which genres encode the expectations of communities in texts, the lack of effective methods for teaching it is a significant gap in genre pedagogy. To date, genre pedagogy has been only modestly successful in addressing the gap. The gap is, in part, due to a major methodological hurdle in research. There is an almost complete lack of data on the actual composing processes in genre-based instruction and corpus-assisted writing. Therefore, our knowledge is limited regarding just how students actually transfer knowledge gained from genre-based instructions to their writing and how they use a corpus to improve their writing. This
chapter reviews literature on genre pedagogy with a focus on the instructional methods and their impact on improving lexicogrammatical performance; and research methodology for observing the composing processes as students’ texts unfold using screen recording technique.

2.1. Genre, genre theories and genre-based instruction

Genre is an abstract concept that refers to conventionalized patterns of texts, which members of a community use to perform social activities. As genre encodes the assumptions of a community regarding the acceptable ways in which members to participate in social activities, it allows the members to perform social actions efficiently without discussing the assumptions. For example, a genre as mundane and simple as a daily greeting may encode complex assumptions about the ways a community establish and maintain interpersonal relationships. These assumptions can be possibly mapped to a highly developed honorific system. The community members cope with this complexity through genre of greeting. With the complex interpersonal dynamics already encoded in the greeting genre (and thus, taken care of), the members can maintain their interpersonal relationship with efficiency. For members of a community, therefore, genres are socio-cognitive tools to efficiently perform social activities. For the community to which the members belong, genres serve as a collective memory through which the community passes down its knowledge system (Wertsch, 2002).
2.1.1. Genre and genre theory

Genres are broadly defined as socially recognized ways of using language in discourse communities (Bhatia, 1993; 2004, Hyland, 2003; Swales, 1990). Contemporary genre theories date back to the mid 1980s, and since then, have taken divergent paths in their development. Based on the extent to which a theory recognizes the textual substantiality of genres, two approaches are commonly distinguished. As linguistic approaches to genre, Systemic Functional Linguistics (SFL) and English for Specific Purposes (ESP) recognize genres as substantial entities with formal regularities. In contrast, a nonlinguistic approach, New Rhetoric (NR), considers genre as transient performance, rather than formal entity. In this view, genres are primarily the discursive aftermath of social events. Thus, genre refers to abstract cognition, while texts are the formal entities that linguistic approaches identify as genres and therefore only material traces of such cognition.

Difference in the genre perspectives is related to the level of abstraction in genre definition. In ESP, genres are the socially recognized prototypical categories of texts. Thus, genres are identified according to the ways in which members of a community recognize them. For example, recipes are recognized as the recipe genre if community members routinely use them and recognize similarity between recipes—even though recipes can significantly vary from one another. Differing from the ESP perspective, SFL allows some level of abstraction by distinguishing genres as broad patterns such as exposition and procedure and their realizations in specific texts such as essays and recipes (Martin, 1992). Thus, there is some distinction between meaning and its textual
realization in SFL. In contrast to these two linguistic approaches, NR identifies genres according to the contexts to which they belong. A recipe, for example, is the textual means for conducting an action, cooking. Therefore, a genre can be described only in terms of the actions in which it has occurred. The conceptual orientations and pedagogical approaches in three perspectives are summarized in Table 2.1.

Table 2.1. Genre Perspectives

<table>
<thead>
<tr>
<th></th>
<th>SFL</th>
<th>ESP</th>
<th>NR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary focus</strong></td>
<td>Linguistic realization of context</td>
<td>Discourse structure and features</td>
<td>Social purposes; pragmatic action</td>
</tr>
<tr>
<td><strong>Intellectual Roots</strong></td>
<td>Functional Grammar; Discourse semantics</td>
<td>Discourse analysis; pragmatics</td>
<td>Post-structuralism</td>
</tr>
<tr>
<td><strong>Pedagogy</strong></td>
<td>ZPD; Teaching learning cycle</td>
<td>Explicit instruction; Genre analysis</td>
<td>Situated learning; enculturation</td>
</tr>
<tr>
<td><strong>Educational Context</strong></td>
<td>L1 secondary education; adult migrants</td>
<td>Occupational and academic training; Post-graduate level</td>
<td>L1 university; workplace; contexts of transition and enculturation</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td>Procedure, exposition, explanation</td>
<td>Article, memo, sales letter</td>
<td>Political briefs, patents, medical records</td>
</tr>
</tbody>
</table>
2.1.2. Genre pedagogy

Differing orientations in genre perspectives consequently lead to diverging approaches to pedagogy. A fundamental difference between linguistic and non-linguistic genre pedagogies lies in the two modes of teaching: explicit instruction and implicit (situated) learning. In SFL, instruction focuses on the linguistic characteristic of genres and the relationship between lexicogrammar and context. In ESP, instructions aim to facilitate noticing of the structural and grammatical features of the target genres. Genre analysis is the primary method of identifying as well as teaching the key genre features. In a sharp contrast with these two approaches, NR posits that genres cannot be explicitly taught but they are learned only by participating in discourse communities. Genre knowledge is gained through cognitive apprenticeship, in which an expert member helps a novice member. Approaches to genre pedagogy in three genre perspectives are summarized in Table 2.2.

Table 2.2. Approaches to Learning in Three Genre Perspectives

<table>
<thead>
<tr>
<th></th>
<th>SFL</th>
<th>ESP</th>
<th>NR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning theory</strong></td>
<td>Sociocultural theory; ZPD</td>
<td>Schema theory; noticing</td>
<td>Situated learning</td>
</tr>
<tr>
<td><strong>Syllabus design</strong></td>
<td>Teaching-learning cycle</td>
<td>Need and situation analysis</td>
<td>Genre system sequencing</td>
</tr>
<tr>
<td><strong>Mode of instruction</strong></td>
<td>Explicit instruction</td>
<td>Explicit instruction</td>
<td>Implicit apprenticeship</td>
</tr>
<tr>
<td><strong>Method of instruction</strong></td>
<td>Joint construction</td>
<td>Genre analysis; Simulation</td>
<td>Contextualization activities</td>
</tr>
</tbody>
</table>
2.2. Impact of genre-based instruction on writing performance

Genre perspectives differ in terms of their instructional methods and their contributions to enhancing students’ genre performance. Despite their potential benefits, a conclusion remains tentative regarding the impact of genre-based instruction on writing development. This is partly due to the overall lack of empirical studies (Tardy, 2006) and detailed data reporting on students’ textual construction in the previous studies (Cheng, 2007b).

2.2.1. Writing instruction in SFL

Pedagogy in SFL is situated in the context of the postwar history of immigrant education in Australia. The Commonwealth government has offered language programs to all new immigrants on their arrival. These programs were developed in an era of decreasing job opportunities and other exigencies of socially disadvantaged groups. SFL-based projects have significant impact on literacy education for these groups. Instruction focuses on explicit delivery of linguistic features of target genres in order to make them accessible to learners. Typically, instruction explicitly addresses each of the three interrelated domains of language: the subject-matter knowledge (field), written and spoken register (mode), and relationship between author and audience (tenor).

1 The Adult Mirant English Program - AMEP (Feez, 2002) and New South Adult Migrant English Service – AMES (Joyce, 1992; Paltridge, 2001).
SFL offers a guiding principle for instruction drawing on Vygotskian Sociocultural Theory (Vygotsky, 1978). Based on the notion of the Zone of Proximal Development (ZPD), instruction in SFL aims to maximize the ZPD using the teaching and learning cycle. The key stages in the cycle are building a contextual framework, modeling, joint-construction, and independent construction (Joyce, 1992; Macken-Horarik, 2002; Martin, 2009). In the cycle, teachers build knowledge of contents and contexts (contextual framework), then demonstrate key genre features through exemplars (modeling), and work with students to eventually facilitate collaborations between students (joint-construction). Finally, students are encouraged to perform writing tasks without the teachers’ help (independent performance). One cycle is linked to the next cycle and each new cycle builds on the knowledge from the previous cycle.

2.2.2. Impact on genre performance in SFL

For many educational projects in Australia, the goal of instruction has been to integrate learners from diverse backgrounds into the societal structure. Writing instruction aims to help students achieve perform independently as functional members in educational or workplace contexts. SFL has been generally effective in achieving this goal in primary and secondary education and workplace literacy training (Feez, 2002; Joyce, 1992).

Macken-Horarik’s (2002) study exemplifies how the SFL approach helped young writers to develop their genre performance. The participants were students in a secondary
school and they were writing in the explanation genre on in vitro fertilization (IVF). In
the first draft, the students reproduced the schematic stages and mimicked the language
use of the teachers’ examples. For example, one of the students, Beth, wrote in her first
writing task, “Participants are infertile couples, where either the woman has a damaged
fallopian tube or the man has a low sperm count, wishing to have a child.” At this point,
she recycled the language and ideas from instruction and readings rather verbatim. Her
writing consists of listing the facts about IVF, while it does not show her own thought on
the issues in terms of its social and biological significance.

From this point on, the students experienced a series of writing stages starting
from simple, non-academic genres and moving on to increasingly complex linguistic
features. As students’ knowledge and skill increased, the teacher accordingly decreased
her assistance. Instead, she encouraged the students to take a greater role in constructing
the explanation genre through explicit discussion on the lexicogrammatical patterning of
the genre. In the final writing task, students showed their capability of independent
performance in the target genre. In her final writing task, Beth wrote, “They [scientists]
could specifically make people, clones, to do certain thing. Inheritance would mean
nothing then, because the child wouldn’t really have any parents. Already it is causing big
moral problems and they can only get worse.” When compared with her first essay, this
portion of her final draft suggests her improved performance. While she was repeating
the childless couple’s words in her first essay, Beth could detach herself from the voices
of scientists in her final essay and externalized her own thoughts on the topic through an
evaluation of the scientific progress in a moral perspective. Development in her final
draft encompasses the three context variables, i.e., increased content knowledge on IVF (field), articulation of its ethical implications to audience (tenor), and sophisticated grammatical and structural constructions that characterize written register in school (mode).

In tertiary education, despite room for more research, the potential of the SFL perspective is promising as well. Some studies have exemplified that SFL can offer significant implications for effective writing instruction and curriculum design (Byrnes, 2002, 2009), which future research can usefully draw on to advance L2 writing pedagogy at graduate and post-graduate level.

2.2.3. Advantages and drawbacks of SFL in genre-based instruction

While SFL offers rich a repertoire for L1 primary and workforce education, L2 writing instruction at the tertiary and post-tertiary level has received less attention. In L1 literacy education for young learners and adult immigrants, the contribution of SFL is well recognized with a body of empirical literature (Christie & Martin, 1997; Cope & Kalantzis, 1993; Feez, 2002; Feez & Joyce, 1998; Hammond & Mackin-Horarick, 1999; Jones, Gollin, Drury, & Economou, 1989; Macken-Horarik, 2002; Martin, 1997, 1998; Rothery, 1996). For L2 writing instruction in higher education, however, fewer empirical studies described L2 writers’ development in concrete terms. The dearth of research makes it difficult to answer questions such as whether the focus on lexicogrammar in SFL
actually results in the lexicogrammatical development and, if it does, how SFL teachers can facilitate the development.

Research findings, thus, have not been conclusive regarding the effectiveness of SFL on L2 writing development. There are some studies that have suggested general and potential benefits of SFL-based instruction in teaching languages including Spanish (Colombi, 2002, 2006), Chinese (Mohan & Huang, 2002), and German (Byrnes, 2009). However, less optimistic results have been reported as well. Ferreira (2005) found that genre-based instruction is somewhat limited in facilitating conceptualization of abstract relations between context and its textual realization. In her study, observations of 14 ESL students in one-semester ESL writing course did not show significant improvement in their theoretical thinking skills. Instead, the students relied on the five-paragraph format persistently, with which they were familiar. The finding suggests that the schematic residue of previous instruction can be a major challenge to the writers’ development. This finding is consistent with the commonly known difficulty of destabilizing the residual practice in genre pedagogy (Johns, 2002).

One major challenge for teachers of university writing courses is the difficulty of developing curriculum and teaching materials based on the theoretical constructs in SFL. While writing instruction in secondary and workforce education rarely goes beyond three basic variables of register (i.e. field, tenor, and mode), writing at university level involves much more complex concepts such as discourse communities, textual conventions, and their dynamic relationship. However, writing in genres at graduate and post-graduate level (e.g. doctoral dissertation) requires highly sophisticated skills and, thus, easily goes
beyond the simpler genres in primary/secondary levels, on which SFL has mainly operated.

2.2.4. Writing instruction in ESP

The ESP perspective emphasizes the pragmatic value of genres. Two essential processes in ESP instructions are genre analysis and need analysis. Genre analysis involves collecting and analyzing representative samples of genre in order to identify typical organizational structure (i.e. move structure) and grammatical constructions (Bhatia, 1993; Flowerdew & Dudley-Evans, 2002; Gledhill, 2000; Marco, 2000; Upton, 2002; Upton & Connor, 2001). ESP teachers deliver the findings from such analyses to students through explicit description. As for curriculum design, ESP emphasizes need analysis, a technique to assess students’ practical writing needs, i.e., the demands of writing assignments in academic contexts (Johns, 1990; Swales, 1990). ESP course developers typically perform two kinds of need analysis. In present situation analysis, they examine students' current needs by examining four key factors: learners, their experience and preference in learning, motivation of learning, and current literacy abilities (Hyland, 2004, p. 95). In target situation analysis, the writing situations in which students are expected to perform are described, and incorporated into the curriculum. Through these analyses, ESP teachers offer focused instruction on the realistic demands of the students.
Although there are numerous suggestions in the ESP literature with different names and foci, methods of instruction in ESP can be divided into two fundamental categories, exemplar analysis and simulation. In exemplar analysis, instruction focuses on raising students’ awareness of target genre features through representative exemplars. In typical exemplar analysis activities, teachers describe and discuss the key features (e.g. move structure) of a target genre in explicit terms and encourage students to conduct their own genre analysis by using the exemplars and noticing the key characteristics. During the analysis, special emphasis is on the relationship between the audience community and the author’s communicative purposes and their influences on structural variation in genre (Dudley-Evans, 1994; 2000). The strength of exemplar analysis activity is that it has strong support from the ESP research literature (e.g., Swales and Feak, 1994) and research studies that have applied the technique to practices (Flowerdew, 1993; Henry & Roseberry, 1998). Swales and Lindeman’s (2002), for instance, showed an activity in which students collected and analyzed their own exemplar texts of literature review sections. Using the exemplar analysis, these students collaboratively compiled review sections for prospectus in their dissertations.

While exemplar analysis facilitates noticing of genre features, simulation focuses on the transfer of the noticed features to writing. Simulation provides virtual contexts for writing through enactment of writing situations. For example, students can enact a debate on a social issue in a newspaper article (Halleck, 1990), a hypothetical reproduction of a public discussion on a conservation issue (Kamimura & Tjie, 2002), and a mock conference organization (Halleck, Moder, & Damron, 2002). The goal of these activities
is to help students obtain writing experiences in specific contexts, rather than writing for a general, unknown audience. One important question in simulation is whether simulated experiences actually lead to enhanced written performance. According to Saliés (2002), enactment alone does not result in improved organization and accuracy in students’ writing and therefore explicit instruction is necessary. Regarding the issue, Cheng’s (2007a) proposal is to connect the simulated experiences to follow-up instructions and feedback. Then, teachers can use the problems in students’ writings during the simulation activities for extended learning opportunities.

2.2.5. Impact on writing performance in ESP

Whether and to what extent ESP instruction facilitates students’ writing performance is still under debate. Some studies reported positive impacts of ESP instruction on writing performance (Bacha & Bahous, 2008; Carter, Ferzli, & Wiebe, 2004; Gosden, 1998; Pang, 2002). Carter et al. (2004) reported the positive effect of genre-based instruction on learning the lab report genre. Results of holistic measure and primary-trait scoring showed that the treatment group with genre instruction performed significantly better in their writing than the control group without treatment. Cheng (2007b) presented stronger evidence for the effectiveness ESP on learning genre through an ethnographic study. His study tracked one Chinese graduate student in an ESP-based writing course, in which the student wrote three versions of introduction on the same topic for three different audiences. Using the student’s drafts, interviews, and his
annotation on his own texts, this study showed that the instruction helped the student to
develop an ability to adjust his writing to varying expectations of audience communities.

Other studies, however, reached somewhat tentative conclusions. Pang (2002) found that while explicit instruction was effective in terms of teaching move structure, it is less effective in raising awareness of the contextual functions of these moves. Henry and Roseberry (2007) reported a mixed result as well. They examined L2 learner’s performance in writing tourist brochures. In a university in Brunei, 40 undergraduate students received a brief instruction on the features of the genre and a short tourist brochure (200 to 500 words). Results showed that, despite some improvement in move structure, the students still made errors in connecting grammar to communicative purposes. These findings imply that their ESP instruction is less effective in teaching lexicogrammar than structure, and thus, has room for further research.

2.2.6. Advantages and drawbacks of ESP in genre-based instruction

The most salient contribution of ESP to writing pedagogy is, arguably, its explicit description of structural organization of text through “move analysis” (Swales, 1990; Swales & Feak, 2000). Descriptions of the structure in terms of the structural units such as moves and steps give students clear guidelines in learning new target genres. Once the move structure is described, students can see how each move is mapped to the intended communicative purposes and lexicogrammatical constructions. For example, a move analysis of research articles can demonstrate to students that authors tend to use hedges in
order to achieve their communicative goals such as expressing uncertainty or indicating
deferece to disciplinary norms of interpersonal stance in certain sections (Hyland, 1996).
By explicitly connecting structure (i.e. hedge) with its mapping purpose (i.e. uncertainty
and interpersonal stance), ESP teachers make the text-context relationship
comprehensible to students.

Despite the obvious benefits of the ESP genre analysis, some concerns have been
voiced against the potential prescriptivism of ESP. From the NR perspective, Freedman
and Medway (1994) denounced ESP as “a recipe theory,” criticizing its approach to
writing pedagogy for reductive pragmatism and prescriptive approach (p. 46). In fact, this
is concern is shared by ESP teachers as well. In a survey study about genre-based
instruction, Kay and Dudley-Evans (1998) reported that teachers perceived that imposing
normative structure is a common pitfall in practice. Research on ESP instruction has
attempted to fill this gap by suggesting methods such as team teaching by language
instructor and subject instructor (Dudley-Evans, 1995), or collaboration between ESL and
content course teachers in separate courses (Johns, 2002, 2008). However, it remains to
be seen whether such suggestions turn out to be viable under various institutional
constraints.

2.2.7. NR genre-based instruction and writing performance

Unlike the linguistic perspectives, NR does not view genre performance as a
teaching outcome and therefore researchers in this tradition do not advocate explicit
teaching of genre (Freedman & Medway, 1994). Nevertheless, some implications for genre-based instruction can be gleaned from NR, especially from the ethnographic research techniques and teaching methods.

In the NR perspective, the primary method for genre learning is cognitive apprenticeship, which is based on theory of situated learning (Lave & Wenger, 1991). Studies in NR have focused on the ways in which genre learning is supported through interactions between newcomers and experienced members in academic and professional communities. Blakeslee (1997) observed a mentoring relationship between a graduate student and his advisor in an effort to publish scientific papers. The study suggested that the factors that constrained situated learning were the students’ approaches to composing, the implicitness of situated learning, and the distribution of authority in the advisor-advisee relationship. Based on the findings, some recommendations were presented for improving situated learning (e.g. Identify and work more with students' existing knowledge and strategies) (p. 158). In the context of transition between school and workplace settings, Parks (2000) observed how bilingual francophone nurses in an English-medium hospital in Quebec learn the nursing care plan genre over the period of 22 months. In order to learn the genre, the nurses had to negotiate between the ESP instruction that they received and their practices in the workplace. Through the longitudinal situated learning, they eventually learned the genre.

For writing teachers, a major drawback of NR is the difficulty of offering cognitive apprenticeship in school settings. Regarding this issue, suggestions of NR revolve around ethnographic assignments to engage students in exploring the various
contexts of writing. Devitt, Reiff and Bawarshi (2004), for example, provide a number of examples of contextualizing activities such as interviewing the course instructors, visiting the sites of writing, and comparing cross-cultural differences in genres. However, it is difficult to predict the extent to which such activities facilitate students’ lexicogrammatical development.

2.3. Role of corpus technology in genre-based writing instruction

In genre-based instruction, corpus technology holds considerable promise to provide support for teacher’s instruction. Generally, the contribution of corpus technology to academic writing pedagogy is recognized in areas such as language description, textual analysis, and teaching material development. (Bondi, 2001; Connor, Precht, & Upton, 2002; Hyland, 2002; Upton, 2002; Upton & Connor, 2001). In classroom practice, however, the role of corpus is yet to be robustly established in genre pedagogy (Flowerdew, 2005). Currently, the role of a corpus in genre pedagogy is limited to providing exemplar texts either through large, reference corpora (Lee & Swales, 2006; Powell & Simpson, 2001) or small, specialized corpora (Aston, 2002; Bondi, 2001; Ghadessy et al., 2001). To date, only a few studies have examined the potential of a corpus beyond its role as document storage. Hafner and Candlin (2007), one of the few studies, provided online concordance program for novice lawyers in a legal writing course and reported the frequency of their corpus access. The results suggest that the
lawyers consulted the corpus with fairly low frequency (a few searches a week) and that they used it mostly to look up the relevant contents, rather than address linguistic issues.

Regarding the contribution of a corpus to writer’s development, there is only anecdotal evidence. Gaskell and Cobb (2004) examined the effects of hyperlinked feedback on students’ revisions. Instead of traditional written feedback, they provided concordance lines and observed how students used the feedback to improve their writing. Results of their study implied rather modest influence of such feedback showing that only eight students out of 20 attributed their writing development to the concordance feedback. As for students’ perception, Yoon and Hirvela (2004) reported the results from a survey study in which they asked their students to comment on their concordancing experience. The results indicated that the students felt as if they built some confidence in vocabulary and writing skills through corpus consultation. However, they did not perceive that they developed in semantic domains such as reading comprehension.

Using a corpus for enhancing lexicogrammatical performance remains largely unexplored. However, it is a promising area as well to which corpus technology can potentially make significant contributions. In their exploratory study, Lee and Swales (2006) presented an interesting suggestion for self-compiled corpora (p. 59). This involves students compiling a small corpus of genre exemplars in order to address their immediate writing needs. The students were asked to collect and analyze genre exemplars as awareness-raising activity and discussed the characteristics that they noticed in the corpus. Then, teachers encouraged the students to use the noticed characteristics in their
own writing. As the students were working with very relevant exemplars, they were able to conduct a focused and efficient genre analyses.

Although the on-the-fly analysis technique is no more than a suggestion in genre pedagogy, it is worth further attention. It is convincing that students benefit from working with exemplars that are highly relevant to real assignments, rather than with examples of general relevance and hypothetical exercises. By developing a corpus-based system that allows for rapid compilation and retrieval of genre exemplar, such a suggestion can be efficiently materialized.

2.4. Screen recording in writing research

In research on genre-based pedagogy, there is an almost complete lack of data on the process of students’ text construction. In ESP, Cheng (2007b) is the only study that described how students actually analyzed genre exemplars and transferred findings to their writing. Using the self-commentary technique, he asked students to record their understanding of genre, the features that they noticed, and their rationale for incorporating (or not incorporating) certain genre features in their writing. In corpus-based research, Yoon (2008) is one of very few studies that investigated the interaction of corpus-assisted writing. In her study, the teacher gave students assignments that required them to use an online concordance program. The students, then, reported the items that they looked up, the reason for looking up the items, and usefulness of the concordancing in addressing their needs regarding the items. The results showed that students felt as if
concordancing raised their rhetorical awareness. Although evidence in these two studies is limited to students’ comments and retrospective narratives, these two studies have certainly increased our understanding of students’ experiences in genre analysis and corpus consultation. In extending the efforts in these studies, this thesis suggests that the screen recording technology can further enhance our understanding by allowing for first-hand observations of the composing processes.

Screen recording refers to computer programs and techniques for recording the computer screen actions and creating digital video clips. With the availability of video compression technology in the late 1990s, computer-aided screen-recording methods began to gain visibility in composing process research. Currently, a range of software programs are available free of charge or at affordable prices (for review of programs, see Degenhardt, 2006; Geisler & Slattery, 2007; Latif, 2008). Studies that used screen recordings are listed in Table 2.3.

Table 2.3. Screen Recording Techniques in Writing Research

<table>
<thead>
<tr>
<th>Area</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen videotaping</td>
<td>Collier (1983)</td>
</tr>
<tr>
<td>L1 revision in word-processing</td>
<td>Owston, Murphy, &amp; Wideman (1992)</td>
</tr>
<tr>
<td>Personal writing</td>
<td>Geisler (2001)</td>
</tr>
<tr>
<td>Learner perception</td>
<td>Luoma &amp; Tarnanen (2003)</td>
</tr>
</tbody>
</table>
Early screen recording studies in the late 1970s onward used a video camera to record students while they were writing. The pioneering works of Ann Matsuhashi on temporal aspects, e.g., pauses, have been influential (Matsuhashi, 1981, 1987), and Collier’s (1983) study is, arguably, the earliest to videotape students’ word processor screen while they composed aloud. The techniques in these studies that paired audio–video data are a precursor of current triangulation techniques that combine screen recordings, keystroke logging, think-aloud, and stimulated recalls.

More sophisticated, computer-aided methods began to appear in the literature in the 1990s. Owston, Murphy, and Wideman (1992), for example, used a screen-recording program to examine the revision strategies of 8th-grade students using word processors. More recently, in the past few years, an increasing number of screen-recording studies have been published. These studies mainly focused on L1 writing contexts, including personal writing (Geisler, 2001), technical writing (Slattery, 2005, 2007), and technical communication in the workplace (Swarts, 2004, 2010; Van Ittersum, 2009). In L2 writing, though, researchers are only just beginning to explore the potential of screen recording. Among the few published papers are Glendinning & Howard’s (2001, 2003) studies using screen-recording techniques to document the collaborative-writing sessions of EFL students and Luoma and Tarnanen’s (2003) study on learners’ perceptions of a self-rating software program.

Despite the clear benefits, screen-recording method has its own shortcomings; lacking established analytical techniques, it is not clear how the behaviors captured in
screen recordings can be connected to, and enhance our understanding of, the internal cognitive processes of writers. Geisler and Slattery (2007) suggested that the key to this problem is in taking account of “the writers’ consciousness”; therefore, “suitable prodding” in recall interviews would reveal “why a writer has employed a given sequence of actions” (p. 197). However, this suggestion raises another issue regarding the danger of using narrative data at its face value. Writers’ retrospective narratives are not so much a precise reproduction of the composing process as a reinterpretation of it, through which writers create coherence out of their past composing experiences. Reliance on the participants’ accounts as a sole basis for data interpretation, thus, can and does undermine the validity of research (Pavlenko, 2007).

2.5. Issues in real-time research in L2 writing

The limitations of real-time data analysis have been articulated in the literature (e.g. Lindgren & Sullivan, 2006; Miller, 2005; Ransdell & Levy, 1994). Regarding the difficulty of connecting real-time data to cognitive processes, Miller (2005) observes:

Although triangulation of data from concurrent or retrospective interviews can support the teacher/researcher’s process of interpretation, the observations remain speculative. We can at best infer what underlies the overt behavior we are able to capture. (p. 311)
Although the point concerning the speculative nature of data interpretation is well taken, this limitation does not necessarily imply that researchers have no better means of inquiry than retrospective “speculation.” In fact, a high degree of precision (and less speculation) in data interpretation can be obtained by introducing innovative methodology. For example, Lindgren and Sullivan used real-time data to demonstrate a step-by-step analysis of the linguistic hypotheses that 12th–15th-grade Swedish writers made about L2 English. Instead of depending on the participants’ holistic reflection on their writing, the researchers (2006, p. 162) described in detail the instances of revision and inferred the cognitive process that the writers were experiencing. For example, one student wrote:

I want you to come to sweden therefor Sweden <4.8> 6 <X> the summer holidays in Sweden <3.0> are really great.

The screen replay shows that the student originally wrote, “I want you to come to sweden therefor Sweden”, then paused (4.8 seconds) and deleted “Sweden”, and added, “the summer holidays in Sweden are really great”. In regard to the revision, Lindgren and Sullivan (2006) discussed two potential hypotheses:

**Hypothesis 1**: The revision is *formal*. ‘therefor’ is a mistranslation for a Swedish word with a similar morphology, ‘därför, for English ‘because’. The writer was working on the form, i.e., sentence structure, intending to create a subordinate sentence that would provide the reason for the invitation.

**Hypothesis 2**: The revision is *conceptual*. The significance of the deletion of ‘Sweden’ is minimal. Rather, in the midst of a global revision, the writer might have an (unknown) intention to “adjust” the sentence according to “the overall plan” (p. 162).
Although this analysis marks a step forward in analyzing real-time data by breaking down the cognitive activity into smaller units to trace learner hypotheses, the analysis still relies on the researchers’ interpretation; therefore, it is more or less speculative. The two hypotheses made inferences about the writer’s cognitive process that the data did not represent. Certainly, it could be argued that the researchers should simply ask the participants to state the rationale for their revisions; yet, as this thesis has already pointed out, such reflections would not provide a precise representation of the composing process.

Then, how do we remove this speculative reasoning from an analysis of real-time data? One answer lies in the provision of a further layer of data—one capable of connecting real-time data to cognitive processes; and, though, such a layer cannot remove all speculation, it can more securely anchor interpretation to results. Suppose we have a hypothetical piece of data showing that the writer in the above example eventually replaced “therefor” with “because.” With this pair of words, it becomes much clearer that the writer was focusing on these particular items, rather than on a global-scale adjustment, and thus, the pair allows us to accept Hypothesis 1 and reject Hypothesis 2 with greater confidence. Such pairs, in other words, serve as an additional layer of data that reveals writers’ thinking processes during composing. In the following chapter, this thesis will demonstrate a methodology for augmenting analysis of real-time data using such additional data collected through corpus technology.
CHAPTER 3
RESEARCH DESIGN AND METHOD

This chapter describes a corpus-based system and reports its impact on improving students’ lexicogrammatical performance in an intermediate ESL composition course. This system represents a first attempt at using a search engine in genre-based writing pedagogy. Drawing on genre theory and applied corpus linguistics, the corpus system provides students with access to the target discourse via Internet. Equipped with a specialized corpus with a custom search engine, the system serves as a semi-ubiquitous lexicogrammatical reference for students. For evaluating the effectiveness of the system, this thesis closely follows three focal students and their interaction with the system (i.e., LCI) for one semester. The goal of this observation is two-fold: to describe the formal and functional aspects of LCI and identify evidence (or lack thereof) for improved lexicogrammatical performance that can be attributed to the interaction.

The analytical method in this thesis aims to achieve high-precision documentation of L2 writers’ composing processes through the triangulation of the multimodal datasets, i.e., screen recordings, retrospective reflections, and corpus search queries. The method is developed specially for this study and it is, again, the first attempt to use search queries as research data for researching the composing processes. The method seeks to address two severe methodological limitations: A lack of real-time data to allow first-hand observation of the composing processes; and a lack of methodology to connect the
behavioral description in real-time data to writers’ internal cognitive processes. As an effort to achieve these objectives, this chapter describes the corpus and its companion interface, datasets, collection procedures, and analytical technique. The chapter concludes with a discussion of trustworthiness of data analysis and research ethics.

3.1. Context of the study

3.1.1. Site

The research site was an intermediate/advanced ESL writing course at a large American university. The class met twice a week in a classroom and additionally, students were required to attend three writing conferences in the teacher’s office during the semester. Both locations served as venues for data collection. Screen recordings and corpus queries were collected during writing tasks in the classroom. The classroom was equipped with networked computers, which gave students access to an online corpus that the course provided as a writing resource. The corpus had a query-logging device, which automatically collected the students’ queries. The computers had screen-recording software installed as well, which the students used to record their screens. As for reflection data, writing conferences took place in the teacher’s office and each session lasted approximately twenty to thirty minutes, during which oral and written reflections were collected.
3.1.2. The course

This study is situated in one section of ESL composition class taught by the present researcher in the fall semester of the year 2008. This course was a mandated requirement for international undergraduate students. The course curriculum was developed based on the genre-based approach to writing instruction (Christie & Martin, 1997; Swales, 1990) and focused on specific target genres, including summary, reaction paper, and mini-scale research report. Using these basic genres, the students wrote on general topics consisting of language, language learning, and culture.

The course design and materials drew on suggestions from contemporary genre research, addressing three instructional areas consisting of content, structure, and lexicogrammar. The course text was Devitt, Reiff, and Bawarsh’s (2004) book written in the NR genre perspective. The book was useful for introducing genre concepts to students, as it provided activities to help student to contextualize the target genres. Many in-class activities drew on the genre analysis techniques suggested in ESP-based materials (Askehave & Swales, 2001; Swales, 1990; Swales & Feak, 1994, 2000). The activities were adapted to the course for presenting structural organization and its relationship with communicative purposes. Finally, works in the SFL perspective (Schleppegrell, 2004) provided useful resources for text-building activities with an explicit focus on lexicogrammar.

The course was divided into three Units. Following the teaching-learning cycle in SFL (Feez & Joyce, 1998; Joyce, 1992; Macken-Horarik, 2002), each unit was designed to sequence the writing tasks to help students to begin from a simple genre and move on
to increasingly complex genres. In Unit I, two basic genres in academic settings, summary and reaction paper, were introduced. With these genres, central concepts were discussed including schematic structure, rhetorical situation, and communicative purpose. Unit 2 presented a more complex academic genre – a research report. The class activities became more challenging as well, as students were asked to analyze genre exemplars and to identify and transfer the genre features to their writing. Core lexicogrammar features began to be introduced in this unit including nominalization, passive construction, and impersonal style. In Unit 3, students were asked to revise their research paper from the previous unit. Table 3.1 summarizes the course design.

Table 3.1. Course Design

<table>
<thead>
<tr>
<th>Unit</th>
<th>Target genre</th>
<th>Instructional focus / Activity / Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>Summary and reaction paper</td>
<td><strong>Focus</strong>: Genre concepts - schematic structure, communicative purposes, and rhetorical situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Activity</strong>: Describing contexts, content building, Writing self-commentary</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Topic</strong>: L2 writing and writers, learning to write in L2, writing across diverse cultures and contexts</td>
</tr>
<tr>
<td>Unit 2</td>
<td>Research report</td>
<td><strong>Focus</strong>: Lexicogrammar features - Nominalization, Passive construction, and Impersonal style</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Activity</strong>: Genre analysis, proposal presentation, and conducting a research survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Topic</strong>: Language use in various contexts and language learning</td>
</tr>
</tbody>
</table>
including e-chat, blogs, social network, language learning websites, and tools/strategies for language learning

| Unit 3 | Revision | **Focus**: Using genre to revise texts  
| Activity: Project presentation, guided revision and peer review |

Genre analysis activities played a significant role in raising students’ rhetorical awareness. Following the suggestion in Cheng (2007b), the course provided self-commentary activities that required two steps to complete: a) analysis and b) meta-analysis. First, in analysis, students reported the findings from an analysis of the course text, and then, in meta-analysis, they wrote comments on their own analysis. An example of self-commentary written by a student is presented in Figure 3.1:

<table>
<thead>
<tr>
<th>Analysis of reading text</th>
<th>Meta-analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is much limitation in doing language game even though it is good for a beginner since it is more exciting and relaxing instead of the tedious lectures.</td>
<td>I state my opposed opinion first which make my statement straightforward, and then I state the advantage of the [author’s] suggestion, because I don’t want my reader think I go extreme on my own opinion.</td>
</tr>
</tbody>
</table>

According to my own experience…

| Here I use my own experience to prove my opinion, because it will make my point more persuasive. |

Figure 3.1. Meta analysis activity
When students had gained some awareness through the genre analysis tasks, the instruction focused on helping them to transfer their awareness to writing. Two contexts were distinguished in providing help: guided performance in the classroom and individual performance outside the classroom. In the classroom, various assistance was provided including in-class lectures, written and oral feedback, peer group discussions, and revision activities. As for the context of individual performance, students were provided with exemplar texts and a range of tools including the course corpus and an online-concordancer (The Collins Online English corpus sampler). In addition, students were introduced to other tools such as online dictionaries and multilingual translation websites. Although students were encouraged to use whatever tool(s) they found useful, the course provided an opportunity to inform their choice through classroom discussions about the advantages and disadvantages of these tools.

3.1.3. Participants

Seventeen undergraduate students enrolled in the course and twelve students participated in the study by signing a written consent. Among these participants, three focal students were selected based on the inclusion/exclusion criteria of the study. This study excluded those students who have not consented to provide all three types of data - audio, video, and screen capture or have not participated in all in-class task assignments and stimulated recall interviews. The study included the students who shared L1, major
discipline, and comparable experiences in L2 writing to minimize the influences of these variables on their writing performance and interactions with the corpus.

The three focal students, two females and one male, were from China and spoke Mandarin as their first language. All three students were business majors with shared interests in marketing and finance. They had approximately one year’s experience of taking general English courses either in an international school in China or in a language course in North America. Such a focal group was not predictable, but not surprising, either, as Chinese students were the largest L1 group in the class - eight out of seventeen enrolled students and six out of twelve students who consented. The names of the focal students are Jingjing (female), Yining (female), and Yushi (male). These are the participants’ real names, given with their permission.

3.2. The corpus and search engine

This section describes the corpus-based system that is equipped with a specialized corpus with genre and discipline specific corpus and a companion search engine. Description includes the content and size of the corpus, the web interface, through which the students accessed the engine to search the corpus, and the query log that the system generates.
3.2.1. The corpus

As a resource for the course and a research tool as well, this study compiled a corpus and developed an interface to access the corpus. Simply an electronic collection of academic texts, the corpus has about 350,000 words. The size was determined based on discussion of specialized corpora for pedagogical purpose (Aston, 1997). The corpus consists of academic journals in the broad topic areas of communication, language learning, and technology. These topic areas were chosen based on their relevance to the course reading texts and discussion topics.

The database of the corpus is ‘virtually’ compiled, i.e., the corpus exists as a collection of hyperlinks that point to academic journals accessible via Internet, rather than physically stored texts. Virtual compilation was considered as an optimal method, as collecting discipline-specific texts was an extremely time-consuming task.

3.2.2. Corpus interface

A special characteristic of the corpus is that it has a companion search engine. The interface refers to this engine and a website in which the engine was housed. The corpus interface was developed to address the particular needs of the course. Because the course curriculum focused on the specific target genres, as opposed to general essay writing, the need for a discipline-specific collection of genre exemplar texts was an important concern during the curriculum development. The course developers chose corpus technology to address the issue as this choice allowed for a prefabricated search engine service (Google
A useful feature of the engine was its flexibility, which was such as to allow the course designers to easily collect and modify the contents of the corpus. Thus, when a simple website was added to the engine as an interface, the corpus was ready to provide the students with fast and stable access to the genre exemplars throughout the semester. A snapshot of input screen of the interface is shown in Figure 3.2:

The user interface of the engine was intuitive to the students. As the search interface allowed multiple-word search, students could simply type in multiple words and phrases in order to consult the corpus. The search engine enabled users to zero in on appropriate sentences by taking multiple search words as input and allowing the users to revise the searches easily. Search results were contextualized as they were displayed in whole sentences, which were linked to the full-text documents. Figure 3.3 shows an example of consulting the corpus with a search example, “fundamental difference.”
Figure 3.3. Search results display

The initial query, “fundamental difference,” can be easily revised to include “there is” and queried again (Figure 3.4):

A GESTALT CRITIQUE OF PURPOSEFUL BEHAVIORISM The purpose of this ... However, there is a fundamental difference between Tolman's view of male behavior and the Gestalt view of behavior. Tolman still attempts to derive values ... content.apa.org/journals/orv/41/4/381.pdf

PsycARTICLES - Why Positive Information Is Processed Faster The ... In these data, there is a substantial negative correlation between the ... but originated in a fundamental difference between positive and negative attitude ... content.apa.org/journals/ssp/96/1/05.html by C Umkelbach - 2006 - Cited by 2

PsycARTICLES - Collective Induction: Social Combination and ... However, there is one fundamental difference. The experimenter indicated whether each hypothesis was correct or incorrect. There is no such omniscient ... content.apa.org/journals/ssp/45/3/605.html by PR Laughlin - 1965 - Cited by 22 - Related articles

"AMBIGUOUS CONDITIONING: A PHENOMENON OF BILATERAL TRANSFER That there is no fundamental difference between the behavior of dogs 1 to 3 and dogs 4 to 6, except with respect to the rapidity of transfer ... content.apa.org/journals/com/26/1/63.pdf

Figure 3.4. Revised search results
Students were given a one-hour tutorial session in the first month of the semester and then asked to complete three short exercise tasks to become familiar with the tool.

The choice of a custom search engine was not made in accordance with the suggestions in the corpus-based pedagogy literature, which recommended desktop or online concordance software (also known as concordancers) for corpus search. Desktop concordancers work by storing and searching text data on the users’ PCs, while the users access online concordancers via the Internet. The present study, though, had strong theoretical as well as practical rationales for choosing a custom search engine over both desktop and online concordance software. First, the course needed to access a specialized corpus of target academic genres. This ruled out most online concordance services (e.g., the British National Corpus and the Collins Cobuild Corpus), as they do not allow users to modify the database or point the concordancer to a new database. Second, contemporary genre theory observes that genres constantly change over time and across discourse communities. This dynamic view of genre disqualified desktop concordance programs that work offline, as they could not sufficiently reflect the change in the target genre as it occurred.

Finally, both kinds of concordance software required a considerable learning curve. In contrast, most students were already familiar with the search engine. Thus, when introduced to the class, the interface required a minimal learning curve and little user effort.
3.2.3. Query log

A query is a search that writers enter in order to consult the course corpus. The query log in this study, thus, simply refers to a list of searches that writers entered while consulting the corpus. In order to record the search queries, a computer program was written (Python) and attached to the corpus interface. The program received and saved the queries in a computer database (MySQL), from which a log of search queries could be retrieved. Figure 3.5 shows an example of the retrieved query log:

![Query log retrieval](image)

The log contains three kinds of key information among others: timestamps, search queries, and sign-in pseudonyms.
3.3. Screen recording and stimulated recall

The present study used screen-recording software (iShowU) to record the students’ computer screens in real-time\(^2\). Screen-recording software became available in the classroom computers before the semester began:

![Screen recording software](image)

Figure 3.6. Screen recording software

The program runs in the background without interfering in students’ writing processes. When the writing session is over, the program created video clips of the computer screen, which were saved and played as digital movies later on. If necessary, these files could be further edited into smaller files for a follow-up analysis (Figure 3.6).

Once the video clips and corpus query log had been collected, the students were asked to attend stimulated recall sessions. Stimulated recall in this study refers to a

\(^2\) http://www.shinywhitebox.com
common technique in real-time data studies for eliciting participants’ recollection (Lindgren & Sullivan, 2003). In this study, the recall sessions were integrated in regular writing conferences as required course activity. Prior to the recall sessions, the teacher reviewed the screen recordings to prepare the questions (Figure 3.7).

![Review of screen recordings](image)

Figure 3.7. Review of screen recordings

In these sessions, the video clips were played back and the students watched the clips with the instructor. The student or the instructor could pause the clip for questions and comments at any time during the session. The sessions were audiotaped and transcribed. Figure 3.8 shows the playback example:
This study analyzes three types of data: (1) screen recordings, (2) oral and written reflections, and (3) the query log. During the semester, six screen recordings were collected from each participant. For the focal students of this study, the total length of the screen recordings was 424 minutes and the average length was 24 minutes. Each class session lasted 75 minutes and students were given approximately 30 minutes for each of the six in-class writing tasks. The data were collected while the students were engaged in authentic writing tasks, i.e., the students were not doing exercises or tasks for the purpose of eliciting data. The students worked on graded in-class writing tasks or drafts of a major assignment, and thus, they brought their usual attention to the work. The oral reflections were collected in audiotaped stimulated recall sessions that students attended during the
semester. The written reflections were collected from student papers and electronic bulletin board postings.

In addition to these two kinds of data, search queries were collected automatically by the corpus interface and stored in a database. These queries were retrieved from the corpus toward the end of the semester. Queries collected in the first six weeks of the semester are not included in the dataset, as in-class tutorial sessions took place in the first month. Thus, over an approximately two-month period, the focal writers performed 329 queries. Table 3.2 summarizes data type and description:

Table 3.2. Data Type and Description

<table>
<thead>
<tr>
<th>Data type</th>
<th>Description (format)</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen recordings</td>
<td>video clips of computer screen action</td>
<td>Jingjing: 194 minutes</td>
</tr>
<tr>
<td></td>
<td>(H.323 compression)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yining: 109 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yushi: 121 minutes</td>
</tr>
<tr>
<td>Oral/written reflections</td>
<td>audio recordings of writing conferences</td>
<td>Various</td>
</tr>
<tr>
<td></td>
<td>(mp3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Journals and bulletin board postings</td>
<td></td>
</tr>
<tr>
<td>Search query log</td>
<td>Lists of search words</td>
<td>Jingjing: 48 queries</td>
</tr>
<tr>
<td></td>
<td>(MySQL database)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yining: 194 queries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yushi: 87 queries</td>
</tr>
<tr>
<td>Written assignments</td>
<td>Major assignments</td>
<td>3 assignments for each student</td>
</tr>
</tbody>
</table>
The query log has a special importance to this study, as it constitutes the “additional layer of data” to address the validity issue in real-time writing research. It was pointed out earlier that analytical validity is at stake if a conclusion about the internal cognitive processes is drawn based solely on our interpretation and/or the participant’s narratives. Thus, in a slight disagreement with Geisler and Slattery’s (2007) emphasis on the writer’s consciousness, this thesis suggests that we may improve analytical validity through a kind of data that mediates between real-time data and cognition. Specifically, this paper hypothesizes that search queries closely interface with writers’ thinking processes, as queries are, by definition, created to address (and thus reflect) their cognitive needs. In that sense, no query is random and all queries have a specific purpose. Then, analysis of these search queries may lend stronger support to our inferences regarding the cognitive processes of writers given that we will base our data interpretation on logical reasoning, rather than on our intuition and/or the writers’ perceptions.

3.5. Data analysis procedure

Data analysis was performed using a two-step procedure. In order to develop basic research tools, i.e., to define what to analyze and how, a pilot analysis was required. This pilot study was necessary due to the lack of an analytical scheme for query analysis in the literature. The objective of the pilot analysis was two-fold: to identify the unit of analysis and to establish a data-coding scheme. Three primary data—screen video clips,
oral/written reflections, and the query log—were reviewed multiple times in order to identify consistent patterns across these data. When the pilot analysis identified the analytical unit and the coding scheme, a main analysis was performed on a focal writer’s data to document her composing process.

### 3.5.1. Analytical framework of corpus consultation

For developing an analytical framework, this study conducts a grounded analysis of the data. For a formal description, the study started with the model of classroom discourse analysis (Sinclair and Coulthard, 1975), as there was structural similarity between the corpus consultation and classroom interaction. For example, the interaction between students and the corpus is bidirectional, taking turns asking and answering questions, which is similar to an interaction in the classroom. Beyond this structural similarity, however, LCI fundamentally differs from the structural sequence that the model describes. The pilot analysis shows that in LCI, it is students’ agency that initiates their interaction with the corpus system and constructs the learning outcome. As students interact with an artifact, rather than a teacher, they engage in the cognitive processes that share little in common with the hierarchical structure described in the classroom model. Therefore, this study uses the structure minimally as a basis for formal description of LCI. As a primary analytical method, this study performs a more grounded analysis and develops an appropriate analytical framework of LCI.
3.5.2. Unit of analysis

Three primary data, screen video clips, oral/written reflections, and the query log, were reviewed multiple times in search of consistent patterns across these data. An initial analysis of the data suggested that the focal student’s composing processes were organized in chunks that formed discernable patterns, which seemed to reflect her writing needs followed by an effort to address those needs. The present paper refers to such a sequence as a “transaction.” Conceptually, a transaction in a composing process is identified based on three characteristics: (a) it is motivated by a particular problem or challenge, (b) it looks for a single target discourse item, and (c) it normally begins and ends with a visual signal (e.g., beginning with mouse cursor highlighting and ending with scrolling away). The next step was to formally define a transaction. The following example obtained from a student’s screen recording illustrates a formal transaction boundary.

<table>
<thead>
<tr>
<th>Original text</th>
<th>Internet will take place of paper backs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge</td>
<td>The definite article</td>
</tr>
<tr>
<td>Target item</td>
<td><em>the</em></td>
</tr>
<tr>
<td>Beginning signal</td>
<td>movement of the mouse cursor over the text</td>
</tr>
<tr>
<td>Query 1</td>
<td>take place of</td>
</tr>
<tr>
<td>Query 2</td>
<td>take <em>the</em> place of</td>
</tr>
<tr>
<td>Ending signal</td>
<td>textual revision and scrolling away</td>
</tr>
</tbody>
</table>

| Revised text           | Internet will take *the* place of paper backs |

Figure 3.9. Transaction
Figure 3.9 shows that a transaction is a formally identifiable phenomenon. In the query log, the student’s searches (Query 1 and 2) constitute a group that can be isolated from one another, and these groups of queries can be connected to the corresponding visual signals in the screen recordings (see the following section on data coding). Also, description in stimulated recalls shows that the formal boundary of the transaction corresponds to the reflection data as well: the writer describes the writing process in a series of narrative episodes, each of which has an identifiable beginning and end. Typically, the writer begins a reflection by commenting on the beginning signal (moving mouse cursor) and concludes the narrative with a comment that corresponds with the ending signal (revision and scrolling away) in the screen clip. This sequence shows that the writer perceives a challenge and an ensuing effort as an identifiable event, which gives further support to the proposal that the transaction is an appropriate unit of analysis. Traditional units such as words, sentences, and paragraphs do not capture the writer’s conceptualization. In contrast, transactions allow us to reorganize a composing process in a meaningful boundary of writers’ needs and responsive effort in a way that is consistent with the writer’s perceptions.

3.5.3. Form/Function analysis

This thesis offers a formal and functional analysis of the composing process. In formal analysis, the objective is to identify transactions and describe the motivation based
only on the form. In the above example, two searches, “take place of” and “take the place of,” constitute a transaction. The transaction, as identified in the previous section, allows us to locate the learner’s need and make an informed guess about it. By comparing the two related queries, we may conclude with a fair degree of confidence that the transaction revolves around a syntactic issue, i.e., the article system. At this point, of course, the conclusion is based only on the form reflected in the query log.

In the functional analysis, this thesis connects formal transactions to a writer’s hypotheses and strategies by considering the content of the data. If the formal analysis seeks to answer what the challenge was, the functional analysis focuses on how the challenge was met. In addition to the formal analysis of the query log, the screen video clips further show that the writer was comparing two example sentences in the search results:

<table>
<thead>
<tr>
<th>Original text</th>
<th>Internet will take place of paper backs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search result 1</td>
<td>Thus, he announced that the premiere performance of &quot;Hamnet&quot; would take place at 20:00 GMT . . .</td>
</tr>
<tr>
<td>Search result 2</td>
<td>Nothing can take the place of a human person. That is my bottom line…</td>
</tr>
<tr>
<td>Revised text</td>
<td>Internet will take the place of paper backs</td>
</tr>
</tbody>
</table>

Figure 3.10. Linking search results and revision in transaction

These two example sentences from the corpus lead to the subsequent revision in which “the” is added to the writer’s sentence, resulting in “Internet will take the place of
paper backs.” From the first search result, the writer noticed the discrepancy between the intended meaning in the original text (“replace”) and the meaning in the example sentence (“occur”). Then the writer formed a hypothesis about a correct form, tested it out in the next query, and accepted the hypothesis by confirming it in the second search result.

The next step in the analysis is to connect our interpretation of the transaction to the writer’s perception of the process as it is given in the reflective narrative. This step looks for consistency of content between the data sources:

I was not sure about whether “take place of” or “take the place of” is correct. At the beginning, it [the corpus] didn't solve my problem, because I didn't pay attention to the actual results. Only by simply comparing the number of results from “take place” and “take the place”, I chose to use take place here. [However], I noticed that although “take place” provides more results, none of them are in the form of “take place of”. Then I tried “take the place” to see it’s correct.

(December 13, 2008)

Despite its brevity, the writer’s reflection has all the essential components and maintains the canonical sequence of a narrative (Labov & Waletsky, 1967). The writer began the reflection with an orientation, “I was not sure,” followed by the content of the story. Then came the complication, when the writer described how the initial assumption (“At the beginning, it didn’t solve my problem”) was challenged by a later discovery (“I
noticed that”). Finally, resolution was reached when the writer tried a new query to resolve the issue (“Then I tried”).

In the reflective account, there is a consistency between the formal boundary and the content. In terms of form, the writer seems to encode the need and a following effort in an “episode,” which suggests that this particular portion of the composing process is structured in a bipartite format: first, noticing a problem (analyzing the search results, noticing the discrepancy), and then, solving the problem (setting up and testing a hypothesis). As for the content, likewise, all data sources converged on an event that consisted of an issue being raised—a confusion about “the”—which was eventually followed by resolution of the issue—a query aimed at resolving the issue.

In determining the transaction boundary, similarity overrides proximity. Some queries in one phrase or sentence may not share formal properties. Despite the proximity, then, they are considered as two distinct transactions. For example, Yining looked up two queries, “benefit to” and then “not only” to write one long sentence:

Example 1. Identifying transactions

**Original text**: Obtaining a decent writing skill will not only help people to achieve their academic success, but it will also benefit people to pursue their career successes in the future.

**Query 1**: benefit to (Query #1732)

**Query 2**: not only (Query #1733)

(Yining’s Paper #2, November 16, 2008)
The two queries in the example do not share any formal property although they are adjacent and they have resulted in the textual change in the sentence. Then, these queries are considered two distinct transactions. The example suggests that the students may be considering multiple problems at the same time, and therefore, their queries may be intended to handle more than one problem at a time. Then, the difficulty in identifying the transaction boundaries is not an issue of its adequacy as an analytical unit, as it may be reflecting the complexity of the students’ writing process per se.

To conclude the pilot analysis, the transaction is an appropriate unit for analysis. Although the example in the sample analysis is a very simple one, it still shows that even this simple transaction involves a complicated procedure involving identifying the challenge, evaluating the resources, and testing a hypothesis. For an analysis of the complex dynamics in a transaction, a query log can be integrated into the research database.

3.5.4. Data coding

In coding the data, two formal categories of transaction, simple and complex, emerged and were used to distinguish between transactions with only one query (simple) and those with multiple queries (complex). Figure 3.11 illustrates two types of transaction in the focal writer’s query log:
To code the data, the query ID and the queries were retrieved from the database linked to the corpus. Then, the transactions were identified and manually given a serial number (Transaction ID) and coded as either simple or complex. For example, the first transaction (#ywv-08-0047) was coded as a simple transaction because it consisted of only one query (#1307), “but it will also.” The transaction (#ywv-08-0057), on the other hand, was coded as a complex transaction because it had a stretch of related queries (#1345 through #1526).

There were two reasons to code transactions as either simple or complex. First, there was a noticeable distinction in the query log between simple and complex transactions, suggesting that the analysis might benefit from isolating and examining them separately. Second, once these kinds of transactions had been identified, it was clear that the study should focus on complex transactions rather than simple ones, and thus, the distinction facilitated the coding process. Complex transactions reveal the locus of learner
needs by contrasting two related queries with a minimal difference. For example, a pair of queries “hard task” (#1521) and “difficult task” (#1524) differ minimally in regard to the adjectives, “hard” and “difficult” (Figure 3.11), indicating that the writer’s needs revolved around a lexical choice, i.e., a collocating adjective for “task.” With a simple transaction (e.g., “confused,” #1344), however, such reasoning would be extremely difficult.

The distinction between simple and complex query has further significance for this study, as these query types may parallel the writers’ thinking process. The crucial difference between these two types of transaction is in the cognitive process that motivates a change from one query to the next. Notice that such a change presupposes two cognitive processes, i.e., evaluation and hypothesis-testing. In the example, “hard task” and “difficult task,” Yining evaluated the search results and apparently found that the results did not satisfy her needs. Then, she hypothesized that “difficult task” was a better choice than “hard task” and she went on to test her linguistic hypothesis in the next query. Her query refinement in the complex transaction reflects these cognitive processes. Thus, it is important that complex transactions be distinguished from simple transactions in the early stage of data coding.

3.6. Trustworthiness of data analysis and ethical issues

Trustworthiness in this study is ensured by its effort to achieve methodological rigor in collecting and analyzing research data. Discussion of trustworthiness focuses on
three areas - internal validity, external validity, and reliability. In qualitative research, high validity is achieved by reducing researcher bias (Johnson & Saville-Troike, 1992), while reliability is enhanced by providing a well-defined and replicable scheme for data coding and analysis. Researcher bias can be minimized by collecting relevant data and basing the interpretation of findings on empirical evidence. Reliability depends on the extent to which a researcher provides operational definitions of analytical units and clearly documents the procedures to study the units in a replicable manner.

As the composing process research in LCI is an under-explored area without robust documentation, the issue of ensuring trustworthiness in this study is fundamentally an issue of obtaining trustworthy data. In this area of research, the issue of lacking trustworthy data can and has undermined research validity. None of the previous studies, to the utmost of my knowledge, has actually observed the composing process in LCI in real time as a text unfolds. Then, there is clearly an issue of trustworthiness when a study discusses a process or an interaction without directly observing the process and the interaction. Furthermore, even when first-hand, real-time, observation data is available, there is an issue of connecting such data to the internal cognitive process.

With the methodological gap in mind, this study ensures internal validity in two ways: by employing computer-aided techniques to collect real-time data and by developing an analytical technique to analyze an additional layer of data, i.e., the search queries, for data triangulation. While real-time data enhances internal validity by allowing direct observations of the focal students’ composing processes, the analytical technique bases the interpretation of real time data on evidences from the query log.
The external validity of this study is enhanced through its realistic research context. The emphasis on the realistic setting is based on a belief that it is theoretically impossible to replicate a hypothetical lab setting exactly in real-world writing contexts and therefore, a higher degree of external validity is achieved when the research context becomes closer to realistic writing situations. Engineering the research condition by imposing the use of a corpus on students reduces external validity. This study is careful to examine data as it emerges in a naturalistic setting, and thus, enhances external validity.

In order to ensure that this study is examining a realistic context, no elicitation tasks are imposed on students, either as homework or as in-class activities, in order to observe student-corpus interaction as it naturally occurs. Although there were three short tutorial exercises in the first month of the study, this study carefully excluded all the data collected during this period and the following month. To further enhance external validity, this study recognizes and respects the students’ right to opt out, i.e., to not use the corpus. In fact, students were introduced and encouraged to use a range of other tools as well as the corpus. With regard to the reflections, students could comment on their experiences of using the course corpus. However, they did not have to, as they could choose to write about any other topic (e.g., language use on Facebook) as long as it was related with the course contents. The right to opt out was one of the key differences from the previous corpus-based studies, in which students were required to use and write about a corpus. As none of the writing tasks in this study required that students use the corpus, they could simply choose not to use the course corpus and even opt for more familiar tools such as electronic dictionaries and translation websites.
In regard to reliability, this study enhances trustworthiness by providing operational definition of analytical units and a replicable description of the analytical procedure. This study has provided a working definition of the analytical unit, transaction, in the pilot analysis, and provides definitions of the other structural units as they emerged in the main analysis. The rationale for using these units is based on an established framework of discourse study and is articulated in the description of the methodology. The study has presented a sample analysis and coding scheme in detail in order to allow a replication of coding and analysis. Much time was spent in refining the operational definitions of the units of analysis and in developing a replicable analytical procedure. For future research, the study carefully documents and reports the confusions and limitations in data coding as well.

Participation in the study was voluntary and followed the university's prescribed IRB procedure. Students consented by signing written forms, which were collected by a co-investigator of the study and kept in his locked cabinet until the semester was finalized. In order to avoid any potential coercion, no extra credit was offered in return for participation. All activities in this study were integrated part of the course curriculum, and every student who enrolled in the course had the right and responsibility to participate in, and benefit from, the activities regardless of their participation.
CHAPTER 4

ANALYSIS OF DATA

This chapter explores students’ interaction with the corpus in terms of form and function. It begins with developing an analytical framework to understand the formal characteristics of learner-corpus interaction (LCI). Specifically, a four-level structure is proposed in which formal units of analysis are identified. Next, functions of the units are documented by cross-examining them with the qualitative data. The primary goal of data analysis in the following section is to identify a) formal structure of LCI and b) functions of the structural units. The analysis is initially concerned with isolating units and sequences in LCI (formal analysis). It then identifies learners’ information needs that each unit serves to meet (functional analysis). This study further shows that the analytical framework can extend beyond the one-semester period of the course to examine the post-course queries. The post-course query analysis serves as empirical data to support the interpretation of students’ retrospective accounts of their experiences. This chapter begins with the form/function analysis and connects the findings from these analyses to student reflections of their perception of LCI.

4.1. Formal analysis

Analysis in this section is formal: the primary goal of this section is to identify structural units in LCI. The structure of LCI can be divided into a series of levels, with
Consultation as the largest unit, followed by transaction, exchange, and then move as the smallest unit. Consultation represents LCI as a goal-driven activity - with a goal of completing a particular writing task. Transaction is a set of queries that share formal characteristics and occur around a targeted discourse item and the corresponding learner needs. Exchange, the next formal unit, consists of a single query – retrieval – evaluation sequence (hereafter, the QRE sequence). Move refers to each of these three components of exchange. In query, students enter a search to consult the corpus. Then, the corpus, responding to the query, retrieves and shows the search results. Finally, during the evaluation move, students review the retrieved results and choose to (or not to) refine their query. Query and retrieval are physical operations of keying in the search words through keyboard, and displaying the results on the screen. Evaluation, on the other hand, is non-visible, cognitive operation. Table 4.1 presents the structure of LCI:

Table 4.1. Four-level Structure in LCI

<table>
<thead>
<tr>
<th>Level</th>
<th>Formal description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation</td>
<td>A series of interaction organized around a task</td>
<td>Writing a reaction paper for written assignment</td>
</tr>
</tbody>
</table>
| Transaction | Single or a series of queries intended for a target feature | Simple transaction:  
Query: “but it will also”  
Complex transaction:  
Query 1: “take place of”  
Query 2: “take the place of” |
| Exchange | Single instance of user – corpus | Query: “take place of” |
interaction; Exchange typically consists of the query – retrieval-evaluation sequence

Retrieval: Thus, he announced that the premiere performance of "Hamnet" would take place at 20:00 GMT . . .

Evaluation: Query refinement based on the negative (or non-) evidence

Move The turn a user or a corpus takes

Query: keystrokes

Retrieval: Screen display

Evaluation: Not formally defined

Corpus consultation is a recursive process. Hypothetically, users may repeat the QRE sequence unlimitedly. During the evaluation move, users decide either to accept the search result (and use it for their writing) or to reject it and refine their query. Query refinement may and does recur in LCI. Figure 4.1 illustrates query refinement and QRE recursion in LCI:

Figure 4.1. Query refinement and QRE recursion in LCI
Recursive query refinement is the key difference between human conversation and LCI. In human-human conversation, unlimited repetition of a query is unlikely to take place. Such recursions would occur, if at all, only when a participant in a conversation asks the other participant similar questions multiple times. Examples are very limited to conversations between doctor-patient (examination), police officer-suspect (police interview), child-parent (learning), and language game players (e.g., Twenty Questions). In these interactions, the participants test and revise their hypotheses through repetition. In LCI, on the other hand, multiple query refinement is normal, as LCI does not follow the pragmatic rules of human conversation. Recognition of query refinement is, thus, a fundamental step in formal analysis of LCI.

4.1.1. Consultation

Consultation refers to all corpus-related activities that students perform in order to complete a writing task. A consultation typically begins with an announcement of a writing task assignment and it ends with the completion (i.e., submission) of the assignment. The temporal identification of consultation is opposed to a spatial definition that would confine the corpus use to a particular location, e.g., a classroom. A time-based perspective usefully reflects the realistic context of LCI in which students accessed the corpus from varying locations beyond the classroom. The time-based definition of a writing task draws on the notion of “a system of genre” (Bazerman, 1994; Yates &
Orlikowski, 2002) in genre theory, which views genres as a series of writing activities that writers engage in to complete their writing task.

In the present study, consultation is a (computational) reflection of the students’ needs in coping with the target genre system. The focal students engaged in a range of genres to get their writing task done. For example, in order to complete a formal written assignment, they wrote e-mail messages to the instructor, took notes in the class, discussed the course readings in bulletin board postings, summarized their ideas in reaction papers, and wrote a proposal as well as several drafts. These genres form a system that accounts for the students’ information needs, or the motivation for consulting the corpus. Then, corpus consultation is best described by tracking students’ interaction with the corpus over a stretched span of time, within and outside the classroom. Three consultation sessions have been examined in this study in three formal writing tasks.

Table 4.2 summarizes the consultation sessions:

Table 4.2. Consultation Sessions

<table>
<thead>
<tr>
<th>Task: Target genre</th>
<th>Sub genres</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paper 1: Reaction paper</strong></td>
<td>Summary</td>
</tr>
<tr>
<td>Announced: 9/23</td>
<td>Annotated bibliography</td>
</tr>
<tr>
<td>Submitted: 10/12</td>
<td>Reaction paper</td>
</tr>
<tr>
<td></td>
<td>In-class reflection writing (on course readings)</td>
</tr>
<tr>
<td><strong>Paper 2: Position paper</strong></td>
<td>Report</td>
</tr>
<tr>
<td>Announced: 10/21</td>
<td></td>
</tr>
</tbody>
</table>

73
4.1.2. Transaction

The focal students consulted the corpus in 212 transactions. This means there could be maximally 212 challenges that motivated these writers to consult the corpus. The frequency of transaction varies across the students: Yining is the most active user of the corpus with total 118 transactions. Yushi consulted the corpus in 57 transactions which is about half of Yining’s transactions. Jingjing was the least frequent user of the corpus with 37 total transactions. On the average, there are approximately 23 transactions per student for each writing task. A summary of three focal students’ transactions in all nine writing tasks is presented in Table 4.3:

Table 4.3. Frequency of Simple and Complex Transactions

<table>
<thead>
<tr>
<th>Transactions</th>
<th>Frequency</th>
<th>Number of queries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>92 (77.97%)</td>
<td>92 (47.43%)</td>
</tr>
<tr>
<td>Complex</td>
<td>26 (22.03%)</td>
<td>102 (52.57%)</td>
</tr>
<tr>
<td>Sum</td>
<td>118</td>
<td>194</td>
</tr>
</tbody>
</table>

Yushi

Simple

41 (71.93%) 41 (47.13%)
Connecting transaction frequency and query frequency

For the focal students, simple transactions (N=162) outnumber complex transactions (N=50) by approximately three times. Yining seems to be the most active user of complex transactions (N=26), followed by Yushi (N=16), while Jingjing looks as if she used very few complex transactions (N=8). The greater number of simple transactions, however, should not be interpreted as constituting the superior influence of simple transactions. If considered in terms of query, complex transactions have more queries than simple transactions. In fact, Table 4.3 shows that the transaction types had an almost equal number of queries: 162 queries for simple transactions and 169 queries for complex transactions.

If the number of queries in simple transactions is compared with that of complex transactions between students, the results become more interesting. Although the total number of simple transactions was far greater than that of complex transactions, the number of queries within these transactions showed the opposite. For two focal students
out of three, the number of queries in the complex transactions is even greater than that of simple transactions: Yining has 92 simple queries and 102 complex queries, while Yushi has 41 simple queries and 46 complex queries. This balance implies that the simple and complex transactions may have been contributing to the students’ problem solving to a comparable degree.

4.1.3. Exchange

Exchange refers to a single pair of a user query and corpus response. Exchange in this study is the minimum unit of interaction (cf., p. 53). Unlike exchanges in human conversation, the exchanges in LCI have little structural variation. In turn-taking sequences, the first turn is always the user’s request and the next is always the corpus response.

Typically, Exchange has a tripartite structure: An exchange begins with keying in a search (Query), which retrieves results from the corpus (Retrieval), and then ends with an assessment of the search results (Evaluation). The first two components, Query and Retrieval, are formal processes, while the third component, Evaluation, is a cognitive process. As a non-formal component, evaluation serves only as a placeholder in the present formal analysis. While the content of evaluation will be inferred later in the functional analysis, evaluations will be simply marked either as ‘continue’ or as ‘not continue’ at this point of a formal analysis. A ‘continue’ indicates that an evaluation has resulted in an extended query, while ‘not continue’ indicates that no query refinement
occurred as a result of the evaluation. Yushi’s exchange in Figure 4.2 illustrates the QRE structure in his exchange:

<table>
<thead>
<tr>
<th>Exchange</th>
<th>Query 1</th>
<th>take place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrieval</td>
<td>Thus, he announced that the premiere performance of &quot;Hamnet&quot; would take place at 20:00 GMT . . .</td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>(Continue)</td>
<td></td>
</tr>
<tr>
<td>Query 2</td>
<td>take the place</td>
<td></td>
</tr>
</tbody>
</table>

(Yushi’s screen capture, December 12, 2008)

Figure 4.2. Exchange structure

In the example, Yushi queried, “take place,” and the corpus retrieved a series of results (Figure 4.2 shows one of them). In response, Yushi evaluated the search results and decided to “continue,” i.e., to refine the query.

The three focal students performed 329 exchanges during the semester. As exchanges in LCI always have the QRE sequence, the number of total exchanges is equal to the number of queries (Table 4.3). In 329 exchanges, students searched for 772 tokens (257 token queries per student) and 342 types (114 type queries per student). Table 4.4 presents the descriptive statistics of the exchanges and the type/token ratio (TTR) of the queries:
Table 4.4. Descriptive Statistics of Exchange

<table>
<thead>
<tr>
<th></th>
<th>Exchanges</th>
<th>Token</th>
<th>Type</th>
<th>Type/token ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yining</td>
<td>194</td>
<td>Mean: 3.84</td>
<td>Mean: 0.98</td>
<td>40.3</td>
</tr>
<tr>
<td></td>
<td>N: 477</td>
<td>N: 192</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yushi</td>
<td>87</td>
<td>Mean: 2.34</td>
<td>Mean: 1.06</td>
<td>45.8</td>
</tr>
<tr>
<td></td>
<td>N: 203</td>
<td>N: 93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jingjing</td>
<td>48</td>
<td>Mean: 1.92</td>
<td>Mean: 1.12</td>
<td>62.0</td>
</tr>
<tr>
<td></td>
<td>N: 92</td>
<td>N: 57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum</td>
<td>329</td>
<td>Mean: 2.7</td>
<td>Mean: 1.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N: 722</td>
<td>N: 342</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.4 shows that the students’ queries were relatively short - averaging about 2.7 words (tokens) per exchange. Yining consulted the corpus most often (194 times) and her query words were longer (Mean = 3.84) than the other two students (Mean = 2.34 and 1.92). The general impression is that the length of the query increases in proportion to the number of exchanges. That is, the more often students consult the corpus, the more search words they tend to enter per query. On the other hand, the frequency of unique words (types) shows that the students used (at least) one new word for each exchange (Mean = 1.05). The more the students used the corpus, the fewer new words they seemed to introduce in the refined queries. This finding indicates that students were refining queries by making a small change each time, i.e., by substituting one word with another, rather than revising the entire phrases or sentences.
Then, the relationship between the types and tokens of the query words may offer a useful insight into the students’ corpus use: TTR can serve as an index that reflects the students’ querying behavior. The ratio is inversely proportional to the frequency of query refinement. If the students recycle more words in order to refine their queries, TTR decreases. For example, Yining looked up the corpus 194 times and there were 192 new words, indicating that she refined her query by substituting approximately only one word of the previous queries. Yining did this partial replacement in order to zero in on the target item. Due to the refinement, her TTR goes down to 40.3%. On the other extreme, Jingjing did not refine her query in most cases. She consulted the corpus in 48 exchanges, and there were 57 new query words. As a result, TTR goes up to 62.0%, which implies that Jingjing did not refine her queries as often as Yining did.

To summarize the findings, if the total numbers are equal between two users, the higher TTR means greater differences between the queries, while the lower TTR means smaller differences. A user with a higher TTR tends to have performed simple queries, while a user with a lower TTR is more likely to have performed complex queries, making little changes in each query.

4.1.4. Move

A move is the smallest unit in the LCI structure. While a user and a corpus take turns, each of these turns is an individual move. Three structural moves are discussed: query, retrieval, and evaluation. Formally, a query consists of the user command and the
content. The content of command in the students’ query is, almost invariably, ‘search and display all the matches.’ As the content is implicit, unmarked, and does not vary, commands are typically omitted – unless there is a need to make it explicit. Content refers to the search words, which is explicit. For example, Yushi’s query, “take place,” consists of a command that orders the corpus to fetch all matches to the content words in the search, “take place.”

In order to do more than the default pattern match, users can make a command explicit and modify it. For example, users can add special symbols (e.g., a plus sign, a colon, and quotes) to add a special meaning to a command. Yining used quotes (“ ”) to tell the corpus to fetch only the instances that exactly match her query:

Example 2. Command and content in Query

<table>
<thead>
<tr>
<th>Query #1744</th>
<th>Command</th>
<th>Implicit: Fetch the keyword matches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Content</td>
<td>misused word usage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Query #1752</th>
<th>Command</th>
<th>Explicit: Fetch the keyword matches but include only those that exactly match the keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Content</td>
<td>“sentence strucutral problems”</td>
</tr>
</tbody>
</table>

(Yining’s query log)

Query #1744 has a command that tells the corpus to retrieve all instances (i.e., sentences and documents) that contain any or all of the words, “misuse,” “word,” and “usage.” On the other hand, Query #1752 uses the quotation marks to modify the command explicitly so that the corpus fetches all and only the sentences that have the
exact same words in the same order as in the query content. Notice that there are misspelled words, “structral poblems” in the query. In this case, the corpus would return no match unless there is a phrase that has the exactly same misspelling. Although the explicit commands can be a very useful technique, the focal students rarely used it. Only three explicit commands were observed. They were “difficult task,” “sentence strucutral poblems,” and “Language tools, developed, skills” - with the quotations marks (Yining’s log).

Unlike the query move, retrieval and evaluation moves are internal, and therefore, are hidden logic of the search engine and users. Retrieval is a move in which the corpus performs text search and displays the results in response to the user’s query. Three formal steps within the retrieval move include: a) interpretation, b) search, and c) display. Interpretation is the way a search engine understands the users’ needs. Search is the engine’s internal logic for identifying matches. Display is the way a search engine shows the search results in the visual interface. Among these three steps, interpretation is most relevant for LCI analysis, as it is where the students’ needs should be reflected. For example, Yining was looking for a potential adjective that collocates with a noun, “task,” while the search engine did not allow her to search by part-of-speech search. Such a need can be reflected in the interpretation step to take a non-lexical query.

Evaluation is the final move in which a user decides whether to refine a query. As a cognitive process, the evaluation move is not formally identified. However, the evaluation move may be observed indirectly through behavioral patterns that co-occur with it. These patterns consist of psychomotor operations such as keyboard typing (e.g.,
cutting, copying, pasting texts), browsing (e.g., scrolling up and down; shuffling between pages), and mouse movement (selecting; highlighting; cursor hovering; clicking). For example, if the focal students often highlighted the sentences in the retrieved results with the mouse, then the highlighting operation is likely to suggest that they are reading the highlighted parts. In this study, these formal characteristics of the evaluation move are referred to only when it provides visual signs for identifying transactions.

4.2. Functional analysis

The analysis in this section is functional: it will show how each unit of LCI helps students to address their lexicogrammatical challenges. While the objective of the formal analysis was to describe what the units are, functional analysis aims to describe what the units do and how the students’ needs were met within these units. Going beyond the formal description, functional analysis extends the boundary of investigation to include the content as well. The analysis begins with investigating the difficulties that students face and then it tracks their problem-solving process in LCI. The findings will show that the focal students have idiosyncratic difficulties, which range from simple grammatical issues to appropriation of the target genre discourse. It will further show that the students enhance their lexicogrammatical performance through corpus consultation.
4.2.1. Consultation: Evaluation of the corpus and self-evaluation

In Consultation, this study examines the overarching goal of the students, which is to evaluate the corpus and their self-image as a writer. Students’ evaluations of the corpus globally shape the way in which they interact with the corpus. Analysis of consultation shows that a) the students’ evaluation of the corpus is always carried out in a comparison with other tools, and that b) evaluations are closely related with the students’ perceptions of themselves as non-native speaker (NNS) writers.

4.2.1.1. Evaluation of corpus

Efficiency and effectiveness are key criteria for student evaluations of the corpus. In real-world situations, students’ time as well as their enthusiasm for the ESL writing assignment is limited. These assignments are often lower on their to-do list compared to the papers and exams in their major subject courses. The focal students in this study showed that they were aware of the limited writing resources, and they based their decision to use the corpus on their evaluation of its efficiency as well as effectiveness.

Jingjing: Corpus as error checker

Jingjing demonstrated her ability to evaluate the corpus critically with a realistic goal in mind. Comparing the corpus search engine with electronic dictionary, she commented:
“But in some cases, electronic dictionary does not help. For example, once I am not sure if I should use “interested in” or “interested at”, I tried to look up it in an electronic dictionary. But I found it doesn’t help at all; and I could not find a native speaker [to help me] immediately. Because of this kind of problem, I always made wording mistakes, and I could not receive a high mark for my paper. Since this kind of situations happened many times, I strongly felt that I need another language tool to help me. In ESL class, my instructor introduced me a website called “myCorpus”. It is a search engine. I could type my phrase there and simply click on “search” . . . After I knew this tool, I used it everytime when I write. As I know, all of my classmates use this tool as well. They all feel this tool helped them a lot when they write their paper.”

(Jingjing’s written reflection on her corpus use, November 20, 2008)

In her response, Jingjing clearly indicated that her use of the corpus was motivated by a realistic evaluation of the corpus in terms of its effectiveness in helping her “receive a high mark” as well as its comparative efficiency. She chose to keep using the corpus because it surpassed the other tool (i.e., electronic dictionary) with less effort (“simply click”).

_Yushi: Corpus as advanced linguistic reference_

The other focal students made conscious choices as well based on a critical evaluation. Yushi wrote that he chose to use the corpus _and_ a bilingual translation website as well:
“It [the corpus] really helps me a lot when I am not sure about the usages. By searching the words, I can see whether the words I used were correct or not. But if I don't know the meaning of the words at all, the [corpus] searching engine won’t help me very much. The use of it is based on abundant knowledge of English.”

(Yushi’s written reflection, November 11, 2008)

Yushi presented his critical evaluation of the corpus by pointing out that the corpus is effective only when he had some previous knowledge of the target vocabulary. Thus, his evaluation is that the corpus works for advanced users (“abundant knowledge”). For Yushi, awareness of the target discourse is the key to effective corpus use. Based on this evaluation, Yushi established his own tool-use policy: corpus for “usage” and dictionary for definition.

Yining: Corpus as genre exemplar provider

On the other hand, Yining found that the corpus search engine addressed her needs very well and used it as her primary reference:

“Before my teacher introduced myCorpus to our class, I did not know how to revise my essay by using a language tool except looking up vocabulary in certain website which was not quite helpful in terms of writing. As long as I know myCorpus, I started searching word in myCorpus. It gave me amounts of references that I can check that whether the scholar use the word in the same way as I did.”

(Yining’s written reflection, November 20, 2008)
Yining used the corpus to look for “scholar[ly]” use of language, i.e., the way advanced writers use language. She paid a lot of attention to the appropriateness of her writing and used the corpus to achieve the appropriateness. She was also concerned with stylistic issues such as formality, clarity, as well as word and grammar choice. Addressing these issues requires sensitivity to the lexicogrammar of the academic writing and Yining found that the corpus was the only tool that gave her access to the lexicogrammar of the target discourse.

4.2.1.2. Self-evaluation

In addition to evaluation of the corpus, students engage in self-evaluation in Consultation. Self-image as non-native English users influenced their use of the corpus as well as their composing behavior in general. Specifically, the students viewed the corpus as a representation of the native speaker norm and consulted the corpus in order to achieve “nativeness.” Their self-awareness, thus, was an active factor affecting LCI. The primary goal of the student’s consultation was textual approximation to the native-speaker discourse.

The focal students often wondered if their writing was appropriate. Although, in genre theory, appropriateness generally refers to an ability to perform rhetorical actions in socially expected way, appropriateness for the students simply meant nativelikeness.
Yining, for example, described her concern about nativeness as well as how appropriateness influenced her use of the corpus:\footnote{Highlight and bold type is mine.}

Most of the time, students ask teachers or upper-level classmates for help to revise their essays. Sometimes, they go to an online dictionary to look for a specific definition. However, other than those few resources, they do not have an efficient tool to rely on in order to check if their use of the word is appropriate in certain content, if the sentences are nativelike, and if the punctuations are in the right places. . . As a nonnative speaker, I have structural problems in my writings, so I used myCorpus when I have a problem with my writing . . . MyCorpus can be quite helpful when people try to find a nativelike sentence structure.

(Yining’s Paper #3, December 13, 2008)

Noticeably, the most important concern in Yining’s corpus consultation was her self-image as a non-native speaker. The above excerpt shows that she consulted the corpus in order to construct a textual identity as a competent near-native writer by drawing on the “nativelike” discourse. Although her performance in the written assignments was already excellent at the time of her writing the reflection, she still exerted much effort to revising her text by consulting the corpus frequently.
This study finds a further link to Yining’s self-awareness in screen capture data. In the following example, Yining wrote that the current technology offered a wider range of tools for L2 writers than in the past:

<table>
<thead>
<tr>
<th>Original text</th>
<th>Revised text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lately, as technology is developing in a fast speed, <strong>there are more tools</strong> for L2 users to <strong>choose</strong></td>
<td>Lately, as technology is developing in a fast speed, <strong>more tools are invented</strong> for L2 users <strong>to improve their language learning</strong></td>
</tr>
<tr>
<td>Query 1: technology is developing in a fast speed</td>
<td>(Screen capture transcript of Yining’s draft #2 of Paper #1 (7’18”), October 7, 2008)</td>
</tr>
<tr>
<td>Query 2: society develop fast</td>
<td></td>
</tr>
<tr>
<td>Query 3: in a fast developing society</td>
<td></td>
</tr>
<tr>
<td>Query 4: technology develops fast</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.3. Yining’s revision for nativelike text

Figure 4.3 shows that, before revising the sentence, Yining consulted the corpus in a series of queries. In her consultation, accuracy is not an important concern. Two sentences, before and after the revision, are formally accurate and she was aware of it. Nevertheless, Yining refined the queries three times and her motivation for the revision was to make her text sound as if written by a native speaker:

---

4 Highlight and bold type is mine.
The excerpt suggests that the goal of her consultation was to produce a sentence that sounds “like a native speaker.” Her evaluation of the corpus, then, depended on the extent to which it provided her with native speakers’ examples. Yining later commented: “Using a tool can not only help L2 users become more productive, but also it can also help L2 users speak or write the languages like a native.”

Nativelikeness was an important motivation for Jingjing, as well; she wrote, “by improving our language more native, we might also eliminate bias [against non-native speakers].” Yushi was particularly explicit about using the corpus for authentic language use:

So when L2 learners start to learn English as their second language, they should follow the common rules of English and pursue the touchstone of native speakers.

Although most L2 users may not pass L1s, the process of learning is still worth it—we are on a right track to get close to the riverbank of correctness and precision.

(Yushi’s Paper #3, December 15, 2008)
Yushi proposed that L2 users should attain high proficiency by emulating native speakers’ norm (“touchstone of native speakers”). For him, “the process of learning” an L2 means an approximation of the “correctness and precision” of native speakers.

In general, the students’ awareness of their non-nativeness influenced their corpus consultation to a great extent. Their awareness accounts for their motivated for using the corpus, as the corpus offered convenient access to the native-speaker discourse. The students’ self-awareness shaped their interaction with the corpus.

4.2.2. Transaction: Appropriation

This section extends the discussion on Consultation to a more detailed view of LCI through the next unit, Transaction. While the previous section on the consultation analysis showed the students’ desire to obtain nativeness in their texts on a rather global level of their writing, this section describes the particular lexicogrammatical items that the focal students appropriated from the target discourse through the corpus.

This study uses the term “appropriation” (Bhatia, 1997, 2004) to mean a use of the target genre items in order to produce a context-appropriate text. Bhatia (2004, p. 144) called such an ability “generic competence” and described it as “the ability to identify, construct, interpret and successfully exploit a specific repertoire of professional, disciplinary or workplace genres to participate in the daily activities and to achieve the goals of a specific professional community.” The development of generic competence is a
central goal in genre-based pedagogy and has been discussed as such – e.g., “genre acquisition” (Devitt, 1996), “deploying genre knowledge” (Berkenkotter & Huckin, 1993, 1995), “transferability” (Tardy, 2006), and “recontextualization” (Cheng, 2007b).

While these studies have discussed appropriation on somewhat abstract level, the present study presents in concrete detail the actual texts that are negotiated and appropriated through an analysis of transactions of the focal students. The study discusses two broad categories of the targets of appropriation: lexicogrammatical accuracy (e.g., correct collocation and verb conjugation) and rhetorical appropriateness (e.g., formality). In coding data, these two categories are identified based on the writer’s perceptions. In order to perform a more rigorous triangulation of data, this study takes an additional step to compare their perceptions with the query log. The procedure and the findings are described in the following.

4.2.2.1. Transactions for accuracy

Accuracy was the first and foremost concern in Transaction. Syntactic, lexical, and morphological issues appeared to be the major areas of concern - with syntactic concerns more frequent than lexical and morphological concerns. These concerns motivate and shape the focal students’ interaction with the corpus. This section starts by identifying each motivation and describes their complex interplay in constituting a transaction.
Students’ syntactic motivations frequently revolved around choice of part-of-speech items (e.g., preposition) and grammatical form (e.g., adverbial). Figure 4.4 shows examples of syntactic motivation:

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td># Preposition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yushi</td>
<td>yvw-08-0015</td>
<td>751</td>
</tr>
<tr>
<td></td>
<td>yvw-08-0015</td>
<td>752</td>
</tr>
<tr>
<td>Example 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td># Part of speech</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jingjing</td>
<td>jvl-08-010</td>
<td>636</td>
</tr>
<tr>
<td></td>
<td>jvl-08-010</td>
<td>637</td>
</tr>
</tbody>
</table>

Figure 4.4. Syntactic motivation in Transaction

Example 1 (Figure 4.4) is Yushi’s transaction for a correct preposition. In the students’ query logs, prepositions are the most sought-after item, which implies that they are a frequent source of difficulty for them. The first query in Yushi’s transaction differs minimally from the second query in terms of the prepositions, “for” and “from.” Through the transaction, Yushi identified a correct item (“for”) and replaced “from” with it.

Example 2 (Figure 4.4) is a Part-of-Speech comparison. In this transaction, Jingjing was looking for an adverbial connective in the sentence-initial position (e.g., however). She queried for “opposite,” and then its adverbial form, “oppositely.” As the corpus results did not show “oppositely” as an adverbial connective, Jingjing, chose “opposite.”
Lexical motivation is represented by the queries that differ only in terms of vocabulary, rather than in syntax or morphology. This study defines lexical accuracy as follows: an item that is lexically accurate if it appears at least once in the academic section of a large reference corpus (British National Corpus) and at least once in an electronic collection of academic texts (Google Scholar). Inaccurate lexical choice results in ambiguous or incomprehensible text. In the focal students’ transactions, lexical motivation revolved around word choice and lexical collocation. Word choice refers to the selection of a word that correctly externalizes the semantic content. Figure 4.5 shows an example:

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yining</td>
<td>yvw-08-0060</td>
<td>change essay</td>
</tr>
<tr>
<td></td>
<td>1582</td>
<td>1625</td>
</tr>
<tr>
<td></td>
<td>revise essay</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.5 has two queries that differ only in the verbs (“change” and “revise”). The criteria of this study determines that “change essay” is lexically inaccurate because it does not appear in the two reference corpora and that it is a case of word choice, as the verb, “change,” does not externalize the intended semantic content: By “change”, Yining intended to mean ‘improve’ or ‘make better.’ She looked up “change essay” in the corpus and apparently found that “change” was not accurate. Then she looked up “revise essay”
and found that “revise” served her purpose. Finally, as a result of the transaction, “revise essay” appeared in Yining’s writing.

Collocation is a frequent source of difficulty as well. Students often wondered about the correctness of collocations:

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yushi</td>
<td>yvj-2008-003 560</td>
<td><strong>Back biting</strong></td>
</tr>
<tr>
<td></td>
<td>yvj-2008-015 653</td>
<td><strong>Box marked</strong></td>
</tr>
</tbody>
</table>

Figure 4.6. Lexical motivation in Transaction: collocation

In the transaction #003, Yushi checked the corpus to check or confirm the accuracy of the items. In the first example (“back biting”), Yushi queried for a collocation, “back biting.” Although he found a few results containing “backstabbing,” there were more results with another collocation, “backstabbing.” Although “back biting” would not have been incorrect, Yushi determined that “backstabbing” is the accurate collocation. The next transaction example revolved around another collocation, “check box.” Again, while consulting the corpus, Yushi found more results with “checked” rather than “marked” for the noun, “box.” Based on the transaction, Yushi chose “checked” instead of “marked” in his revision.

Morphological concerns such as orthography, derivative, and inflectional forms motivate transactions. In general, morphological issues are not serious challenges for
students. However, it can complicate an issue when it interplays with other kinds of motivations in a transaction. Figure 4.7 shows an example:

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yining yvw-08-0076</td>
<td>1743</td>
<td>miss used word usage</td>
</tr>
<tr>
<td></td>
<td>1744</td>
<td>misused word usage</td>
</tr>
</tbody>
</table>

Figure 4.7. Morphological motivation in Transaction

In the example, Yining tried “miss used,” which showed her etymological insight, and then refined the query to “misused.” The pair is motivated by morphological concerns, as the elements of the pair differ only in terms of spelling: “miss used” and “misused.”

These motivations are further complicated, if multiple kinds of needs come into play in a single transaction. Then, a single transaction consists of a mix of motivations. In fact, such hybridity of transaction is only natural, as the queries reflect the composing processes, which normally involve a number of translational challenges occurring at once. It is rare that a writer faces only one problem at a time in an orderly manner. Mixed motivations can vary both in kind as well as in number. The present paper has identified three kinds of mixed motivation in the students’ query logs: lexico-morphological, lexico-syntactic, and syntactic-morphological motivation.

A lexico-morphological issue refers to when the morphological difference brings about a change of meaning. Figure 4.8 illustrates lexico-morphological motivation:
The transaction consists of one minimal query pair that contrasts two words ("relative" and "related"), which are etymologically connected, but differ in their meanings. Apparently, the morphological similarity between the two lexically separate items was a source of confusion for the writer. The query log has other similar examples including “respectably” and “respectively,” and “beneficial” and “beneficiary.”

Motivation can become even more complex when the two major factors, lexis and syntax, come into play. Students described lexico-syntactic concerns as when they “heard the word somewhere but do not know how to use it” (Final interview with Yining). Data in the study suggests that students normally have difficulty in lexis as well as syntax at the same time, rather than one at a time. Consider Yushi’s transaction in Figure 4.9:

Figure 4.8. Lexical motivation in Transaction

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yushi</td>
<td>yvj-2008-010</td>
<td>647</td>
<td>relative to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>648</td>
<td>related to</td>
</tr>
</tbody>
</table>

Figure 4.9. Lexico-syntactic motivation in Transaction

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yushi</td>
<td>yvj-2008-038</td>
<td>1585 on a website</td>
<td>syntactic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1587 in a website</td>
<td>syntactic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1589 in the web</td>
<td>syntactic/lexical</td>
</tr>
</tbody>
</table>

96
The transaction in Figure 4.9 shows a syntax-focused contrast between two prepositions (“on”/“in”) in the first minimal query pair (#1585 and #1587), while it extends to syntactic (“a”/“the”) and lexical (“website”/“web”) concerns in the second pair (#1587 and #1589).

Syntactic motivations are often accompanied by morphological issues. Figure 4.10 shows Yushi’s queries in response to syntactic-morphological concern:

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yushi</td>
<td>yvj-2008-050 2461</td>
<td>acquire information</td>
<td>syntactic</td>
</tr>
<tr>
<td></td>
<td>2462</td>
<td>acquire of information</td>
<td>syntactic</td>
</tr>
<tr>
<td></td>
<td>2463</td>
<td>acquire of information</td>
<td>syntactic</td>
</tr>
<tr>
<td></td>
<td>2464</td>
<td>acquire of information</td>
<td>morphological</td>
</tr>
<tr>
<td></td>
<td>2465</td>
<td>acquiring of information</td>
<td>syntactic</td>
</tr>
<tr>
<td></td>
<td>2466</td>
<td>acquisition of information</td>
<td>morphological</td>
</tr>
<tr>
<td></td>
<td>2467</td>
<td>acquisition of information</td>
<td>morphological</td>
</tr>
</tbody>
</table>

Figure 4.10. Syntactic-morphological motivation in Transaction

In the example, Yushi was looking for the nominal form of the verb, “acquire.” Yushi started out with a verbal style and eventually found a way to use the nominal style. During his little linguistic quest, Yushi faced some unexpected challenges, which motivated his complex transaction.

The transaction example shows that an accuracy transaction can become fairly long and complex. The transaction has multiple queries that are not only plural in number.
but also recurrent throughout the transaction. We see a series of revisions with a syntactic motivation ("acquire of information" and "acquiring of information") as well as morphological motivation ("aquire" and "acquirance"). This kind of lengthy transaction suggests that the challenge touches upon multiple dimensions of language. First, the transivity of the verb, “acquire” posed a challenge for Yushi as he had to figure out whether the verb is transitive or intransitive, i.e., whether it takes a grammatical object or not. In the query #2461 and #2462, he sent out two probes into the corpus (“[acquire] information” and “[acquire] of information”) in order to check the transitivity of the verb. Second, he needed to address the orthography issue as well. In fact, the transitivity checking began as a result of a random misspelling in query #2461, “aquire information.” As the corpus did not return any matches, Yushi (mistakenly) hypothesized that “acquire” was an intransitive verb, and thus, began the transitivity check by entering “acquire of information.” Then, the second series of morphologically motivated queries followed when Yushi began experimenting with the nominal forms, “acquiring,” “acquirance,” and “acquisition.” The morphological motivation is particularly clear in the final two queries (“acquirance” and “acquisition”), in which Yushi deliberately experimented with the two variations.

The example further suggests that syntactic and morphological issues are connected and that one of them can easily lead to another. In this particular case, the morphological issue (i.e., the misspelling of “aquire”) led to the syntactic issue (the

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5 These words are misspelled in the original queries.
transitivity of “acquire”), and this syntax issue resulted in yet another morphological issue (the nominal form of “acquire”). The other two students’ queries show frequent syntactic-morphological motivations as well. For example, Yining looked up a verbal and nominal pair, comparing “economic grow” and “economic growth” and Jingjing looked up “interested in” and “interest of.”

4.2.2.2. *Transaction for appropriateness*

In addition to the accuracy concerns, the students consulted the corpus for appropriateness as well. In this paper, appropriateness is distinguished from accuracy, as appropriateness is a choice, and thus, does not involve an accuracy judgment. Identification of the appropriateness transactions is a two-step procedure. In the first step, all complex transactions without grammatical errors are listed. This step rules out the transactions that are motivated by accuracy concerns. In the second step, a transaction is removed from the list if there is any explicit comment from writers that identifies it as an accuracy transaction.

For example, Yining’s transaction #08-0057 has three related queries in the same transaction and all of them revolve around the key search word, “task”:

<table>
<thead>
<tr>
<th>Student</th>
<th>Transaction ID</th>
<th>Query ID</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yining</td>
<td>yvw-08-0057</td>
<td>1513</td>
<td>tough task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1518</td>
<td>task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1520</td>
<td>hard task</td>
</tr>
</tbody>
</table>
This study identifies the query as an appropriateness query because the queries do not have any grammatical errors and there is no comment that identifies it as an accuracy check. Three adjectives, “tough”, “hard”, and “difficult”, are interchangeable without resulting in any lexicogrammatical error. Furthermore, Yining stated in her reflection that she was trying to find a better adjective for “task.” Yining seemed to be playing with these adjectives to single out the one that would best speak for her. She said that she revised the queries because “the revised one shows that the sentences become more academic-like.” This study identified only four instances of transactions that aimed at appropriateness. Table 4.5 shows the appropriateness transactions and the students’ comments on them.

Table 4.5. Focal Students’ Transactions for Appropriateness

<table>
<thead>
<tr>
<th>Student</th>
<th>Query</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yining</td>
<td>What if</td>
<td>I want to use “what if” in my sentence, but it looks a little bit nonacademic writing to me.</td>
</tr>
<tr>
<td>Jingjing</td>
<td>Online chatting</td>
<td>I was not sure if I should use “chatting” or “chat” I found that in academic writing, people use “online chat”.</td>
</tr>
<tr>
<td>Yushi</td>
<td>make a comparison</td>
<td>“Make a comparison” is used very often in Academic English. So under this circumstance it is appropriate to use.</td>
</tr>
</tbody>
</table>
The above examples show that the students were sensitive to the target genre beyond lexicogrammatical accuracy. Compared with accuracy checks, transactions for appropriateness require greater awareness of genre in order for them to be initiated and to be successful. The following section discusses the role of awareness in conducting transactions for appropriating the target discourse.

4.2.2.3. Positive and negative directions

Transactions may or may not result in a textual change in the students’ writings. An examination of the way in which transactions result in change, or lack thereof, may offer information about the writers’ cognitive processes. Specifically, an analysis of transactions can reveal how writers interpret the corpus search results and why they decide to, or not to, appropriate particular target items. This study describes an instance of a transaction as ‘positive’ when a writer tests a hypothesis and finds supportive evidence, while describing an instance as ‘negative’ if a writer finds counter-examples instead of support. One kind of transaction is not necessarily better than the other. Both kinds of transactions contribute to the writers’ hypothesis testing in their own way. The distinction is useful in making inferences about the writers’ evaluation move. Recall that the early analysis of the formal units hypothesized a third unit in LCI, “evaluation,” that is responsible for query refinement. The positive-negative distinction is useful in allowing us to tap into the writers’ evaluation.
In a positive transaction, students find evidence that supports their hypothesis in terms of language use: the corpus search confirms that their query is an accurate and/or appropriate use of language. Such a confirmation tends to result in a textual revision. Figure 4.12 shows an example:

<table>
<thead>
<tr>
<th>Original text</th>
<th>record the <strong>process that</strong> I use myCorpus to revise my essay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Query</strong></td>
<td><strong>Result</strong></td>
</tr>
<tr>
<td>Query 1</td>
<td>process that</td>
</tr>
<tr>
<td></td>
<td><strong>a process approach</strong> to writing</td>
</tr>
<tr>
<td>Query 2</td>
<td>process in which</td>
</tr>
<tr>
<td></td>
<td>the college EFL writers' revision <strong>process in which</strong> teacher's feedback . . .</td>
</tr>
<tr>
<td>Query 3</td>
<td>process of</td>
</tr>
<tr>
<td></td>
<td><strong>the process of</strong> making an analysis of their writing. . .</td>
</tr>
<tr>
<td><strong>Revised text</strong></td>
<td>record the <strong>process of searching words</strong> in myCorpus</td>
</tr>
<tr>
<td></td>
<td>(Yining’s screen capture, Paper #2 revision (14’ 25’’), November 4, 2008)</td>
</tr>
</tbody>
</table>

Figure 4.12. Positive transaction

Figure 4.12 is an instance of positive transaction as the corpus consultation provided evidence that confirmed Yining’s third query (“process of”), which eventually resulted in a textual change from “the process that” to “the process of” (the left column). Yining began her transaction by typing in the query, “process that,” and the query was not successful as it retrieved an irrelevant result, “a process approach” (the right column). The search result, however, hinted at a more relevant form, “process in which,” which eventually became the second query. The second query retrieved a greater number of relevant results. From the results, Yining noticed a nominal form, “process of,” which
Yining used as her last query. The corpus returned relevant results for her final query, providing support for “process of.” Finally, the phrase appeared in the revised text.

In the example, the appropriation of the target form can be attributed to the corpus consultation, rather than the influences from other sources such as a dictionary. The present study finds support from the writer’s reflections and screen recordings. Yining commented on positive evidence that lead to the change, “So, once I was trying to find ‘process in which,’ I could not find any example from the references. However, I found they do use ‘process in which’, and they use it often.” Screen recordings confirm the role of the corpus in helping Yining to find positive evidence. The clip shows that the corpus look-up and the textual change took place in an unbroken series of actions in a short amount of time (less than a minute). This rules out the possibility that any other source except the corpus influenced the appropriation of the target items.

In negative transaction, on the other hand, students find counter-examples against their hypothesis. Figure 4.13 illustrates an instance of negative transaction:

<table>
<thead>
<tr>
<th>Original text</th>
<th>on some degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query</td>
<td>Result</td>
</tr>
<tr>
<td>on some degree</td>
<td>This problem may be overcome <strong>to some degree</strong> by the use of shareware or freeware programs.</td>
</tr>
<tr>
<td>Revised text</td>
<td>to some degree</td>
</tr>
</tbody>
</table>

(Yining’s query log and texts, November 3, 2008)

Figure 4.13. Negative transaction
In Figure 4.13, Yining’s query, “on some degree,” resulted in retrieving “to some degree” from the corpus, which did not support the query and served as negative evidence. In response, Yining replaced her original preposition, “on,” with “to” in the revised sentence.

Unlike the definitive example in Figure 4.13, many instances in negative transaction do not reveal students’ interpretations straightforwardly. Students often find themselves in a situation in which they have only limited evidence to inform their decision whether to retain or revise their original sentence. These situations require that students draw on their awareness of genre in order to make a decision. This study identifies two such situations: non-evidence, and suggestive evidence situation.

Non-evidence situation refers to when the corpus does not return relevant results for a query. It is due to the limited size of the corpus or the broad wording in a query. Figure 4.14 shows a non-evidence situation:

<table>
<thead>
<tr>
<th>Original text</th>
<th>Thus, the term “native speaker” is a <strong>blurred concept</strong>.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query 1</td>
<td>blurred concept</td>
</tr>
<tr>
<td>Query 2</td>
<td>concept</td>
</tr>
<tr>
<td>Revised text</td>
<td>Thus, the term native speaker is <strong>problematic</strong>.</td>
</tr>
</tbody>
</table>

(Jingjing’s draft #2 and the final version of Paper #1, query on 10/30/2008)

Figure 4.14. Non-evidence situation in negative transaction

In Figure 4.14, Jingjing consulted the corpus for “blurred concept” (Query 1), but the corpus did not return any matching results due to its limited size. Then she simply
looked for “concept” (Query 2), and the corpus, not surprisingly, returned thousands of results as it is such a common word in the database and the wording in the query was too broad. Overwhelmed at the sheer number of results, Jingjing decided to give up on her original phrase (“blurred concept”), and opted for a circumlocution, “problematic.” Although “blurred concept” would have worked, Jingjing interpreted the non-evidence of it as negative evidence and revised her sentence.

Suggestive-evidence situation refers to when the corpus does not provide definitively positive or negative evidence but it offers only remotely relevant results. The situation occurs when a query only partially matches the exemplar texts in the corpus. For example, Yining’s query, “fix essay” (#1578), is the most common way to put these two words together and thus it matches the corpus partially, i.e., each word exists in the corpus but not in a collocation:

<table>
<thead>
<tr>
<th>Original text</th>
<th>fix essay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query</td>
<td>Results</td>
</tr>
<tr>
<td>fix essay</td>
<td>the student must also fix errors by . . .</td>
</tr>
<tr>
<td></td>
<td>If the teacher gives me a corrected essay . . .</td>
</tr>
<tr>
<td></td>
<td>I can also make up some incorrect ones and you can try to</td>
</tr>
<tr>
<td></td>
<td>fix them . . .</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Revised text</th>
<th>revise essay</th>
</tr>
</thead>
</table>

(Yining’s query log and texts, November 3, 2008)

Figure 4.15. Suggestive-evidence situation in negative transaction
In Figure 4.15, the corpus results neither confirm nor reject the query. Instead, the corpus shows an example that seems to indicate a semantic dissonance between “fix” and “essay”. In the results, “fix” collocates with entities with a flaw (“error” or “incorrect ones”), while “essay” does not necessarily connote a flaw. The example represents a suggestive situation without either positive or negative evidences. Instead, the corpus results imply that there might be better collocation than “fix essay”. Yining interpreted the situation as negative evidence and eventually revised her sentence by replacing “fix” with “revise.”

Although the influence of the corpus is less visible in the non-evidence and suggestive-evidence situations, the corpus still contributes to the students’ revisions. These two situations are much more challenging to students than straightforwardly positive and negative transactions. The situations represent a locus in which the students’ genre awareness and their interpretation of the corpus results take a central role in addressing their needs. It is also important for a researcher as the situations reflect the students’ cognitive processes in the evaluation move of LCI.

4.2.3. Exchange: Verification and Elicitation

While transaction reflects an overall process of solving a problem, exchange represents each of multiple steps that constitute transaction. Formally, exchange has a tripartite structure of query – retrieval – evaluation (QRE). Functionally, students test out their linguistic hypotheses step by step in exchange. In analyzing exchange, the study
describes two kinds of strategies: a) verification and b) elicitation. Verification refers to when students have the target item in mind and check the item against the corpus. Elicitation, on the other hand, is a more proactive strategy to make the corpus provide a target item when students do not already know the target item.

### 4.2.3.1. Objectives in exchange

In verification exchange, students use the corpus to check the accuracy and appropriateness of an item. Typical questions that students ask in verification include “is this grammatically correct?” and “do people say something like this?” (Yining’s final interview, December 12, 2008). These kinds of questions are a very common and consistent motivation for the students, accounting for 84.2% of the total number of exchanges. Verification exchange is identified as an instance when a query is intended to retrieve a match. Figure 4.16 illustrates the definition:

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Exchange</th>
<th>Query ID</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>yvw-08-0015</td>
<td>#1</td>
<td>751</td>
<td>no excuse from</td>
</tr>
<tr>
<td>#2</td>
<td>752</td>
<td>no excuse for</td>
<td></td>
</tr>
</tbody>
</table>

(Yining’s query log, November 3, 2008)

Figure 4.16. Verification exchange

Yining’s transaction in Figure 4.16 consists of two exchanges, each with one query. These exchanges are confirmation checks for the prepositions “for” and “from.”
When Yining tried her first query, “no excuse from,” she found no match. She took this non-evidence situation as negative evidence and rejected her original query, “excuse from.” When she tried her second query, “no excuse for,” the corpus returned many examples confirming its accuracy. These two exchanges verified the correctness of the query and addressed the needs.

In elicitation exchange, students use a query as a probe to draw out examples from the corpus. This kind of exchange corresponds to the students’ needs for building a sentence from fragments of resources. When students start to write a sentence, they often have pieces of words and grammar items, to which they add more language material in order to eventually produce a complete sentence. In other words, elicitation exchange serves to provide the collocation contexts to the query. Figure 4.17 shows an example of a query and its collocation contexts:

<table>
<thead>
<tr>
<th>Exchange type</th>
<th>Query ID</th>
<th>Query</th>
<th>Collocation context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verification</td>
<td>1513</td>
<td>tough task</td>
<td></td>
</tr>
<tr>
<td>Elicitation</td>
<td>1518</td>
<td>task</td>
<td>difficult, hard, demanding</td>
</tr>
</tbody>
</table>

Figure 4.17. A query and collocation contexts

In Figure 4.17, “tough task” is a query for verification exchange, as its purpose is to confirm the accuracy of the query. In contrast, the following query, “task,” is a part of elicitation exchange, as it focuses on, not the query per se, but on the possible co-
occurring words, i.e., collocation contexts. In the example, the contexts are three
adjectives that can co-occur with “task,” i.e., “difficult,” “hard,” and “demanding.”

Elicitation exchanges are fewer in number than verification exchanges,
accounting for only 15.8% of the total number of exchanges. Elicitation exchange is
defined as an instance when a query is intended to retrieve words or grammatical items
that occur with the query. Figure 4.18 presents examples:

<table>
<thead>
<tr>
<th>Query ID</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>1732</td>
<td>not only</td>
</tr>
<tr>
<td>1733</td>
<td>not only but also</td>
</tr>
<tr>
<td>1734</td>
<td>not only but also be</td>
</tr>
</tbody>
</table>

Text

Obtaining a decent writing skill will **not only** help college students to achieve their
academic success, **but it will also be beneficial** to them to pursue their career successes
in the future.

(Yining’s query log, November 3, 2008)

Figure 4.18. Elicitation exchange

In these exchanges, the queries, “not only” and “but also,” elicited the example
sentences in order to complete her sentence. Yining recalled that her problem revolved
around “how to write a sentence with ‘not only, but also’” (Yining’s stimulated recall,
November 7, 2008). She already knew that a sentence can be structured around the
formulaic items, “not only” and “but also,” but she still needed to collect more materials
in order to complete her sentence. Using the items that she already knew as queries, she elicited sentence examples from the corpus in order to flesh out the sentence.

4.2.3.2. Identifying and coding Exchange

As differing kinds of exchange emerged during the main analysis, this study further developed a coding scheme for exchange. Based on the goals and strategies, the study distinguishes four kinds of exchange:

Table 4.6. Four Types of Exchange

<table>
<thead>
<tr>
<th></th>
<th>lexicogrammatical correctness</th>
<th>conformity to genre convention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>confirmation of correctness</strong></td>
<td>Accuracy Verification</td>
<td>Appropriateness Verification</td>
</tr>
<tr>
<td><strong>requests for co-occurring items</strong></td>
<td>Accuracy Elicitation</td>
<td>Appropriateness Elicitation</td>
</tr>
</tbody>
</table>

Identifying the type of exchange requires at least three data sources: a) query log, b) texts (before and after a revision), and c) students’ oral and written reflections. The query log provides the fundamental data, the exact queries in transactions. When compared with the texts, the query log allows us to determine if a transaction is using verification or elicitation as its strategy. The query log provides some information for distinguishing accuracy and appropriateness transactions. The findings from these two kinds of data are compared with the students’ reflections on their intentions behind the exchanges. The final step seeks consistency, i.e., all three kinds of data must converge to be able to determine the type of exchange. In case of disagreement among these data, the
present study either asked students in the recall interview sessions in order to reach an agreement, if possible, or excluded the particular exchange from analysis as unidentifiable exchange type.

The actual coding used the plus-minus feature scheme for a simple way to summarize the results. Figure 4.19 shows an example of the coding:

<table>
<thead>
<tr>
<th>Query ID</th>
<th>Query</th>
<th>Accuracy</th>
<th>Appropriateness</th>
<th>Verification</th>
<th>Elicitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>751</td>
<td>no excuse from</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>752</td>
<td>no excuse for</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 4.19. Coding exchanges

Yining’s queries, “no excuse from” (#751) and “no excuse for” (#752) are concerned about right- or wrongness of the preposition, and thus, coded as “+ accuracy.” This coding is consistent with the subsequent change in her writing, i.e., she replaced the preposition “from” with “for,” while not showing a concern for appropriateness. As conformity to the genre convention is not a central concern, the query is further marked as “- appropriateness.” As for strategies, the queries aim to either approve or disapprove the preposition *per se*, while obtaining potentially co-occurring words, or collocation contexts, is not a focal concern. The query is, therefore, coded as “+verification” and “– elicitation.” Now, the coding, “+accuracy, + verification,” reads as “the query functions to verify accuracy,” as opposed to verifying appropriateness or eliciting contexts.
4.2.3.3. Reporting the inconsistency in the coding

Prior to presenting the results of exchange analysis, this study reports two challenging cases and the policy to maintain consistency regarding such cases: first, discrepancy between the datasets, and second, understated purposes in reflections.

Case 1: Mismatch between stated purpose and textual change

The students’ accounts of their purpose are not always consistent with the subsequent changes in their writing. The discrepancy may result in inconsistent coding. For example, Yining looked up “prepare” (Figure 4.20) and as a result, she changed her text by (correctly) adding the preposition, “for” to the verb, which is an accuracy exchange. However, she stated her purpose as “I want to use ‘prepare’ at the beginning of the sentence.” The stated purpose concerns the location of the verb, which is an appropriateness exchange. Then, there is a contradiction between the stated purpose and the textual revision:

<table>
<thead>
<tr>
<th>Query</th>
<th>Stated purpose</th>
<th>Textual change</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>prepare</td>
<td>“I want to use prepare at the beginning of the sentence”</td>
<td>prepare for [NP]</td>
<td>+Accuracy -Appropriateness</td>
</tr>
</tbody>
</table>

Figure 4.20. Mismatch between stated purpose and textual change

In such a case, this study attempts to reach an agreement between the queries and the reflections by asking the student about the discrepancy. The stimulated recall
interview revealed that the student began with an intention to identify an appropriate position of the verb, which is a rhetorical concern, and then switched to the issue of preposition, which is a grammatical concern.

Case 2: Understated purposes

Students may not clearly state their purpose of exchange, which makes it difficult to determine if the exchange was intended for accuracy or appropriateness. Figure 4.21 illustrates the case:

<table>
<thead>
<tr>
<th>Query</th>
<th>Stated purpose</th>
<th>Textual changes</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>regarding</em></td>
<td>(General usage)</td>
<td>1. regarding to =&gt; regarding</td>
<td>+Accuracy</td>
</tr>
<tr>
<td>(#745, Yining)</td>
<td>“I am not sure how to use this word”</td>
<td>2. [Move to sentence-initial position]</td>
<td>+Appropriateness</td>
</tr>
</tbody>
</table>

Figure 4.21. Understated purpose

In Figure 4.21, Yining’s reflection does not articulate the purpose of the exchange. The textual changes show that the exchange contributed to both accuracy and appropriateness. First, Yining solved her grammar issue by replacing “regarding to” with “regarding.” Then, she relocated “regarding” to sentence-initial position in order to address her rhetorical needs. These changes, however, are not fully represented in her reflections, which described her motivation for the changes simply as not knowing “how to use” the words. In cases such as this, the purpose of the item is understated and requires a further investigation in stimulated recall interview. When the student is not
available for interview, this study compares the query log with the textual change in order to identify the writers’ purpose. Motivation for accuracy is relatively easier to identify: In Figure 4.21, it is clear that the query serves to revise the grammatical form if the textual changes are examined. Motivation for appropriateness is, however, difficult to identify unless the student’s reflection corroborates a conclusion drawn from the query log analysis. If a reflection is not available, therefore, this study codes the query only as ‘+accuracy.’ If both textual changes and reflections are not available, this study excludes the case from the analysis dataset.

4.2.3.4. Descriptive statistics of Exchange

Out of all 343 exchanges of the focal students, 57 exchanges qualified for the coding scheme in the study by showing consistency across three data sources, the query log, the texts, and the oral and written reflections. Then this study assigned each exchange to one of the four categories: a) accuracy verification, b) appropriateness verification, c) accuracy elicitation, and d) appropriateness elicitation. Table 4.7 shows the types and frequency of these 57 exchanges:

Table 4.7. Descriptive Statistics of Exchange

<table>
<thead>
<tr>
<th></th>
<th>Yining</th>
<th>Yushi</th>
<th>Jingjing</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy verification</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>Appropriateness verification</td>
<td>7</td>
<td>4</td>
<td>10</td>
<td>21</td>
</tr>
</tbody>
</table>
Table 4.7 shows that the focal students consulted the corpus mostly for the verification purpose (84.2%), while they engaged in elicitation exchanges less frequently (15.8%). In contrast, it shows a balanced frequency in terms of the search objective: accuracy (50.9%) and appropriateness (49.1%). The impression is that the students largely relied on confirming accurate or appropriate language use, while they were not using the corpus to its full potential for eliciting the exemplar academic texts.

4.2.3.5. Four types of exchange

Type 1: Accuracy verification

Accuracy verification is the most popular type of exchange (45.6%). Yushi and Jingjing seemed to favor accuracy verification, which accounts for approximately half of their exchanges. The accuracy verification exchange alone accounts for 67% of all of Yushi’s exchanges and 50% of Jingjing’s exchanges. In contrast, Yining’s queries average out across all four types.

In accuracy verification, students consulted the corpus for a quick correctness check on discrete items, rather than phrases or sentences. For example, Yushi searched for “corpuses,” wondering about the plural form of “corpus.” The exchange is only
motivated by an accuracy concern. Table 4.8 shows the motivating challenges in all accuracy verification exchanges:

Table 4.8. Challenges in Accuracy Verification

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>collocation</td>
<td>6</td>
<td>“check box,” “every box was checked”</td>
</tr>
<tr>
<td>number</td>
<td>3</td>
<td>“email writings,” “grammars”</td>
</tr>
<tr>
<td>phrasal verb</td>
<td>1</td>
<td>“look up for something,” “look something up”</td>
</tr>
<tr>
<td><strong>preposition</strong></td>
<td><strong>13</strong></td>
<td>“on some degree,” “searching for academic resources”</td>
</tr>
<tr>
<td>reflexive pronoun</td>
<td>2</td>
<td>“I myself am,” “I myself is”</td>
</tr>
<tr>
<td>word order</td>
<td>1</td>
<td>“As these extracts shown,” “As shown in these extracts”</td>
</tr>
</tbody>
</table>

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Table 4.8 shows that prepositions are the most frequent issue for the focal students, followed by collocations. Although the corpus was useful in solving these problems, a dictionary would have solved most of the problems, as well. The only exceptions are collocations, for which the use of an academic text corpus can be far more efficient than a dictionary. An oddity in this list is that it lacks the queries intended to check the use of articles. English articles are notorious for their difficulty for speakers of languages that do not need articles, such as Mandarin. A more detailed analysis on the move level, however, will show that the students did have concerns about article use, which are not captured on exchange level.
**Type 2: Appropriateness verification**

Appropriateness verification is the second most popular type of exchange (36.9%). This type reflects the students’ awareness of academic genres and their concerns about producing a well-written text rather than just an error-free text. In appropriateness verification, students already knew that their writing was not incorrect but they still consulted the corpus for better lexicogrammar. For example, Yushi looked up “The search engines are focused on” in the corpus when he needed to make a choice between active and passive voice. Yushi knew that either passive or active voice would have worked. However, he consciously chose the active voice version: he commented, “. . . ‘The search engines focus on’ sounds better than the previous choice [passive voice].” The motivating challenges for the students’ decision-making were traced in the transactions. Table 4.9 presents the breakdown of the challenges:

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>collocation</td>
<td>8</td>
<td>“decent essay,” “well-written essay”</td>
</tr>
<tr>
<td>passive voice</td>
<td>1</td>
<td>“The search engines are focused on”</td>
</tr>
<tr>
<td>phrase location</td>
<td>1</td>
<td>“in a meanwhile” (sentence-initial)</td>
</tr>
<tr>
<td>preposition</td>
<td>2</td>
<td>“regarding,” “On the aspect of grammar”</td>
</tr>
<tr>
<td>(academic) register</td>
<td>3</td>
<td>“the result will be shown,” “what if”</td>
</tr>
<tr>
<td>word choice</td>
<td>7</td>
<td>“inversely,” “natural”</td>
</tr>
</tbody>
</table>

22
Table 4.9 shows that students mainly consulted the corpus for lexical issues such as collocation and word choice. In other words, for the students, appropriateness in academic writing had much to do with choosing “right” words. The corpus was efficient in addressing most of these lexical issues by providing example sentences. As for genre- and register-specific problems (e.g., passive voice, academic register), however, the efficiency of the corpus varied according to the students’ interpretive capabilities. For example, Yining looked up “what if” in order to see if the phrase occurred in academic texts at all. The corpus results showed that “what if” does occur in academic texts but she decided not to use “what if” because, according to her, “it looks a little bit nonacademic writing.”

Table 4.9 suggests that grammatical choices often went unrecognized although the students were very sensitive to lexical challenges. During the semester, the course emphasized three forms of grammatical constructions, i.e., passive voice, nominalization, and impersonal style. Despite the emphasis, there was only one exchange (regarding passive voice) that particularly aimed for a grammatical choice.

Type 3: Accuracy elicitation

Accuracy elicitation refers to instances when students intentionally use incomplete or incorrect word forms in order to retrieve correct or complete forms. This type of exchange was very low in quantity: only two such examples were found among the 57 exchanges:
Figure 4.22. Accuracy elicitations

In the first example, Yining intentionally used an incomplete query, “no excuse,” to retrieve collocation contexts. In the second example, Yining looked up “serve the thesis” knowing that the verb, “serve” could be potentially inaccurate for her purpose (“I am not sure that is how I should use it”). Lacking the replacement for “serve,” she simply used it and found many instances of “support the thesis,” which she used in the revised text.

Although “accuracy verification” and “accuracy elicitation” may sound alike, elicitation is a more mature consultation technique than verification since it allows the students to draw on the rich linguistic resource in the corpus. Despite the benefit, elicitation is also a psychologically expensive operation, as it requires that students understand, and align to, the internal querying mechanism of the search engine to some extent.

Type 4: Appropriateness elicitation
Appropriateness elicitation is a kind of exchange in which students purposefully enter an incomplete or inappropriate query in order to elicit appropriate exemplars. In the focal students’ query logs, appropriateness elicitation is the only kind that includes sentence-level queries. These queries are intended to elicit example sentences that include all or part of the search words. It is a particularly useful technique if a student’s lexical inventory is not extensive enough to complete a sentence.

To illustrate, Yining only had fragments of words to begin with (Figure 4.23). She had “Language tools, developed, skills” in her inventory. She had to collect more vocabulary as well as syntactic constructions to encode the fragments in a sentence with appropriate lexicogrammar:

<table>
<thead>
<tr>
<th>Query</th>
<th>Purpose</th>
<th>Textual change</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Language tools, developed, skills</em></td>
<td>“I tried different way to arrange these phrases, but I just couldn’t find the right way to express what I want to say.”</td>
<td>“Language learning skills can also be improved as language tools become more developed.”</td>
</tr>
</tbody>
</table>

Figure 4.23. Appropriateness elicitations

In Figure 4.23, Yining’s strategy was to use the words that she already had as input for the corpus. By using this strategy, she was able to collect more language materials, expand her repertoire, and build a complete sentence. Yining commented that she consulted the corpus to find the “right way” to externalize her thoughts. There are 8 instances of this exchange type in total. Table 4.10 presents the frequency and examples:
Table 4.10. Challenges in Appropriateness Elicitation

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Example [for (goal)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>sentence construction</td>
<td>3</td>
<td>“Language tools, developed, skills” [for a sentence]</td>
</tr>
<tr>
<td>collocation</td>
<td>1</td>
<td>“Chat save” [for “Chat record”]</td>
</tr>
<tr>
<td>gerund</td>
<td>1</td>
<td>“applied in evaluating” [for evaluation]</td>
</tr>
<tr>
<td>word choice</td>
<td>2</td>
<td>“in order to achieve the” [for goal]</td>
</tr>
</tbody>
</table>

The students’ elicitation exchanges show that the corpus was not just a quick-fix tool or a static storage of language. Rather, the corpus can function as an interactive sentence builder as well. Further, the students’ examples, especially Yining’s example, suggest that students are frustrated when they have some fragments of thought and vocabulary only in L1, while being required to externalize them in L2. Appropriateness exchange effectively addresses the issue. Thus, when addressing the appropriateness concern, the corpus greatly surpasses other tools such as a dictionary.

4.2.4. Move: Retrieval and refinement

Structurally, exchange has a tripartite move structure: query – retrieval – evaluation (QRE). Focusing on function, however, this section examines the focal students’ moves in two units: a) query-retrieval and b) evaluation. The query and retrieval moves are observable, physical operations in which users input the queries and the corpus displays the results. In contrast, the evaluation move is a non-verbal, cognitive process in
which users evaluate the corpus results and make decision whether to refine the query or not. Therefore, this study isolates evaluation from the other two moves as a separate analytical unit. The purpose of the analysis is to identify the contribution of these units to the focal students’ problem-solving processes. Specifically, the analysis focuses on the students’ evaluation of the corpus results and the subsequent establishment/refinement of their linguistic hypotheses in the queries. Challenges in the processes are documented.

4.2.4.1. Query and retrieval

The corpus query log is a record of the students’ efforts in response to the challenges they encounter in writing. The query log, thus, reveals their challenges and strategies. A distinct characteristic of the focal students’ query moves is that the logs contain function words as well as content words. This finding contrasts with the common understanding that the query logs of the general-purpose search engines largely consist of nouns and adjectives, while they rarely contain verbs (Eiron & McCurley, 2003). However, the corpus query of the focal students contains 227 function words (26.6%) out of all 854 words. Although the content words (N=627) still outnumber the function words, it is a remarkable difference from the general-purpose search engine queries.

All three focal students included function words in their queries. Each student’s use of function words is roughly proportional to the total number of the function words in the logs:
Table 4.11. Content Words and Function Words in Query

<table>
<thead>
<tr>
<th>Student</th>
<th>Content words</th>
<th>Function words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jingjing</td>
<td>65</td>
<td>28</td>
</tr>
<tr>
<td>Yushi</td>
<td>215</td>
<td>68</td>
</tr>
<tr>
<td>Yining</td>
<td>347</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>627</td>
<td>227</td>
</tr>
</tbody>
</table>

Approximately a quarter of the queries are function words in the focal students’ logs. The number of function words reflects the focal students’ needs for grammatical items. Table 4.12 is the breakdown of the parts of speech for the function words.

Table 4.12. Function Words in the Query Log

<table>
<thead>
<tr>
<th>Part of Speech</th>
<th>Frequency</th>
<th>Frequent examples (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preposition</td>
<td>107</td>
<td>in (29), of (18), on (15), with (12), as (9)</td>
</tr>
<tr>
<td>Determiner</td>
<td>46</td>
<td>the (19), a (13), no (5), some (3), this (2)</td>
</tr>
<tr>
<td>To (infinitive)</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Pronoun</td>
<td>9</td>
<td>will (7)</td>
</tr>
<tr>
<td>Possessive pronoun</td>
<td>8</td>
<td>them (4), it (3), one (2)</td>
</tr>
<tr>
<td>Modal</td>
<td>7</td>
<td>its (6), their (1), my (1)</td>
</tr>
<tr>
<td>Subordinate conjunction</td>
<td>5</td>
<td>while (3), whereas (1), whether (1)</td>
</tr>
<tr>
<td>Coordinate conjunction</td>
<td>6</td>
<td>but (4), or (2)</td>
</tr>
<tr>
<td>Wh-Adverb</td>
<td>5</td>
<td>how (4), however (1)</td>
</tr>
<tr>
<td>Particle adverb</td>
<td>2</td>
<td>up (1), on (1)</td>
</tr>
<tr>
<td>Wh-determiner</td>
<td>2</td>
<td>which (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>227</td>
</tr>
</tbody>
</table>

123
Table 4.12 shows that Preposition is the most frequent item followed by Determiner and To-infinitive. The high frequency of prepositions is consistent with the findings from the transaction and exchange analysis (see Table 4.8). However, the query analysis further shows that Determiner and To-infinitive can be a major source of difficulty for the students as well. The article system, which did not appear in the analysis on the exchange level, is the third most frequent source of difficulty. The article as a challenge is not captured on the exchange level due to two reasons. First, the issues of article use often appear as a simple query (as opposed to complex query), and thus, the observation of the query log, the initial step in the exchange analysis, tends to exclude the queries for article use. Second, the students rarely mentioned the articles as a challenge. The value of an analysis of the move level is, then, that it visibly shows the challenges that the exchange and transaction analyses do not capture.

As for the contribution of the corpus to students’ writing, an important question to ask at this point is how well the corpus addressed the students’ needs for grammar, as reflected in the function word queries. Unfortunately, the analysis of query and retrieval revealed that the corpus was not effective in handling these function word queries. Specifically, there was a serious mismatch between the students’ query and the corpus’s retrieval. In this study, mismatch refers to the difference between the queries and the retrieved linguistic items, particularly, the function words. For example, the corpus did

\[ \text{\footnotesize In Information Retrieval research, mismatch refers to the difference between the users’ queries and the retrieved documents (Smyth, Balfe, Freyne, Briggs, Coyle & Boydell, 2004).} \]
not allow a search by part-of-speech, when students look for a function word, the corpus searched for the content words around the function words. For example, when Yining entered “the easier way” to check whether “the” is required or not, the corpus returned the sentences that contained “easy” and/or “way” anywhere in the sentence, while ignoring “the”, as it is a function word. The issue is further discussed in the later section as a limitation of the pedagogical use of the corpus search engine.

4.2.4.2. Evaluation

Evaluation is a move in which students peruse the search results and, optionally, refine their queries. Unlike the query and retrieval moves, evaluation is a cognitive process, and thus, is not directly observable. This study used the screen recordings and the students’ reflections to make inferences about their evaluations. The most important contribution of the evaluation move to the students’ writing is the interactive hypothesis-testing that the corpus allowed. The following section describes the analytical procedure.

4.2.5. Tracking the hypotheses

In order to track hypothesis development, this study tabulates the students’ queries and their evaluations in their reflections. The analysis follows a procedure that begins with identifying the transaction and motivations (formal analysis), then it connects the queries to the students’ retrospective accounts, and makes inferences about the hypotheses through the examination of minimal query pairs (functional analysis). Finally,
triangulating on all the available datasets, the analysis will reconstruct the hypotheses that the writer was testing. For demonstrating a method to track hypotheses, one transaction was retrieved from Yining’s query log and coded. The coded transaction serves as ground data for the next step in the transaction analysis:

<table>
<thead>
<tr>
<th>Query ID</th>
<th>Query example</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2435</td>
<td>obtain skill</td>
<td>Lexical</td>
</tr>
<tr>
<td>2437</td>
<td>have skill</td>
<td>Lexical</td>
</tr>
<tr>
<td>2440</td>
<td>writing skill</td>
<td>Lexical</td>
</tr>
<tr>
<td>2441</td>
<td>develop writing skill</td>
<td>Lexical</td>
</tr>
<tr>
<td>2442</td>
<td>develop writing ability</td>
<td>Lexical</td>
</tr>
<tr>
<td>2444</td>
<td>develop writing abilities</td>
<td>Syntactic</td>
</tr>
<tr>
<td>2446</td>
<td>develop writing skill</td>
<td>Lexical</td>
</tr>
</tbody>
</table>

Figure 4.24. Motivation in the focal writer’s transaction

In the next step of analysis, the query log is compared with screen recordings and reflections to confirm (or revise) the analysis. Based on the comparison, the composing process will be described. The description, however, does not directly rely on either kind of data—screen recordings or reflections. Such reliance on the first-hand data has undermined the analytical validity in process research (see the section Issues in Real-time Research). Instead, the present analysis will reconstruct the focal writer’s hypotheses by
triangulating on the data sources. The reconstructed description of hypotheses, then, will serve as an intermediary dataset to support inferences about the composing process.

The first step to describe the hypothesis development is to list the queries in a complex transaction in parallel with the writer’s reflections. A complex transaction in the query log suggests that the writer is evaluating the corpus search results; a subsequent refinement of a query indicates that the writer is formulating a hypothesis based on the evaluation and is testing it against the corpus. By examining the query refinement, therefore, we can possibly track the writer’s hypotheses as they have developed. The following figure exemplifies this step by tabulating the focal writer’s queries and her reflections:

<table>
<thead>
<tr>
<th>Original text</th>
<th>Obtaining a decent writing skill will not only help college students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query</td>
<td>Reflection</td>
</tr>
<tr>
<td>obtain skill</td>
<td>it sounds like anyone could go out and buy their skillfulness in writing. So I searched “obtain skill”</td>
</tr>
<tr>
<td>have skill</td>
<td>(no comment)</td>
</tr>
<tr>
<td>writing skill</td>
<td>most of the sentence use “obtain + property”, but skill is ability, and I did not find any reference contains “obtain skill”. Then I typed in “writing skill”</td>
</tr>
<tr>
<td>develop writing skill</td>
<td>I saw sometimes they use “development of writing skill”, then I search “develop writing skill”.</td>
</tr>
<tr>
<td>develop writing ability</td>
<td>I found people do use it. But I also saw they use “develop writing ability” I was considering whether I should use “ability” instead of “skill”, then I searched it, but they do not use it a lot. So I keep using develop writing skill</td>
</tr>
</tbody>
</table>
Developing a decent writing skill will not only help college students

(Yining’s query log and reflection, December 12, 2008)

Figure 4.25. Tabulating Yining’s queries and reflection

The side-by-side tabulation of the queries and the accompanying comments allows us to track the development of Yining’s thinking. Through a series of query refinement, Yining evaluated each query and refined the query based on the evaluation. Specifically, Yining refined the query each time by analyzing the corpus result and establishing a linguistic hypothesis. Then she tested the hypothesis in the refined query. Just by examining the queries in Figure 4.25 (left column), we can draw a tentative conclusion that these queries focus on lexical issues, i.e., word choice, rather than on syntactic or morphological issues. Then, by taking account of the writer’s reflection (right column), we can confirm our conclusion with greater confidence.

The next step in tracking the development of the hypotheses is to actually reconstruct them by triangulating on all the available datasets. The query log provides a breakdown of the transaction, the screen recordings retrieve the search results that the writer was basing her hypothesis on, and finally, the reflections show the extent to which there is consistency between the writer’s perception and the other kinds of data. Each type of data, thus, makes its own contribution. Based on triangulation of these data, the present analysis reconstructs the moment-by-moment representation of the development of her hypotheses, again, in a tabulated presentation:
Developing a decent writing skill will not only help college students

<table>
<thead>
<tr>
<th>Query</th>
<th>Motivating hypothesis</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>obtain skill</td>
<td>H1: “skill” may not be something that can be obtained in a short time</td>
<td>H1: Accepted</td>
</tr>
<tr>
<td></td>
<td>H2: “obtain” does not highlight the fact that the object (“skill”) takes time and effort to achieve</td>
<td>H2: Accepted</td>
</tr>
<tr>
<td>have skill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>writing skill</td>
<td>H3: “writing skill” may elicit the collocating verbs</td>
<td>H3: Partially accepted</td>
</tr>
<tr>
<td>develop writing skill</td>
<td>H4: The verb as in “develop skill” is more frequently used than the nominal form as in “development of skill”</td>
<td>H4: Partially accepted</td>
</tr>
<tr>
<td>develop writing ability</td>
<td>H5: “develop ability” is more appropriate than “develop skill”</td>
<td>H5: Rejected</td>
</tr>
</tbody>
</table>

Revised text

Developing a decent writing skill will not only help college students

Figure 4.26. Visualizing Yining’s hypothesis development

The tabulated representation in Figure 4.26 shows that the writer evaluated corpus results and tested her hypotheses based on the evaluation of the results. On the surface, the only textual change is the substitution of “developing” for “obtaining.” However, the analysis shows that the revision is a result of a complex process involving the writers’ linguistic analysis and hypothesis.

In her first query, “obtain skill,” Yining hypothesized that there was a better verb than “obtain” for emphasizing the work it takes for an international student to become a good writer of English. For her, achieving a high level of skill as an L2 writer was
something that would take a longitudinal effort; it was not a skill that one could simply
come by in a short period. She felt, somehow, that the verb “obtain” did not connote this
painstaking effort. Yining commented that “obtain” sounded as if the writing expertise
were something that “anyone could go out and buy,” such that its use would downplay
the challenges involved in the longitudinal learning process. Then, in her second query,
“have skill,” seems to reflect her effort to determine the semantic property of “skill” by
contrasting “obtain” with “have,” which represents an aspect of a finite state.

Yining’s first and second queries originated from her sensitivity to language use
and an effort to articulate her thoughts about learning to write as an L2 writer, which this
paper documents in two hypotheses as follows. H1, her first hypothesis, states that the
semantics of the noun, “skill,” entails a longitudinal effort, while H2, the second,
subsequent hypothesis, states that the verb, “obtain,” does not correspond with the
semantics of “skill.” The corresponding query, “obtain skill,” was her strategy to confirm
her hypothesis about the non-existence (and therefore inappropriateness) of this verb–
noun collocation. Screen capture data shows that the collocations for “obtain” retrieved
from the corpus in response to her query included “information,” “outcome,”
“meaningful data,” “goals,” and “many skills.” Perusing these results, Yining concluded
that the verb “obtain” did not encode the aspect of temporal longitude, as it depicted
rather a finite status of achievement. Thus, she accepted two hypotheses and concluded
that “obtain” did not collocate well with “skill.”

Yining’s next step was, naturally, to look for a verb that would express the
longitudinal acquisition of writing “skill.” Her third query, “writing skill” is an effort to
find such a verb, from which the third hypothesis can be inferred. The following hypothesis, H3, is quite different in its purpose from the two preceding hypotheses. In the two early hypotheses (H1 and H2), Yining already had in mind the target form (“obtain skill”) and intended to confirm the (non) use of this particular form. In her third hypothesis, however, she did not have the target form and, therefore, had to elicit one from the corpus through her query. Although she felt that “obtain” did not work for “skill,” she did not know what verb would substitute for “obtain.” In response to the need, H3 states that the query, “writing skill” will elicit some verbs to replace “obtain.” As a result of the search, Yining did find a candidate verb, but in a nominal form (“development”). Now her query only partially served the purpose (of testing the hypothesis). Therefore, we may argue that she partially confirmed H3 for finding a semantic replacement and yet partially rejected it as well for retrieving a nominal form.

H4 states that the verbal form, as in the query, “develop writing skill,” is more frequently used than its nominal counterpart, “development of skill.” By visually scanning the corpus results, Yining eventually accepted the hypothesis. However, her evaluation this time was a convoluted one. Although she did see a number of instances that had the verbal form, “develop,” the noun that frequently collocated with “develop” was “ability,” rather than “skill.” Now she had to choose one noun over the other.

Yining’s final query, “develop writing ability,” was intended to help make a decision between two collocations, “develop skill” and “develop ability.” The query reflected her final hypothesis (H5) that the verb, “develop” collocates with “ability” more frequently than with “skill.” H5 is similar to her first two hypotheses (“obtain skill” and
“develop skill”) in that she already knew and intended to confirm the appropriateness of the target form(s). As the corpus results suggested that “skill” was used more often with “develop” than was “ability,” Yining rejected H5 and retained her original choice, “develop skill.”

It is noticeable that, in her revision, Yining partially integrated the tendency for nominalization in academic texts by using a gerund (“developing skill”) although she had been looking for a verbal form (“obtain” and “develop”) throughout the transaction. Furthermore, she chose the nominal form even though the verbal form (“develop skill”) was more frequent in the corpus results. Then, it is interesting that, without explicitly noticing the nominal feature of academic text, Yining still incorporated the feature into her text. The corpus thus seems to have influenced her writing in an implicit way as well as through explicit search results.

In sum, the focal student engaged in a complex process of hypothesis development, shuttling between evaluating the resources and hypothesis testing. The tabulation was useful in describing the processes. Due to the hypothesis testing, Yining’s composing process can be understood as a multi-stage procedure consisting of three recursive steps: hypothesis testing through a query, evaluation of the search results, and revision (or optional query refinement).
4.3. Voluntary and continued use of the corpus

In examining students’ perception of their corpus use, ensuring the credibility of data interpretation has been a major challenge to this study. The difficulty is largely due to the discrepancy between the event as it occurred and the event as perceived and experienced by the students. This study attempted to address the discrepancy issue by triangulating on query logs in addition to the students’ reflections. Analysis in this section aims to achieve consistency across their reflections and the two kinds of search queries, those collected a) over the course span and b) after the completion of the course (hereafter, post-course queries). If the students’ perception of the corpus use was generally positive, there should be corresponding voluntary use as well as continued use of the corpus, and vice versa.

4.3.1. Voluntary use of the corpus

Voluntary use of the corpus refers to the queries with which students consult the corpus, although they are not required to. In order to examine the voluntary use of the corpus, this study carefully excluded the queries collected during events that required the students’ to use the corpus. In this study, two occasions may have influenced the students’ use of the corpus. First, the instructor conducted a tutorial session in the first month of the semester (September). Then, students (optionally) wrote three one-page reflections on their corpus use in the following month (October). The last reflection was due November 10. Past these two months, no assignments required the students to use the corpus until
the course closed on December 12. Therefore, only the queries collected from November 11 to December 12 (32 days) are considered voluntary, while all other queries were excluded from examination. Table 4.13 provides descriptive statistics of voluntary queries:

Table 4.13. Descriptive Statistics of Voluntary Use of the Corpus

<table>
<thead>
<tr>
<th></th>
<th>All queries</th>
<th>Voluntary queries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jingjing</td>
<td>48</td>
<td>23 (47.92%)</td>
</tr>
<tr>
<td>Yining</td>
<td>194</td>
<td>159 (81.96%)</td>
</tr>
<tr>
<td>Yushi</td>
<td>87</td>
<td>63 (72.41%)</td>
</tr>
<tr>
<td></td>
<td>329</td>
<td>245 (74.47%)</td>
</tr>
</tbody>
</table>

Table 4.13 shows that 74.7% of the total queries were voluntary. In fact, there is a good chance that the actual number of voluntary queries might be even greater than 74.7%, considering that some queries prior to November 11 can also be voluntary. The possibility is likely, as it is difficult to believe that the three reflection assignments had a major influence on the quantity of the queries; they were not graded, and the required lengths were relatively short with each task requiring only one page (double spacing). However, this study still excludes all the queries prior to November 11 in order to ensure that it examines only the voluntary queries. In terms of daily average, students (voluntarily) used the corpus even more frequently (N = 8.17) than when they had the corpus-related tasks that required them to use the corpus (N = 7). The study has found that the major reasons for corpus consultations are the lack of alternative resources,
effectiveness and efficiency of the corpus compared to other tools, and the use of tool(s), including but not limited to the corpus, as an integral part of writing in L2. The remainder of this section reports the students’ reflections on their rationale for using the corpus during and after the course.

4.3.1.1. Awareness of lacking resources

Although students showed generally positive attitudes toward the corpus, the primary reason for them to use the corpus was lack of resources. The students’ voluntary queries represent not so much an appreciation of the corpus, but rather a lack of resources available to them (and corresponding frustration). Prior to the introduction of the corpus in early September, 2008, students had a class discussion on their writing strategies. During the discussion, a recurrent theme was the lack of resources. All three focal students showed their awareness of the lacking resources and incapacity of some of the tools that they used for addressing their needs in writing.

Teacher’s help as limited resource

In the reflections, Yushi noted that a teacher’s help is a limited resource. Yushi’s self-help strategy was to identify and use as many tools as possible:
Excerpt 1

Maybe we can get some help from our teacher, but teachers still cannot be considered as a full time consultant. My advice is, as what we talked about in class\(^7\), to look for as many tools as you can to help you. Thank god we have computers, which make us accessible to many resources.

(Yushi’s opinion writing, September 19, 2008)

There seems to be a sense of helplessness in Yushi’s comment that teachers are not a “fulltime consultant” as well as a sign of relief when he said, “Thank god we have computers.” It is the same sense of helplessness that Yining expressed in saying, “Before my teacher introduces myCorpus to me, I do not know whom to turn to” (Yining’s Paper #3, December 12, 2008). According to Yushi’ response, unavailability of the teacher is a source of frustration to the students: their teacher is not there for them at the time of actual writing, which is the time when they need their teacher most. For Yushi, the corpus was a self-help strategy in absence of the teacher’s help.

_Taking maximum advantage of available resources_

Jingjing, on the other hand, suggested a more realistic, hybrid approach; she suggested that, for lexicogrammatical issues, students identify a tool that worked best for themselves and use it. As for content issues, students should contact their teachers:

\(^7\) Yushi is referring to the classroom discussion on writing strategies.
Excerpt 2

I think we should find our own tools to help us. We can use different technology to help us. For example, we can use Microsoft word to help check grammatical and spelling mistakes. We can use on-line or electronic dictionaries to look up words. We can also use software to translate sentences. All we need to do is to find the most suitable one and to use it. For the contents, we can ask our teachers to look at them. We should go and talk to our teachers actively. In this way, we can improve our English as well.

(Jingjing’s opinion writing, September 19, 2008)

Jingjing’s comment is consistent with Yushi’s as it suggests that students use the tools as a self-help strategy and their use is motivated by the lack of available help. Taking a more proactive approach to the issue than Yushi, however, Jingjing suggested that L2 writers strategically maximize the benefits by assigning their needs to the best available resources. Slightly different from Yushi’s suggestion for compiling a repertoire of tools to substitute the teachers’ help, Jingjing considered a way to use the limited teacher’s time to her greatest benefit. As a realistic way to achieve such a benefit, her suggestion points toward a division of labor between the tools and the teacher.

Incapability of the available tools for addressing the needs

Still differing from the two focal students, Yining questioned the quality of the tools that her classmates suggested as a solution to the issue of lack of help. Her
argument is that, although the tools may offer some help for the accuracy issues, they are incapable of telling if an item is “appropriate” and “nativelike” or not:

Excerpt 3

Most of the time, students ask teachers or upper-level classmates for help to revise their essays. Sometimes, they go to an online dictionary to look for a specific definition. However, they do not have an efficient tool to rely on in order to check if their use of the word is appropriate in certain content, if the sentences are native-like, and if the punctuations are in the right places.

(Yining’s Paper #3, December 12, 2008)

There is a clear indication in Yining’s comment that the tools that students used previously are not capable of addressing their needs in determining the appropriateness of their text.

In sum, the focal students indicated that they used the corpus because no other help was available. Their 245 voluntary queries, therefore, represent the moments when students felt helpless. These queries should not be interpreted as unanimous exhortation of the corpus, although they certainly speak for the effectiveness of the corpus to some extent. Rather, the queries reflect the dire situations in which the students were left to produce academic discourse without any other help but the corpus.
4.3.1.2. Effectiveness

Effectiveness refers to the capability of the corpus to solve students’ immediate problems. With the lack of resources, effectiveness was an important motivation for voluntary corpus consultation. Focal students’ reflections show that they used the corpus in an individualized way to address their own issues.

The corpus as content and language resource retriever: Yushi’s case

Yushi was a methodical analyst of the effectiveness of the corpus. As a business major, he looked at the value of the corpus and wrote a software evaluation report. He had his own criteria for evaluation and applied them to the corpus. Below is his comment on “search capability” of the corpus, one of the four evaluation criteria that he used:

Excerpt 4

As for the search capability, MyCorpus not only supports word searching, but also supports phrase search and even sentence search. **This feature gives me more opportunities to get to the right search result I want** . . . MyCorpus provides a complete academic article related to each result found. **This much more complete context given by MyCorpus helps me understand the circumstances where and how the words are used.**

(Yushi’s Paper #3, December 12, 2008)
Yushi’s comment provides concrete reasons for his positive evaluation by highlighting two useful features of the corpus - full text link and phrase search. The corpus offered realistic help to him, as he actually found a research article on software evaluation through the corpus and used it as a major resource for his report writing. Its effectiveness in addressing his needs accounts for his voluntary use of the corpus.

Corpus as an error checker for high grades: Jingjing’s case

For the students, grades are one of the most important criteria of effectiveness: the higher the grade a tool gets them, the more effective the tool is. Once students had found out that the corpus actually solved their problems, they became voluntary users. Jingjing noted:

Excerpt 5

This is my first semester in the university. When I do not know how to express a word in English, I used electronic dictionary. But in some cases, electronic dictionary does not help. Because of this problem, I always made wording mistakes, and I could not receive a high mark for my paper. . . In ESL class, my instructor introduced me a website called “myCorpus”. It is a search engine. I could type my phrase there and simply click on “search”. It shows all academic writings that contain my phrase. ..

After I knew this tool, I used it every time when I write. As I know, all of my classmates use this tool as well. They all feel this tool helped them a lot when they write their paper.

(Jingjing’s pre-class writing, November 20)
Jingjing kept using the corpus, as it was the most effective tool in helping her obtain higher grades. In a sense, choosing the corpus was a natural selection process in which any tool that is not effective in problem solving would go extinct from her tool list. The dictionary was the first to be discarded and the concordancer followed closely. In contrast, voluntary corpus queries represent the result of her judgment, which is firmly based on the perceived link between her corpus use and an increase in her grade.

*The corpus as phrase and sentence sampler: Yining’s case*

In her reflections, Yining presented a critical evaluation of the corpus. Yining based her opinion on two areas, which she referred to as “sentence structure” and “word usage.” As for sentence structure, her evaluation was generally positive and it was firmly based on her specific experiences of the corpus:

Excerpt 6

. . . myCorpus is effective on improving the writings more academic and more organized. [My experience] also reveals that myCorpus help [me] more on sentence structure. . . I tried different way to arrange these phrases [“as technology is developing in a fast speed, tools”], but I just couldn’t find the right way to express what I want to say. I found there’s a sentence structure “can be done as”, so my sentence is changed from “Lately, as technology is developing in a fast speed, there are more tools for L2 users to choose”
to “Language learning skills can also be improved as language tools become more
developed”.

(Yining’s paper #3, December 12, 2008)

In Excerpt 6, her first sentence simply states that there is an increased availability of tools, but the second one goes further and emphasizes the possibility of a better way to learn L2. While making the revision, her concern was not grammatical accuracy but externalization of her thought, as represented in the second sentence. As she was able to find a useful example from the corpus, she perceived that the corpus was effective in addressing her concern.

Yining’s second issue was lexicogrammatical choice, which she called “word usage.” She found that the search tool was particularly effective for showing prepositions for a verb:

Excerpt 7

Most of the time, I am not sure if the preposition I use after a verb is right, so I usually type a verb to see what preposition they put after it . . . it took the least time for me to find the verb usage and I usually find the use of the verb the first time I search it.

(Yining’s paper #3, December 12, 2008)

However, the corpus was less effective with multi-word or phrases, as the search engine ignored the function words (i.e., preposition and relative pronoun), while showing the content words (i.e., the noun) in bold as high-priority items:
Excerpt 8

On the contrary, it is hard to find the preposition immediately since only the verb or noun is in bold font. So, once I was trying to find “process in which”, I could not find any example from the references. However, I quoted the preposition as my teacher told me to, and then I found that they do use “process in which”, and they use it often.

(Yining’s paper #3, December 12, 2008)

Yining found that the search engine did not consider function words as meaningful units, although they are the items that she had most difficulty with. By putting quotation marks around the words, she was able to tell the corpus to include the preposition, which is a technique called “phrase search.” However, phrase search still does not solve the fundamental problem with the function word search because, to be able to perform a phrase search at all, students need to know what words to look for in the first place. Yining was able to look for “process in which” only because she already knew that “in which” could follow “process.” Although Yining felt the corpus solved her problem for this instance, she still had a good chance of facing the same kind of issue.

4.3.1.3. Efficiency

In addition to effectiveness, efficiency is an important consideration for the students in evaluating the corpus: the less time students spend solving a problem with a tool, the more efficient the tool is. By definition, efficiency of the corpus is evaluated in
comparison with other tools. As in the effectiveness evaluation, the process is a natural selection: an inefficient tool is instantly discarded and once discarded, it is never reconsidered. The focal students’ narratives reflect their awareness of efficiency in selecting the tool(s) for writing. The students were comparing the corpus with a number of tools including a grammar checker\(^8\), the corpus search engine, portable electronic dictionaries, online dictionary websites, bilingual translation websites, and an online concordancer\(^9\). In addition to the search engine, two tools that appeared in the students’ reflections are the grammar checker and an online concordancer.

Although the grammar checker was efficient in what it does, its use is limited to a simple morphological and syntactic items. The checker has a simple built-in parser to locate errors and make suggestions to correct the errors. The students used the grammar checker as a quick fix for errors. For example, Yushi wrote, “the two websites which” and then he noticed an error indication, a green underline below “which.” The checker’s suggestion was to choose either “the two websites, which” or “the two websites that,” i.e., either “which” with a comma or “that” without a comma (Yushi’s screen capture clip, November 4, 2008). Eventually, Yushi replaced “which” with “that,” ending up with “the two websites that.”

Students made critical comments on concordance software in their reflections. According to the students, its inefficiency as well as ineffectiveness discouraged them

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\(^8\) MS-Word Spelling and Grammar Checker

\(^9\) Cobuild Corpus Sampler (http://www.collins.co.uk/Corpus/CorpusSearch.aspx)
from using it. The students’ responses were quick and straightforward. For example,

Yushi noted:

Excerpt 9

The [concordancer] is bad looking and slow. **I think realistically nobody will use slow websites, especially when there are alternatives** . . . I highly recommend to use MyCorpus instead. MyCorpus is faster, easier and more accurate.

(Yushi’s Paper #3, December 12, 2008)

Yushi pointed out that concordance software is simply outdated: “the way of using it is really old fashioned and boring to me. I don’t want to type so many ‘other’ things in order to get my result.” He cited the difficulty of multi-word search as a major inconvenience: “A plus (+) must be used to connect words in phrase searching. It is not very popular today though. Many people now just want to simply type in the words and get the results.” It is noticeable that his negative evaluation contradicts the positive evaluation in most of the concordance-based studies, which praised the value of concordancing. In fact, Yushi’s comments hint at an explanation for the discrepancy: the students in the past studies had no “alternatives” and if they did, none of them would have used a concordancer. This comment of his is clearly enacted in his choice of the corpus over other tools.
4.3.1.4. Digital tools as an integral part of writing

Students’ voluntary use of the corpus is related to their perception of networked computing, a common writing environment, and digital tools as an integral component of writing. Students commented that using digital tools is part of their writing and they used the corpus simply as an additional tool. Their comments on their use of the tools were collected in an in-class discussion in which they discussed in groups what constitutes L2 writing competence. As a follow-up activity, they wrote their responses to a question: “Do you believe that knowledge and ability to use the tool should be considered a part of L2 writers’ writing skills/competence? Why or why not?” The following reflections are their responses to the question.

In her response, Jingjing agreed that a tool should be considered a part of writing competence. Her rationale was that a tool, if available, could make substantial differences in the quality of writing. She further noted that she used the corpus tool as a part of her writing competence:

Excerpt 10

It is certain that in the process of writing, they [students] would have questions, confusions and mistakes. . . . The process of seeking for help will directly influence the quality of their paper. Thus, I strongly feel that the ability to use tools should be considered a part of L2 writers’ writing. . . . In ESL class, my instructor introduced me a website called “myCorpus”. It is a search engine. I could type my phrase there and
simply click on “search”. It shows all academic writings that contain my phrase. . . After
I knew this tool, I used it every time when I write.

(Jingjing’s in-class response, November 20)

Prior to the introduction of the corpus, Jingjing used to consult Google search and portable electronic dictionaries as linguistic references. Once the corpus had become available to her, she used it more frequently than the other tools (“I used it every time when I write”).

Yining’s comment was specific about the benefit of including the corpus as a part of her writing competence. Yining specifically pointed out that the corpus worked for her because it allowed her to access and mimic the target academic discourse:

Excerpt 11
After using it for a month, I believe that the knowledge and ability to use the tool should be considered a part of L2 writers’ writing skills… As long as I know myCorpus, I started searching word in myCorpus. It gave me amounts of references that I can check that whether the scholar use the word in the same way as I did. If not, I can change my sentence into the way they mostly use.

(Yining’s in-class response, November 20)

For the focal students, the corpus was simply one of the common tools they used for their writing tasks. Writing for them was a collaborative activity with the digital tools. Their perception of digital tools as part of their writing skill may be due to their particular
writing environments: Like all other first-year students, the focal students were residing in student dormitories, which offered a ubiquitous computing environment. As networked computing was already their natural writing context, it was easy for them to integrate the corpus into their repertoire of digital tools for assisting their writing.

The students’ liking for trendy technology accounts for some of their preference of the corpus to other tools. As young adults who grew up in Web 2.0 environments (e.g., Twitter and Facebook), the focal students were sensitive about being “cool.” Thus, the “coolness” of the search engine may have expedited their decision to abandon the concordancer. For the students, the concordancer was “old fashioned” and “bad looking” (Yushi’s Paper #3, December 12, 2008). While effectiveness and efficiency are important reasons for using a tool, “coolness” is an enhancing factor of voluntary use for the students, i.e., to be a part of their digital writing habitat, a tool must be not only fast and efficient, but also importantly, it should have the flavor of a trendy, state-of-art technology.

4.3.2. Continued use of the corpus

The course ended on December 12, 2008, and the final grades were given on December 17 of the same year. Approximately four months later, on April 23, 2009, the focal students’ query logs were retrieved in order to examine whether the students used the corpus after the conclusion of the course. The reason for retrieval was that the post-
course queries, if existing at all, would serve as valuable data, on which this study could triangulate on the students’ perception of the corpus.

From the query logs, 70 queries were found spanning over the four-month period from January to April in the year of 2009. Normally, analyzing these queries requires a functional description, which is missing in this case. Unlike LCI during the semester, however, the post-course queries represent anonymous LCI, which means that supporting data, i.e., screen recordings and reflections, are not available. With these data lacking, the analysis of the post-course queries focused on strictly formal analysis using minimal query pair as a primary means of analysis. This technique allowed this study to make inferences about the writers’ strategies and challenges only based on the query log. The results of the analysis are reported in the following.

4.3.2.1. Form/function analysis of the post-course queries

As an initial step of post-query analysis, this study performed form/function analysis on the 70 post-course queries. In the formal analysis, the objective was to identify the number and types of transactions and queries. Table 4.14 presents basic descriptive statistics of the post-course queries:
Table 4.14. Descriptive Statistics of Post-course Query Log

<table>
<thead>
<tr>
<th></th>
<th>Number of transactions</th>
<th>Number of queries in transactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>31 (73.81%)</td>
<td>31 (44.29%)</td>
</tr>
<tr>
<td>Complex</td>
<td>11 (26.19%)</td>
<td>39 (55.71%)</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>70</td>
</tr>
</tbody>
</table>

Table 4.14 shows that the post-course queries have a generally consistent tendency for students to use more simple transactions. The tendency in the post-course queries is very similar to the results of the formal analysis of the queries collected during the semester. In both kinds of queries, simple transactions outnumbered complex transactions. In the post-course queries, there were 31 simple transactions and 11 complex transactions. When compared in terms of the number of queries, the simple and complex transactions are balanced: there were 31 queries in simple transactions and 39 queries in complex transactions. On average, each transaction consists of three queries, and each query has one or two words. The convergence in descriptive statistics of the two kinds of query logs suggests a similarity of students’ search behaviors during and after the course.

As for functional analysis, the analytical procedure was more complicated than the formal analysis. Due to the lack of contextual information from supporting data, i.e., screen recordings and oral and written reflections, the functional analysis only focuses on complex transactions. In order to identify the unit of analysis, this study had to further isolate complex transactions into smaller units. It is, again, due to the lack of supporting data to tell us where a transaction begins and where it ends. As a reminder, Yining’s
queries, “tough task,” “hard task,” and “difficult task,” were grouped together in a single transaction based on the consistency across the datasets: these queries shared a lexical item in the query log, they appeared as a coherent narrative episode in her reflections, and there were visual signals that show she began the transaction by relocating the mouse cursor, and ended it by making a revision and scrolling away. In anonymous log analysis, however, none of these information sources are available. This study focuses on minimal query pairs in order to address the paucity of data. Minimal query pair refers to two adjacent queries with a single lexicogrammatical difference (e.g., “hard task,” and “difficult task”).

Using minimal pairs as the primary unit of analysis, this study has identified three patterns in anonymous LCI: substitution, addition, and relocation, as the following examples illustrate:

<table>
<thead>
<tr>
<th>Query ID</th>
<th>Query</th>
<th>(Post-course query log)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitution</td>
<td>2702 common people</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2703 normal people</td>
<td></td>
</tr>
<tr>
<td>Addition</td>
<td>2928 substitute</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2929 substitute to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Substitution) 2930 substitute for</td>
<td></td>
</tr>
<tr>
<td>Relocation</td>
<td>3059 not before long</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3060 not long before</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.27. Substitution, addition, and relocation
In Figure 4.27, “common people” (#2702) and “normal people” (#2703) are a minimal pair, as they differ only in a single lexical item. These queries are refined by substitution, in which “normal” is replaced with “common.” By examining the pair, we learn, at least, that the challenge to the unknown writer was lexical, i.e., choosing an adjective for “people.” The next example shows that an example of addition: “substitute” (#2928) and “substitute to” (#2929) differ only in the added preposition, “to.” It is likely that “substitute to” represents hypothesis testing about verb transivity. Unlike this pair, the following query, “substitute for” (#2930) is a case of substitution intended to test a hypothesis on prepositional collocation. Then the first pair (#2928 and #2929) and the second pair (#2929 and #2930) represent different areas of challenges and different kinds of search strategies. The final pair, “not before long” (#3059) and “not long before” (#3060), is a case of relocation. They differ only in terms of word order indicating that sequencing these words was a challenge to the writer.

Besides the three patterns of refinement, other potential patterns are not included in the analysis. For example, subtraction is often found in the query log and could be considered as a pattern of interaction. However, despite its high frequency, subtraction is not included because the motivation for subtraction refinement is more difficult to infer than the other three query patterns. Consider the example:

<table>
<thead>
<tr>
<th>Subtraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>3059</td>
</tr>
<tr>
<td>3061</td>
</tr>
</tbody>
</table>

(Anonymous post-course query log)

Figure 4.28. Query refinement by subtraction
Query #3061 is a result of subtraction refinement. Unlike substitution, addition, and relocation, we always lose a piece of information in subtraction, which makes it even more difficult to make inferences than it was. Thus, when an item is removed from a minimal pair the number of possible explanations increases exponentially. It is extremely difficult, if not impossible, to infer what the example in Figure 4.28 is intended for and why the anonymous writer removed “not” and “long” from the queries.

By examining minimal pairs of adjacent queries, this study identified 13 challenges in 11 complex transactions:

Table 4.15. Challenges in Post-course Query Log

<table>
<thead>
<tr>
<th>Types of challenge</th>
<th>Frequency</th>
<th>Query example (transaction #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article</td>
<td>1</td>
<td>in the contrast, in contrast (#37)</td>
</tr>
</tbody>
</table>
| Collocation        | 8         | common people, normal people (#31)  
|                    |           | sleeping hour, slumber hours, sleep hours (#35)  
|                    |           | soon before, short before (#39) |
| Preposition        | 3         | ask for a favorite, ask a favorite (#1)  
|                    |           | substitute to, substitute for (#36) |
| word order         | 1         | not before long, not long before (#39)  |

13

*Note.* # indicates transaction id in the post-course query log.
The results of post-course log analysis are, again, consistent with the findings of the analysis of the queries collected during the semester. Lexical collocation is the most frequent motivation, as expected, and preposition was the second most frequent item.

4.3.2.2. Interpretation of post-course queries

Post-course queries, together with voluntary queries, show that the students found the corpus helpful in a realistic sense. In general, the post-course queries provide support for the students’ positive perceptions of the corpus system. Had it not offered realistic help, the corpus system would have been discarded when the semester was over. The post-course queries, then, confirm students’ positive evaluations of the corpus by showing that it was their tool of choice even when they wrote for non-ESL courses.

The post-course queries reflect the students’ writing needs as they faced new writing contexts. There were two noticeable changes in their writing situations in the following semester. First of all, their writing loads considerably decreased. It is because they already took two writing-intensive courses, and therefore, did not need to take any additional writing-intensive courses. While decreasing in quantity, their writing tasks became less general and more discipline and genre-specific than their first semester. It was due to the content courses that they took in elective courses (e.g., Astronomy), and the content courses in their disciplines (e.g., Business administration, Economics, and Management Information Systems). Some of the courses that the focal students took in the spring semester of 2009 are as follows:
Table 4.16. Focal Students’ Courses in Spring 2009

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Writing workload (English)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCTG</td>
<td>Accounting</td>
<td>None</td>
</tr>
<tr>
<td>ASTRO</td>
<td>Astronomy</td>
<td>Minimal</td>
</tr>
<tr>
<td>BA</td>
<td>Business Administration</td>
<td>Minimal</td>
</tr>
<tr>
<td>ECON</td>
<td>Economics</td>
<td>Minimal</td>
</tr>
<tr>
<td>GER</td>
<td>German 001</td>
<td>None</td>
</tr>
<tr>
<td>HIST</td>
<td>World History</td>
<td>Summaries and one term paper (or book review)</td>
</tr>
<tr>
<td>JPNS</td>
<td>Japanese 002</td>
<td>None</td>
</tr>
<tr>
<td>KINES</td>
<td>Physical Education Activity</td>
<td>None</td>
</tr>
<tr>
<td>MIS</td>
<td>Management Information Systems</td>
<td>Minimal</td>
</tr>
</tbody>
</table>

It is highly probable that the new writing situations influenced their continued use of the corpus. As the students were in an early stage of enculturation into the tertiary-level education as well as their academic disciplines, their needs shifted towards discipline-specific language. Some words in the query log seem to reflect such needs (e.g., “resistance,” “philistine citizen,” “world view revolution,” and “architectural engineering”). The post-course queries reflect their needs, which the ESL composition course did not fully address.
4.4. Summary

4.4.1. Formal and functional analysis

This section performed both a formal and a functional analysis of LCI. The formal analysis examined four structural units, i.e., consultation, transaction, exchange, and move. The section presented operational definitions for formally identifying these units, and then reported the descriptive statistics based on the definitions. In functional analysis, the four units were re-examined in terms of their contributions to the students’ writing performance. In consultation, the highest layer of LCI, the students evaluated the corpus and themselves as L2 writers. Transaction, the next unit, showed the students’ effort to achieve two kinds of purposes, i.e., appropriating the target discourse items in terms of accuracy and appropriateness. The analysis further distinguished positive and negative transactions; and identified two situations that required further attention of corpus-based research, i.e., non-evidence, and suggestive-evidence situations. In exchange, two kinds of strategies in LCI, verification and elicitation, were discussed. Based on the purposes and strategies, the section distinguished exchanges in the four categories consisting of accuracy verification, appropriateness verification, accuracy elicitation, appropriateness elicitation. Each of these exchanges served the diverse needs of the focal students. Finally, the analysis of moves focused on the students’ function words as a distinct characteristic of LCI and pointed out that the inability to address the needs for function-word searches is a limitation in using the corpus search engine for pedagogical purposes. Evaluation move played a crucial role in LCI analysis by allowing a moment-by-moment analysis of
data and allowing for reconstruction of the internal cognitive processes of the writers in parallel with their composing process as captured in data.

In sum, the formal and functional analysis in this section shows that L2 writers’ interaction with the corpus is a highly structured and interactive process, in which their desire to be a good writer as well as their strategic moves in response to the immediate challenges shapes the scenes of entire LCI. In a close collaboration with the students, the corpus tool assisted the students in testing their hypothesis for addressing the lexicogrammatical challenges, and thereby, contributed to enhancing their genre performance.

4.4.2. Continued use of the corpus

To examine L2 writers’ perception toward the corpus, this study used two kinds of corpus queries, those collected a) over the course span and b) after the completion of the course (i.e. post-course queries) in addition to the oral and written reflections. These queries are important in LCI analysis in two ways. First, they serve as triangulation data to confirm (or contradict) the students' evaluations of the corpus. Second, they allow us to trace some aspects of the writers’ needs in their transition to the new writing contexts, beyond our ESL classroom.

The analysis of the voluntary queries reveals that the student’s motivation for using the corpus is a lack of resources, especially at the time of individual writing. In response to the lack and in search of self-help, they compared and evaluated a number of
available tools, which include (electronic) dictionaries, translation websites, concordance software and the corpus. In making a choice of a tool, not only effectiveness but also efficiency was a conclusive factor. If a tool were not effective or efficient in addressing their issues, it was instantly abandoned never to be reconsidered again. In a sharp contrast with the reports in the previous studies, the concordancer was one of the first tools to be abandoned by the students. Finally, voluntary use of the corpus is related with the focal students’ writing environments, in which digital tools and networked computing are an integral part of writing. Such familiarity with the digital tools has a positive influence on their voluntary use of the corpus.

This study found that the students continued to use the corpus even after the completion of the course. Four months after the conclusion of the course, the study retrieved 70 post-course queries. The descriptive statistics of the queries showed that the post-course queries followed the general tendency found in the queries collected during the course. Using minimal pair as the primary unit of analysis, this study has identified three functional patterns in anonymous LCI: substitution, addition, and relocation. These functions of the post-course queries seem to reflect the changes in the students’ writing contexts. Although still in an early stage, the students were being enculturated into their academic disciplines and accordingly, their needs shifted towards the discipline-specific language. The new writing situations influenced their continued use of the corpus, which suggests new aspects of the L2 writers’ needs, which the ESL composition course did not fully address.
CHAPTER 5
DISCUSSION

The three focal students in the present study had some success in enhancing lexicogrammatical performance through LCI. However, despite the generally positive outcome, several challenges and issues emerged as well. First, the formal and functional analyses of LCI showed in a fuller picture that L2 writers’ needs are difficult to predict or address due to their variation across differing writing situations. Regarding the role of LCI in addressing these needs, this chapter discusses what characteristics of LCI helped the students to meet the challenges and how these characteristics may inform the future research on corpus-based mediation. This chapter furthers the discussion by recognizing the urgent emerging issue of plagiarism. Although textual borrowing can be a generic pattern of interaction in any corpus-based pedagogy, there is a surprising lack of attention in the current body of research. In response, this chapter focuses on the question of what the teachers’ responsible position is with regard to the textual borrowing in LCI. Addressing learner needs and the plagiarism issue requires that we reconceptualize LCI. This chapter points out the inadequacy of Data-Driven Learning theory (DDL) for understanding LCI, and alternatively proposes Distributed Cognition (DC) theory as a conceptual framework of LCI and as a central principle of designing computational mediation in genre-based writing instruction.
5.1. Pattern of interaction in LCI

This section answers the first research question regarding the interactional pattern of LCI by extending the structural analysis of LCI to a discussion of dialogic negotiation, the primary characteristic of LCI, and a critical evaluation of corpus-based mediation. The evaluation serves two practical purposes: to help teachers to make an informed choice when choosing a meditational tool for their corpus-assisted teaching, and to offer guidelines for designing a corpus-based activity.

5.1.1. The LCI units

Consultation is the highest layer in the structure of LCI in which students evaluate the corpus tool and themselves as L2 writers. It is the locus of the students’ desires to achieve advanced literacy. In order to ensure a valid observation on the consultation level, this study respects the students’ right to not use the corpus and thereby, encourages them to voice their opinions. The focal students were explicitly given a choice for not using the course corpus and no assignment or class activity required them to use the corpus. The only exceptions were the tutorial sessions in which students were introduced to the corpus. With the right not to use the corpus, the students were able to articulate their rationale for using the corpus with very specific examples, as the choice was completely their own.

LCI, in its essence, is a struggle that consists of students’ desires of externalizing their thoughts and their ensuing efforts, which, transaction, the next structural unit,
captures well. Every transaction in LCI represents the L2 writers’ needs and their strategies to meet the needs. Transaction begins with a problem and ends with a solution. Students’ problem solving appears in a recursive, dialogue-like structure: they solve their problems by asking a question and receiving an answer from the corpus. In terms of the reciprocal exchange of information, LCI bears a similarity with a particular type of human conversation, a hypothetical interview, in which an investigator tries to elicit as much information as possible from a cooperative informant in order to solve a problem. The informant, on the other hand, provides answers responding to the investigator’s questions. The conclusion that the interviewer eventually draws is the solution to their current problem. Similarly, problem solving in transaction takes place through a dialogic communication between the students and the corpus.

While transaction represents global problem solving in LCI, negotiation occurs in the smaller units of exchange and move. The dialogue-like structure in LCI is a result of query and its refinement is based on the search results. Query refinements in exchanges represent student’s proactive hypothesis testing to draw and synthesize information from the corpus, which is tailored to their individual and contextualized needs. The dialogic interaction, thus, allows students to construct situated genre knowledge in response to their immediate lexicogrammatical challenge. On the move level, evaluation makes the dialogue-like pattern possible by connecting one exchange to the next. Evaluation is a point of convergence that allows a synthesis of students’ genre awareness and the genre knowledge that the corpus provides. Through the synthesis, students transform and appropriate information from the corpus.
5.1.2. LCI in corpus search engine and concordance software

The focal students’ problem solving is a negotiated outcome, which can be attributed to dialogism of LCI. In facilitating dialogic interaction and the negotiation, interactivity of the corpus played a crucial role. Interactivity is the quality that allows students to perform hypothesis testing and eventually to enhance their lexicogrammatical performance. Despite its importance, interactivity has not received adequate attention in corpus-based research, as the previous studies typically asked students to analyze concordance lines and induce a rule, rather than interact with the corpus.

Corpus-based pedagogy can be improved by being more responsive to the students’ individual needs. In the previous studies, corpus activities are pre-planned and given by the teacher, rather than initiated by students. Gaskell and Cobb (2004), for example, added hyperlinks to the errors in students’ writing so that when students can view the pre-coded concordance lines on their computers by clicking the links. With the concordance lines as clues to their errors, students were supposed to induce a rule from and apply it to fixing their errors (e.g., “go to home”). Corpus consultation, however, does not have to be given as a teacher-controlled activity. Teachers can encourage students to engage in on-the-fly corpus consultation in the classroom. Although corpus-based studies have been limited in the capacity for addressing students’ needs in student-led writing situations, the limitations can certainly be removed by providing a more flexible and technologically advanced corpus system.

LCI in this study is in a better position to address students’ needs than the previous approaches (e.g., analysis of static concordance lines), as it allows for more
interactive consultation of a corpus. Thus, LCI differs from the concordance-based approaches in several ways. In LCI, the primary goal is to create a text as a negotiated outcome, as opposed to inducing a set of rules. The interactive nature of a search engine promotes students’ hypothesis testing in response to their challenges in realistic writing situations. The comparison between these two methods is presented in Table 5.1:

Table 5.1. Comparison of Concordancing and Searching

<table>
<thead>
<tr>
<th></th>
<th>Concordance software</th>
<th>Search engine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interactivity</strong></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td><strong>Pattern of interaction</strong></td>
<td>Linear</td>
<td>Recursive</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Finding a rule</td>
<td>Text construction</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Inductive reasoning</td>
<td>Hypothesis testing</td>
</tr>
<tr>
<td><strong>Learning outcome</strong></td>
<td>Reduced description of language</td>
<td>Negotiated text</td>
</tr>
<tr>
<td><strong>Context</strong></td>
<td>Hypothetical, experimental, preplanned</td>
<td>Realistic, situated</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td>Formal similarity</td>
<td>Contextual similarity</td>
</tr>
</tbody>
</table>

There are a few noticeable differences between the ways in which students evaluate the concordance lines in the previous studies and the search results in LCI in this study. In the concordance-based presentations, students compare the concordances based on formal similarity, while paying less attention to the contexts. The comparison, however, is less effective in highlighting the context of writing, i.e., what the student hoped to express and why. Differing from this form-focused activity, comparison of search results in LCI encourages students to evaluate the text in terms of the contextual...
similarity. In other words, students evaluate the results based on the semantic proximity to the idea that they wished to express. For example, Yining’s three-word query, “society develop fast” aims toward meaning making, as opposed to formal accuracy. At the time of query, Yining was building a sentence to express her idea that there has been a rapid technological improvement, which is a consequence of the fast development in the society in general. Her query was intended to elicit and evaluate the search results based on their closeness to the context that she wished to express. The desirable search results should reflect a) the authorial intention to correlate a change in the general factor (“society”) to a change of a variable under observation (“technology”), and b) the appropriate lexicogrammatical items that tend to co-occur with the search words. Using the search engine, Yining actively revised her queries (four times) and finally found the best candidate that was closest to her idea in terms of the wording as well as the context. Thus, her final revision represents the textual negotiation between her and the corpus. It suggests that LCI can be a more flexible alternative to the concordance-based activities by allowing students to construct a text in interactive corpus consultation.

5.2. Learner needs and performance enhancement

The goal of corpus-based mediation in this study is to enhance students’ lexicogrammatical performance when writing in the academic genres. With regard to this overarching goal, this study addresses two relevant research questions regarding the
students’ needs and the role of corpus-based mediation in enhancing students’ lexicogrammatical performance.

In answering the research questions, this study draws on the Hallidayan SFL framework for understanding the writers’ needs. SFL offers two distinct benefits in augmenting our understanding of their needs. First, with its emphasis on context, SFL raises our awareness of the realistic writing contexts and the consequent variation of text. In this view, the writers’ needs vary across the differing writing situations and therefore, it is extremely difficult to define writers’ needs in static terms. Second, with the emphasis on the lexicogrammatical patterning in creating text, SFL allows us to discuss the needs in terms of the particular lexicogrammatical choices that writers make in externalizing their thoughts.

Realistically, L2 writers face a set of challenges at a time, ranging from mechanics to global organization, rather than one discrete challenge coming after another. Furthermore, writers typically experience an overwhelming cognitive overload in considering contextual variables (e.g., genre, audience, and authorial purposes) that vary across genres, tasks, and even sentences. These challenges appear as two less-explored characteristics of the L2 writers’ needs: multi-dimensionality and situatedness.

5.2.1. Multi-dimensionality of writers’ needs

Multi-dimensionality of writers’ needs refers to the multiplicity of the needs that simultaneously touches upon several areas of linguistic dimensions, i.e., lexicon,
morphology, syntax, and semantics. In LCI, a single query reflects multiple challenges in these areas of representation. Even a simple query about a preposition (e.g., “no excuse from” and “no excuse for”) may indicate lexical and semantic issues as well as an issue of syntactic accuracy. A series of query refinements in Yining’s query log illustrates the multidimensionality:

<table>
<thead>
<tr>
<th>Original text</th>
<th>Lately, as technology is developing in a fast speed, there are more tools for L2 users to choose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query 1</td>
<td>technology is developing in a fast speed</td>
</tr>
<tr>
<td>Query 2</td>
<td>society develop fast</td>
</tr>
<tr>
<td>Query 3</td>
<td>in a fast developing society</td>
</tr>
<tr>
<td>Query 4</td>
<td>technology develops fast</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Revised text</th>
<th>Lately, as technology is developing in a fast speed, more tools are invented for L2 users to improve their language learning</th>
</tr>
</thead>
</table>

(Screen recording of Yining’s draft #2 of Paper #1, October 7, 2008)

Figure 5.1. Multi-dimensionality in Yining’s revision

In Figure 5.1, the challenge to Yining is not limited to lexical concern, i.e., word choice, but it involves broader aspects of the lexicogrammar touching upon syntax, semantics, and rhetorical structure. Syntactically, Query 1 (“technology is developing in a fast speed”) and Query 2 (“society develop fast”) involve at least two kinds of choices: a choice between the progressive and simple aspect of the verbs (“developing,” and “develop”) and another choice between the adverbial and adverb (“in a fast speed” and
“fast”). Semantically, Query 2 (“society develop fast “) and Query 4 (“technology develops fast”) involve a choice between two agents, technology and society, for the verb, “develop.” On the other hand, “society” serves as a circumstance and becomes a background in Query 3 (“in a fast developing society”). We also notice that these choices are connected with Yining’s rhetorical decision with regard to structuring the sentence. She has an option to begin her sentence with either “society” or “technology,” depending on which she decides to highlight.

5.2.2. Situatedness of learner needs

The challenges to L2 writers are situated in the immediate rhetorical context and yet they vary across the contexts. Thus, a lexicogrammatical item may become a source of difficulty for a writer in one writing situation, while the exact same item may not be an issue at all in another situation. In the above example (Figure 5.1), Yining was consulting the corpus for the words, “society,” “technology,” “develop,” and “fast,” which implies that these words were a source of difficulty at that point in time. In other situations, however, these words would not normally be a challenge to her, as she was familiar with these words. In fact, she previously used them in her writing and these words never were a concern again during the entire semester. The difficulty involving the use of these words, therefore, was situated in this particular situation, which was specifically when she tried to describe an era of rapid technical change and a consequent increase in pedagogical affordances.
Situatedness of needs is more challenging than multi-dimensionality for L2 writers. In addressing multi-dimensionality, the focal students may (and did) analyze the multiple dimensions into smaller parts and solve one little problem at a time. In contrast, addressing situatedness requires a synthetic ability to draw on the target lexicogrammar. Another example of Yining’s query illustrates the point:

<table>
<thead>
<tr>
<th>Query</th>
<th>New sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Language tools, developed, skills</em></td>
<td><em>“Language learning skills can also be improved as language tools become more developed.”</em></td>
</tr>
</tbody>
</table>

Figure 5.2. Situatedness in Yining’s revision

Figure 5.2 shows that Yining had only fragments of words to build on when she started to write a new sentence. In the situation, externalizing her thought required an ability to collect more linguistic materials and synthesize them in a complete sentence. Yining recalled in interview that she wanted to say to the effect that the “language tools” became increasingly available to learners as self-help for improving their language skills. The challenge is that she had the thought in her L1 (“I knew what I wanted to say in Chinese”), while she did not have enough linguistic repertoire to verbalize her thought. In order to complete a sentence, she needed additional lexical and syntactic resources in L2, which she obtained from the corpus. It was through a synthesis of her prior L1 word fragments and the newly collected L2 resources that she completed her sentence eventually.
The lexicogrammatical resources that Yining managed to collect this time is not directly reusable for other challenges in a future writing situation, as these resources are tailored to the particular sentence that she wrote. Although her experience and skill gleaned at this time will certainly transfer to her next writing, the particular linguistic resources may not. For each new challenge, thus, she would have to perform a new textual synthesis in order to address its situatedness.

Situatedness is even more difficult to address due to the genre change as well as the change of the contexts. Genres constantly change over time and across varying discourse communities. In order to produce a text appropriate to a target genre, then, writers should align to the change of the target genre as well as the change in their writing contexts. In order to write in the situated genres, advanced writers draw on their knowledge of the target discourse communities. For example, it is commonly known that established writers can and do adjust their manuscript to the expectation of the reviewers of a target journal. To less-experienced writers without the expert genre knowledge, the situatedness of genre is an overwhelming challenge.

Although the situatedness of genre is well noted in the early seminal works on genre theory (Miller, 1984; Freedman & Medway, 1994), genre-based pedagogy is still in search of a way to address the issue. Solutions have been sought in a number of studies that focused on context awareness raising activities (Johns, 2008), simulation-based writing instruction (Cheng, 2007a), contextualizing genre teaching (Devitt, Reiff, & Bawarshi, 2004), and self-compiled mini corpora (Lee & Swales, 2006). Despite the
contribution of these efforts, providing students with direct access to the changes in genres remains a daunting challenge to researchers in this area.

5.2.3. Addressing learner needs through corpus-based mediation

For meeting the complexity of L2 writers’ needs, the suggestions in writing research have revolved around transference: helping students to build up the target lexicogrammar and to transfer it to their writing. The success of a transfer depends on the extent to which L2 writers understand their idiosyncratic writing situations and readjust their lexicogrammatical knowledge to the situations. An issue with this approach is that an ability to carry out such a transfer can be acquired only in a longitudinal period. Corpus-based mediation, however, raises an interesting possibility of addressing the issues at the time of writing through fast and focused analyses of exemplar texts. LCI analysis of this study supports the possibility by showing that the focal students addressed these issues by recycling the lexicogrammatical resources from the corpus with relatively high efficiency. This section examines the way in which the focal students developed their lexicogrammatical knowledge to address their needs in efficient micro-scale genre analysis in LCI.

5.2.3.1. On-line genre analysis

An efficient approach to addressing the multi-dimensional and situated needs is an on-the-spot, small-scale genre analysis. The idea is to help students to meet the
challenge of writing in a new context by performing a rapid micro text analysis using only highly relevant exemplars. Some researchers have suggested and experimented with this idea in genre-based pedagogy. Flowerdew (1993) advocated “on-line genre analysis,” in which writers perform “their own genre analysis” in order to meet their emerging needs. Similarly, Lee and Swales (2006) reported a corpus-informed course activity, in which they asked students to compile two small corpora consisting of genre exemplars and their own writing and to perform a comparative analysis.

Although the suggestions for need-based on-line genre analysis clearly have some potential for addressing the multi-dimensional and situated nature of writing needs, empirical evidence substantiating the potential is lacking. Importantly, these suggestions are limited to instructional settings, in which students receive guidance from their teachers, while they have not accounted for contexts of independent writing, in which students write alone, without the teachers’ help. Cases reported in this study demonstrate the feasibility of on-line genre analysis in contexts of independent writing. The focal writers’ interactions with the corpus suggest that rapid sampling is the key factor in their successful on-line genre analysis, as it allows interactive query refinements and hypothesis testing.

Through sampling, the consultation in LCI replicates the entire process of a full-scale genre analysis, i.e., compiling an exemplar corpus and comparing with learner texts (e.g., Lee & Swales, 2006), except the analysis in LCI is on a micro scale. As students work with specific challenges emerging in a particular context, each corpus search is fully contextualized and search results are directly relevant to the writer’s needs. Thus,
the results of on-line genre analysis are fully situated in their idiosyncratic writing contexts. Furthermore, interactive sampling in LCI allowed the focal students to break down their challenges into smaller items and address one at a time in a series of queries. Their fruitful interaction with the corpus shows that the corpus is a realistic means to materialize the potential of on-line genre analysis suggested in Flowerdew (1993) by addressing situated and multi-dimensional needs of L2 writers.

5.2.3.2. Tutoring emulation

The focal students’ corpus consultations suggest that dialogism in LCI is the key to their successful on-line genre analysis. The dialogic pattern in the writer’s corpus consultation bears a striking similarity to the way in which an experienced tutor offers help to a novice writer (described in Aljaafreh & Lantolf, 1994). With regard to help in a tutoring session, Aljaafreh and Lantolf’s (1994) study defines the qualities of graduation and contingency. Tutors offer graduated assistance by aligning with the students’ current stage of development, while they offer contingent help by maintaining a high level of sensitivity to the student’s performance and withdrawing their assistance once the student has reached the next developmental level.

The corpus consultation emulates human tutoring by sharing two important characteristics. First, the corpus dynamically adjusts exemplar materials to the increasingly sophisticated level of the writer’s awareness reflected in a series of queries (graduation). Based on this graduated help, an L2 writer achieves micro-level
development, moving on from one dimension of challenge to the next, solving one little problem after another. Once the writer has solved the problem, the corpus consultation immediately comes to a stop and the writer starts transferring the enhanced awareness to the textual performance (contingency).

The analysis suggests that the composing process is fundamentally a developmental process. This study, thus, provides data that challenges the processing model in Flower and Hayes (1981) and its contemporary legacy that lacks an account for the role of development in the construction of a text. In contrast to their model, the data in this study suggests that addressing challenges in writing always requires some kind of learning and that each step in the text production is a result of development. L2 writing, as a whole, is a site of struggle to achieve development. Enhanced genre performance, therefore, must involve a two-fold development. First, development should occur on the cognitive plane preparing a writer with a capacity to pool, recognize, and select the textual resources. Second, development should occur in actual production of a text. The focal writers’ data has shown that their internal cognition and the textual performance are inseparably encoded in their queries, each of which represents their cognitive development (i.e., hypothesis) and textual development (i.e., the query text itself).

5.2.3.3. Limitations of the non-interactive corpus use in on-line genre analysis

Corpus consultation facilitates interactive on-line genre analysis through tutoring emulation, a key factor for learning in LCI. By taking the role of an experienced tutor, the
corpus allowed students to address their needs while achieving cognitive as well as textual development. By taking the role of an experienced tutor, the corpus allowed students to address their needs while achieving cognitive as well as textual development. This study attributes the success of tutoring emulation to the interactivity of the tool in the corpus consultation. In retrospect, high interactivity of the corpus system would have materialized Flowerdew’s (1993) suggestion of on-line genre analysis. The concordance program in the early 1990s, however, was limited in its capability to allow for the interactive consultation.

As the tenet of online genre analysis is that writers address the challenges as they arise through fast analyses of exemplar texts, the key success factor is interactive learning. The technique works in an on-the-fly, just-in-time manner as students collect/analyze parallel texts as the need emerges, which requires a tool that facilitates a high degree of interaction between students and a corpus. The concordance program in Flowerdew’s (1993), however, was limited in the capacity to promote interaction. Due to the technical limitation, the benefits of the concordancing activities were limited to relatively simple compare-contrast tasks. For example, it was suggested that the teacher may present a few concordance lines in order to highlight the differences in the use of “say” between two disciplines, history and engineering (see Figure 5.3):
Then the teacher asks students to identify the rule that governs the pragmatics of the verb. Flowerdew (1993) argued that, based on these concordance lines, students may discover that “say” is used for “a reporting function in the historical articles, while in engineering, it is used to exemplify” (p. 312).

One may notice that, in a concordancing activity such as the one in Figure 5.3, there is a noticeable lack of interaction and a reduction of language. The entire semiotic system around the verb, “say,” is reduced to a single rule that implies that students should use “say” for reporting in history and for exemplifying in engineering. Learning in the non-interactive tasks of analyzing concordances, then, is limited to discrete, generic rules. Hypothetically, a meaningful cognitive development in this case would be to learn how different reporting verbs serve as resources to represent author stance, participation in knowledge construction, and relationship to discourse community (Hyland, 1999). Such
development requires learning lexicogrammatical dynamics that encode the varying aspects of the contexts in text.

Reduction of language in corpus activities is largely due to the non-interactive way in which concordances were used. Previous research used corpus activities for relatively simple form-focused activities, while paying less attention to offering gradual and contingent help. In the non-interactive corpus consultations, hypothesis testing is considered as a one-shot guess, rather than cognitive activities that are gradually arranged according to the level of difficulty. Accordingly, the corpus-based activities are not organized to facilitate students’ development in a contingent way, i.e., as a multi-staged process.

These limitations in the non-interactive use of a corpus have undermined the capacity of corpus technology to facilitate online genre analysis. The limitations in the non-interactive concordancing tasks can be articulated in terms of specific criteria (Flowerdew, 1993). Table 5.2 compares the non-interactive use of a corpus in traditional concordancing activities and more interactive use in LCI in the present study:

Table 5.2. Comparison of Two Methods in Facilitating On-line Genre Analysis

<table>
<thead>
<tr>
<th></th>
<th>Concordancing</th>
<th>Corpus search engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collecting exemplars</td>
<td>Difficult to collect, balance or modify</td>
<td>Exemplar database is precompiled and easily modified</td>
</tr>
<tr>
<td>Identifying lexicogrammatical patterns</td>
<td>Potential danger of making inaccurate inference</td>
<td>No need to develop an explicit inference</td>
</tr>
</tbody>
</table>

176
Connecting patterns to context
Reduction of context (KWIC view)
Extensive presentation of context
(paragraphs and full texts)
Transferring patterns to writing
Difficult to transfer; difficult to
construct text; Search results not
adapted to the situated learner needs
Relatively easy to transfer; Easy to
construct text; Search results tailored
to the learner needs

Non-interactive uses of a corpus offer little dialogic learning opportunity, which is
related with the absence of query refinement. In the non-interactive concordancing tasks,
students rarely refine their search queries, while their queries in LCI showed an
impressive 50.8% refinement rate. Due to the highly frequent refinements and consequent
dialogic quality, the help that LCI offers fundamentally differs from the help that non-
interactive tasks can offer. The comparison suggests that interactive use of a corpus is the
key to facilitating on-line genre analysis.

5.2.4. Plagiarism and the textual borrowing in LCI

This study observes that the focal students actively draw on the electronic source
texts that they accessed through the corpus. The screen recordings further show that the
large majority of source text (re)appeared in the students’ revised texts. Although the
textual borrowing was not originally included in the research questions, this study
considers it as an urgent issue that requires an investigation due to its similarity to
plagiarism.
Currently, there is an irresponsible lack of research on plagiarism in corpus-assisted writing. Considering the recent popularity of corpus-based approach to L2 writing, it is rather surprising that researchers in this area have not addressed the issue of plagiarism more carefully. It is not unusual to encounter a study that asked students to use a corpus without raising students’ awareness about potential plagiarism, while no study to my knowledge has explored or presented a prevention measure. Research on plagiarism has only touched upon the issue in broad terms of “Internet plagiarism” or “online plagiarism” (e.g., Austin & Brown, 1999; Scanlon & Neumann, 2002), while leaving corpus-based pedagogy as an unexplored area. The following briefly reviews the previous conceptualization of plagiarism in educational settings and discusses the potential role of a specialized corpus as an effective preventive measure of electronic plagiarism.

5.2.4.1. Plagiarism as an emerging issue in corpus-based mediation

Textual borrowing is an emerging phenomenon in LCI. At a glance, it may even look as if the corpus promoted plagiarism by facilitating students’ access to the electronic source texts. The impression is consistent with the increasing concern about “electronic plagiarism” and “e-Cheating” in writing research (Flowerdew & Li, 2008). These electronic forms of plagiarism are characterized by unacknowledged direct copying from the work of other writers via digital resources, e.g., the Internet. This study raises questions, then, as to what major characteristics define textual borrowing in LCI and whether LCI promotes plagiarism, and, if it does, how we may prevent it.
Two important characteristics of LCI distinguish the textual borrowing in LCI and plagiarism on the Internet. First, unlike electronic plagiarism, the textual borrowing in LCI takes place through intense textual negotiations. Second, as a result of the negotiations, there is a considerable difference between the source texts and borrowed texts in LCI. These discrepancies suggest that we should see the textual borrowing in LCI as an unexplored phenomenon that requires an extended investigation as such, rather than as an act of dishonesty.

5.2.4.2. Conceptualization of plagiarism: Crime versus Craft

Broadly conceived as unacknowledged textual borrowing, the definition of plagiarism falls somewhere along the spectrum between inculpating metaphor, e.g., “theft” and “stealing,” and rather fuzzy description such as “complex relationships between text, memory, and learning” (Pennycook, 1996). The crime metaphor considerably reduces the complexity of plagiarism to an ethical issue, i.e., a dishonest act of stealing texts of somebody else. The metaphor typically represents the position toward the issue of plagiarism in official documents (e.g., university regulations). In contrast, the fuzzy side of the definition seems to approach the realm of epistemological pluralism, which consists of a vast body of literature that views plagiarism as cultural and rhetorical practice (e.g., Bloch, 2001; Currie, 1998; Howard, 1993, 1995; Pennycook, 1996; Scollon, 1995). In tertiary education settings, these divergent perspectives of plagiarism have appeared in two major discourses: institutional discourse and academic discourse.
Institutional discourse articulates its position regarding plagiarism in official materials such as college regulations, formal course readings, and citation style guides. In the institutional discourse, plagiarism appears as a clear-cut concept (Price, 2002) that defines text as “property” and plagiarism as an infringement of the property. In this view, a classic preventive measure is to provide explicit knowledge of and definition of plagiarism as well as its consequences. The effectiveness of the measure, however, is questionable, as the majority of plagiarism involves unintentional text borrowing. The institutional prescription is rather limited to verbatim text copying.

Academic discourse, unlike institutional discourse, distributes its content in scholarly publication and discussions. It takes into account the rich cultural and sociopolitical concerns (Pennycook, 1996; Scollon, 1995, 2000) as well as pedagogical contexts (Howard, 1995; Pecorari, 2003, 2008). Often drawing on Bakhtin’s (1981) work, discussions in this perspective have generally considered text as dialogic entity that consists of multiple voices of writers brought together (Pennycook, 1996; Scollon, 1995).

The dialogic perspective of text represents a substantial shift that questions the concept of textual ownership. The shift signals a repositioning of an author as a re-creator of a text who produces a text by re-voicing prior utterances. Scollon (2000) observed that, “originality derives from the particular mixes, combinations, and hybridities that result” (p. 188). Then, we sense a distinction between texts and crafts. Since all the ingredients for the text production already exist in the world, what an author actually added to a work is the craft of mixing these ingredients, rather than a new text. If added value resides in the author’s skill (and not in material), the property that an author has a claim to is not the
text *per se*, but the skill for combining the textual ingredients. In a pedagogical reification of the perspective, then, learning to write is to develop a craft of textual hybridization. This view challenges the typical distinction between plagiarism and legitimate text production, and thereby, removes the line of demarcation between acceptable and non-acceptable borrowing. In lieu of a borderline, we see a developmental continuum between the expert level of mastery and the novice level of mastery of the hybridization craft. The goal of anti-plagiarism pedagogy, then, is to bridge the students’ developmental gap between these two levels.

5.2.4.3. *Electronic plagiarism*

Electronic plagiarism refers to borrowings from electronic source texts. Although electronic plagiarism typically refers to direct copying of texts from Internet, the concept should be extended to include borrowings from any digital media, including linguistic corpora. Electronic plagiarism has been fast increasing, and the widespread belief about electronic plagiarism is that the networked computing environment is responsible. Some blamed technology for offering an easy access to electronic texts (e.g., Flowerdew & Li, 2007, p. 162). The accusation, however, is naive: such access seems to affect exclusively novice writers and not established writers. Rather, experienced writers seem to benefit from the fast access to source texts due to their ‘expertise’ of textual borrowing.

A more responsible position regarding electronic plagiarism would be to acknowledge the inadequacy of the current anti-plagiarism pedagogy. Research in this
area should focus on how we may tame the power of networked computing, rather than fear its potential danger. As with all other advanced technology, computer network requires an informed use. An important question to ask is, then, whether writing pedagogy has provided substantial help for developing students’ textual awareness so that they benefit from networked environment and extensive resources that it makes available.

5.2.4.4. Anti-plagiarism pedagogy

A common approach in current anti-plagiarism pedagogy is to combine an explicit guideline instruction to provide declarative knowledge about plagiarism and classroom activities to enhance the knowledge. Two kinds of activities have been popular: in-class discussion to raise students’ awareness of the citation convention and its variation across cultures, genres, and communities (Gu & Brooks, 2008; Price, 2002) and hands-on exercise to give procedural knowledge for avoiding plagiarism (Howard, 1993, 1995; Pecorari, 2003).

Researchers have argued that anti-plagiarism activities should take an inductive, context-sensitive approach in order to raise students’ awareness of plagiarism, as opposed to imposing an institution-wide policy on students. Price (2002), for example, suggested that students should learn about acceptable forms of textual borrowing through “dialogic” negotiation with the teachers. Through the negotiation, students are expected to induce the definition of plagiarism. As for the hands-on exercises, researchers have proposed simulation-like activities. Howard (1995) argued for using a guided text borrowing as an
anti-plagiarism activity (e.g., Howard, 1995; Pecorari, 2003). The suggestion, which she called “patchwriting,” involves “copying from a source text and then deleting some words, altering grammatical structures, or plugging in one-for-one synonym-substitutes” (Howard, 1995, p. 788). Students practice word substitution and paraphrasing through the activity and gain procedural knowledge for producing non-plagiarized texts.

Despite its benefits, a clear limitation in the anti-plagiarism pedagogy is that it does not offer any help at the time of students’ independent writing. Obviously, plagiarism occurs outside the classroom, when the teachers’ help is not available. It is odd, then, that independent writing outside the class has not received more attention than classroom instruction. In fact, in the anti-plagiarism literature, attitudes diverge across two writing contexts, i.e., between the enthusiastic discussion of anti-plagiarism activity in the classroom and the silence on preventing plagiarism outside the classroom. Thus, instead of meeting the issue head-on, suggestions in anti-plagiarism pedagogy seem to assume, or hope, that students will transfer the knowledge from classroom instruction to their independent work. The assumption and the wishful anticipation, however, do not receive any empirical support in research. On the contrary, we have seen cases in which students plagiarize even with explicit classroom instruction (Pecorari, 2003; 2008).

The persistence of plagiarism suggests a possibility that students may have two different kinds of needs in the two different writing contexts, i.e., in and outside the classroom. In fact, classroom activities do not represent the composing processes in the actual text production. During the classroom activities, e.g., patchwriting, students start with a source text and produce a ‘clean’, non-plagiarized text. The processes of
formulating thoughts and externalizing through lexicogrammar are missing. The independent production of text, however, is a completely different process from patchwriting: it starts by formulating thoughts and draws on source texts to materialize the thought.

A more sensible approach to plagiarism prevention is to provide contextualized help at the time of writing. The argument is consistent with the observations in anti-plagiarism research, which suggests that the cause of plagiarism is the gap between students’ desire to produce a high-quality text and their lack of competence to materialize the desire. Flowerdew and Li (2007) observed that a gap exists between students’ expectation of “ideal” performance and their “realistic” performance, which often dismays them. In an effort to bridge the gap, students, often unknowingly, choose plagiarism as a “survival strategy” (p. 168). It is only natural, then, that an activity such as patchwriting fails, as it attempts to prevent plagiarism by telling students to use their own words when the very competence to use their own words for producing a high-quality text is exactly what students do not have and need to develop. Here, we see a clear need for a methodological innovation to assist the writers at the time of independent writing.

5.2.4.5. Genre-based response to plagiarism: Genre analysis

Two linguistic perspectives to genre, EFP and SFL, offer a more realistic approach to anti-plagiarism than patchwriting. Genre analysis is a technique with a
potential to addresses two under-addressed areas in anti-plagiarism pedagogy: a) transfer of classroom learning to independent writing and b) assistance at the time of writing. Genre analysis generally refers to a broad range of techniques for analyzing texts with an emphasis on linking lexicogrammatical patterns and the social contexts (Swales, 1990). A genre analyst discovers the patterns by collecting representative examples of a target genre and identifies common structural and linguistic characteristics. In the domain of academic writing, genre analysis has provided a description of prototypical structure to teach target genres (Swales & Feak, 1994) and identified the role of lexicogrammatical features in encoding discourse-level variables in school-based texts (e.g., Martin, 1992; Schleppegrell, 2004).

Genre analysis works in two ways: deductively and inductively. In a deductive step, a prototypical structure is presented to students, while, in an inductive step, students perform their own genre analysis to discover structural and lexicogrammatical patterns. The inductive technique has a great potential for preventing plagiarism, as it facilitates independent analysis of texts. A relevant suggestion is found in Flowerdew’s (1993) proposal for using on-line genre analysis to prevent plagiarism. The main tenet of the proposal is that students perform an on-the-spot text analysis of the target genre to discover key textual characteristics. Then, by transferring the characteristics to their writing, but not the actual texts, students can create a text drawing on source texts while avoiding plagiarism. Specifically, students analyze a set of authentic texts that share the genres and topics with their writing tasks, and use the findings to produce their own texts. According to Flowerdew (1993), the on-line analysis would prevent plagiarism, as the
parallel exemplar texts have different content and author-audience relationship, and thus, students cannot use the texts verbatim.

While Flowerdew’s (1993) proposal is convincing, it is not accompanied by empirical support. Prerequisite for the proposal is that students have a considerable amount of genre knowledge that allows them to discover and transfer key genre features. Then, whether or not online genre analysis can prevent plagiarism depends on the extent to which students can increase their genre knowledge in situ. The present study has shown the inadequacy of non-interactive corpus uses to facilitate genre analysis suggested in Flowerdew (1993). Fortunately, with the advances in corpus technology since the proposal, we are in a better position to implement his proposal.

5.2.4.6. Defragmentation in LCI as anti-plagiarism strategy

In plagiarism prevention, the potential of a corpus has not been fully explored or appropriately acknowledged. In Flowerdew’s (1993) suggestion, for example, a corpus was simply a container that prints out concordance lines on demand. A corpus, however, can take a much more active role in preventing plagiarism, if equipped with a companion search engine and used at the time of independent writing. As a linguistic reference, a corpus facilitates on-line genre analysis through dialogic interaction, which non-interactive, form-focused concordance tasks are not able to offer. Using an advanced search technology thus allows us to materialize Flowerdew’s (1993) idea.
Whether a corpus can actually prevent plagiarism is an empirical question, to which neither the current body of writing research nor this study can offer a conclusive answer. This study, however, has noticed some indications of the positive role of a corpus in preventing plagiarism. Although the focal students borrowed the exemplar texts from the corpus, the processes in their borrowing are clearly distinguished from those in prototypical plagiarism. Prototypical plagiarism would mainly involve borrowing content through paraphrasing and vocabulary substitution. As a result, their writing retains the original content, often in the similar range of vocabulary with the source text. On the other hand, the focal students’ borrowing was not limited to vocabulary and content, but extended to syntax and lexical patterns, e.g., collocations and colligations. Even though vocabulary in source texts does reappear in the student texts, the vocabulary items are (re)encoded in the syntactic structure in a way that it externalizes the students’ thoughts. Yining’s transaction below shows that her textual borrowing is a process of collecting lexical and syntactic resources and encoding her thoughts using the resources:

<table>
<thead>
<tr>
<th>Original text</th>
<th>record the <strong>process that</strong> I use myCorpus to revise my essay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Query</strong></td>
<td><strong>Result</strong></td>
</tr>
<tr>
<td>Query 1</td>
<td>process that <strong>a process approach</strong> to writing</td>
</tr>
<tr>
<td>Query 2</td>
<td>process in which the college EFL writers' revision <strong>process in which</strong> teacher's feedback . . .</td>
</tr>
<tr>
<td>Query 3</td>
<td>process of <strong>the process of</strong> making an analysis of their writing. . .</td>
</tr>
<tr>
<td><strong>Revised text</strong></td>
<td>record <strong>the process of searching words</strong> in myCorpus</td>
</tr>
</tbody>
</table>

Figure 5.4. Textual borrowing in LCI
The revised text reflects the influence of the source texts: the preposition (“of”) and the syntactic structure, in which a gerund follows a preposition, are the results of the source text borrowing. Unlike verbatim copying, Yining’s borrowing focused on syntactic construction.

The other characteristic that distinguishes the text borrowing in LCI from deceptive plagiarism is the dialogic construction in LCI. While prototypical plagiarizers tend to ‘copy and paste’ the source texts with minimal revision, the focal students revised the source texts multiple times in order to fit them into their own texts and writing purposes. Their borrowing, in fact, shares some key characteristics with non-plagiarized writing, i.e., locating and reading resources and multiple revisions based on the resources. Yining’s example in Figure 5.4 illustrates just such characteristics.

Through lexico-syntactic borrowing and dialogic construction, students engage in a composing process that is exactly opposite to the processes of plagiarism. Often, the process of plagiarism involves substitution, in which plagiarizers first take an original idea from a source text and disguise the borrowing by replacing words while retaining the original idea. By substituting, their texts eventually lose the consistency of the original texts - which is how writing teachers still can recognize plagiarized texts despite the engineering on the plagiarizer’s side. In contrast, the focal students engage in a transformational process, rather, in which they start with initial thoughts of their own, in L1 and/or L2. At this point, they had only an incomplete linguistic repertoire to externalize the thoughts. By collecting and adding more materials to their repertoire, the
students began to construct their sentences. This study calls the process *defragmentation*, as opposed to substitution. In the defragmentation process, the writers’ idea fleshes out as they create coherence between the fragments of their thoughts by supplementing them with additional lexicogrammatical items.

In the following example, Yining began with the fragments of vocabulary in Chinese, retrieved more lexicogrammatical items from the corpus, and finally completed her sentence:

<table>
<thead>
<tr>
<th>Fragments</th>
<th>Defragmentation</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Language tools, developed, skills</em></td>
<td>“Language learning skills can also be improved as language tools become more developed.”</td>
</tr>
</tbody>
</table>

Figure 5.5. Defragmentation

In Figure 5.5, Yining began with three items (“language tools,” “developed,” and “skills”) to as basic material to build her sentence with. Unlike content borrowing in plagiarism, Yining already had her content in her mind, and she commented accordingly, “I was trying to find the right way to express what I want to say.” Her borrowing was a means to bring in additional resources to connect the three basic items in a way they externalize her thought in a complete sentence. Defragmentation as in Figure 5.5 does not ‘just’ happen. The focal students defragmented their sentences in a series of interactions with the corpus. The complex transactions and the multiple query refinements represent the interactions that they engaged in during their defragmentation processes. The complex transactions indicate that, for a successful defragmentation, students should be
able to work with the corpus interactively. When equipped with a companion search engine that enhances its interactivity, a corpus offers a realistic way for students to borrow from the source texts, yet without plagiarizing.

5.3. Students’ perception of LCI

The analysis of LCI contributes to our understanding of the situatedness and multiplicity of the learner needs. The corpus helped the focal students to address these issues through dialogic interaction. In their reflections, the students accordingly reported their appreciation of effectiveness and efficiency of the corpus. In contrast, the students were critical about the value of non-interactive tasks of analyzing concordances and eventually stopped to use the concordancer. This finding is at odds with the research literature that reported student’s positive attitude toward concordance analysis tasks. The inconsistent findings merit a further critical investigation. The discrepancy is discussed in the following sections to address the relevant research question regarding students' perceived evaluation of corpus-based mediation.

5.3.1. Discrepancy in findings

While the focal students in this study are critical about concordance analysis tasks, the previous concordance studies have generally reported positive attitudes toward concordancing. Yoon and Hirvela (2004) reported that the concordancing was beneficial for “English writing, particularly for learning common usage and collocates of words and
for building confidence in their writing.” Chambers (2005) passed positive comments on the advantage of corpus consultation for “learner autonomy and discovery learning.” Hafner and Candlin (2007) argued that their students “perceived affordances in the corpus tools.” Concordancing is further described as “[not only] a linguistic resource that helps students to solve immediate writing/language problems, but also as an important tool that encourages learners to become more independent L2 writers” (Yoon, 2008). The findings of this study counter the findings in the previous studies on concordance analysis activities: in this study, the focal students discarded the concordancer immediately.

The discrepancy between the findings of the present study and the previous concordance studies is due to the differing research contexts. Research settings in the previous studies are hypothetical and controlled, as they used artificial writing tasks for eliciting students’ responses and mandated the use of a corpus on students. When concordancing is not imposed on the students, they use it with relatively low frequency. Hafner and Candlin (2007) reported that 300 concordance searches were made by students during two years’ period. It is a relatively small number if we consider that the focal students in this study made 320 searches only in 32 days. Further, when the students used it, it was not for addressing the challenges in their writing but “just to see whether that word can be used with some other words.”
5.3.2. Interpreting the focal students’ perception

Unlike studies that imposed hypothetical contexts on students, the focal students of this study interacted with the corpus in realistic settings. When the writing tasks are contextualized in realistic writing situations, students’ reflections become more detailed and vivid. As opposed to detachment and value judgments in concordance-analysis tasks, the focal students’ descriptions show engagement and emotions. The students described the tension between the task requirement and their ability (or lack thereof) to fulfill the requirement. In a struggle to complete their writing tasks, the students used critical and realistic judgment in order to choose the right tool for them. Their evaluations of the tools were focused and incisive and their decisions were based on assessment of potential return on investment.

This study finds a sense of despair in the focal students’ narratives. The students described their corpus consultations as struggles to meet the challenges of writing. Their comments suggest that they used the corpus due to the limited available help at the time of writing. Yining commented:

Before my teacher introduces myCorpus [The corpus search engine] to me, I do not know whom to turn to when I felt there were so many problems in my writing. I usually simply read my essays again and again. I knew there was a problem, but I did not know how to solve it. So I was not confident about my English writing at all.

(Yining’s Paper #3, December 12, 2008)
Hearing her comment can be disturbing and even painful for a writing teacher. From the perspectives of genre-based pedagogy, her comment is reminiscent of where the perspective originally comes from. Genre pedagogy has called for a responsible position of writing teachers, while criticizing the processing model (Flower & Hayes, 1981) for transferring to students the responsibility for producing a text. Hyland (2003), for example, criticized the processing model as it may “disempower teachers and cast them in the role of well-meaning bystanders” (p. 19). Genre-based perspectives have emphasized explicit instruction of the connection between the text and the context (Hyland, 2007). However, the reflections of the focal students in this study suggest that genre-based pedagogy has been no less powerless than the processing model when it comes to students’ independent writing. Yining’s comment, thus, can sound almost reproachful to writing teachers. While we, the teachers in genre-based pedagogy, criticized the processing model for not offering help to students, and thus, emphasized the proactive intervention, have we not quietly backed out, too, when our class hours were over, and thereby, left our students alone without help when they began the real struggle of writing? Then, we might be described as “well-meaning bystanders” as well.

How can teachers still help students when students are not in their proximity? This study proposes that the corpus technology has some potential for offering assistance at the time of independent writing. Yining noted that she did find some support from the corpus:
Now, I am getting more familiar with myCorpus. Even though my English writhing is not quite native-like, I know how to revise it and where to ask for help.

(Yining’s Paper #3, December 12, 2008)

Offering help for independent writing requires mediated assistance. Although teachers cannot always be with their students, they can still help students through the corpus. Networked computing makes such collaboration possible. The focal students’ perception suggests that such mediated assistance is not only necessary but deserves to be an integral part of writing instruction.

5.4. Reconceptualizing corpus-based mediation from the distributed perspective

The final research question of this study is concerned with how the study of LCI informs theoretical and pedagogical advancement of corpus-based mediation in L2 writing. The theoretical framework for form-focused concordancing is Data-Driven Learning (DDL in Johns, 1986). The tenet of DDL is that random exposure to linguistic data leads to a discovery and learning of linguistic features. This study argues that the conceptualization of language, language learning, and the learner in DDL is problematic. Further, it is an inadequate model for writing pedagogy due to its inability to account for writing in broad sociocultural contexts. While rejecting DDL, this study proposes that the theory of distributed cognition (DC in Hutchins, 1995a, 1995b) offers an adequate theoretical framework for understanding and advancing corpus-based mediation.
5.4.1. Issues in DDL

DDL, the theoretical framework for non-interactive use of a corpus, typically assumes that the writers’ needs are determined by linguistic data and that random exposure to linguistic material results in the acquisition of a language. In DDL, context-rich presentation of language is considered only as secondary information. DDL has focused on simple grammar rules and collocations as the target of instruction. With “focus-on-form” as the primary method of learning (Hadley, 2002), the presentation of language in DDL is intentionally decontextualized to highlight the formal characteristics. In practice, students are given a few concordance lines and asked to discover the linguistic features, which are often not more than simplified findings about a grammar rule or a collocate item. In the DDL-based corpus activities, language tends to be reduced from a holistic system that encodes socially constructed meaning to a simple form-focused activity.

More seriously, DDL promotes a static view of text, which waits to be discovered, rather than co-constructed in situ. Due to the lack of ability to recognize textual co-construction, learning in DDL depends on random chances that students find something useful in concordance lines, which is why the method is called, very aptly at that, “serendipity learning” (Johns, 1986). Flowerdew (1996, p. 95) cites three benefits of concordancing:

1) Learners are truly autonomous and responsible for their own learning.
2) Because searches are learner-initiated it can be guaranteed that the learning corresponds to
learner needs and/or wants.

3) By researching into language use this way learners develop an overall language awareness

These benefits, however, are not supported by empirical findings in DDL. In fact, in DDL, students have never been “truly autonomous” and their searches were never “learner-initiated.” Rather, far from being initiated by learners, the writing tasks have been mandated on students. A theoretical contradiction in DDL may account for the lack of empirical evidence.

Conceptualization of learner in DDL needs to be re-examined as well. DDL typically views learners as novice “language researcher;” who “explores and discovers” the linguistic patterns from concordance lines. Tim Johns (1991) wrote, “... language-learner is also, essentially, a research worker whose learning needs to be driven by access to linguistic data - hence the term ‘data-driven learning’ (DDL) to describe the approach.” In the statement, we sense a noticeable contradiction in DDL regarding its position toward learning needs, i.e., whether the needs are to be initiated or not to be initiated by learners. Johns (1991) describes learner needs as “driven” by the data, while one benefit of DDL-informed concordancing is that its searches are “learner-initiated” (Flowerdew, 1996). Whether learning in DDL is driven by data or initiated by learners, what is at stake is the recognition of learners and their agency in language learning.

In DDL, accordingly, students’ identity is at stake. Regardless of the students’ choice and desire, they are asked to become a research worker (but recall the earlier
statement that learners are “truly autonomous” in DDL). In fact, studies in DDL have
never investigated students’ autonomy and their agency in realistic contexts. In a stark
contrast, a more responsible line of research has described learner autonomy emerging as
a struggle of dissonant identities and conflicting needs and investments (Peirce, 1995;
Siegal, 1996). In the description of learner in DDL, we see a lack of autonomy and an
imposed identity. Although the advocates of DDL claimed that it promotes true autonomy,
learners as autonomous agents seem to be precisely what is missing in DDL.

From the genre-based perspectives, obtaining realistic help in DDL is a near
impossibility. In genre theory, it is axiomatic that writing is a meaning-making practice
through language (Miller, 1984) which always involves making lexicogrammatical
choices (Halliday, 1993; Martin, & Rothery, 1993). Through the lexicogrammar of the
language, writers encode the complex way in which a text reflects context (Martin, 1992).
Considering the misrepresentation of language and language learners, it is difficult to see
how DDL can facilitate meaning making through the construction of texts.

5.4.2. A brief account of distributed cognition

Since the mid-1990s, there has been a fundamental departure from the
conventional view of cognition as a property of an individual’s internal process.
Distributed cognition, an alternative psychological concept, views cognition as shared
and co-constructed in a sociocultural system (Hutchins, 1995a, 1995b). In this
perspective, cognition is a collective entity and, as such, distributed between humans as well as artifacts.

A well-known example of DC is Hutchins’ (1995a) study of a US navy ship in which he observes that a successful navigation requires coordination between humans and artifacts. In a group-based activity such as navigation of a ship, he argues, a successful outcome relies on the multiple thinking processes at the same time, in and outside the heads of the crew. Another one of Hutchins’s (1995b) DC studies focuses on an airplane cockpit in which a pilot, a co-pilot, and a suite of technical devices share and construct information for a successful flight. Again, the thinking is happening in the cockpit system itself, rather than only in the heads of the pilots, in the form of coordinated information shared among the human and non-human participants (Hutchins, 1995b, p. 267). In both cases, the completion of the tasks depends on efficient distribution of work in a way in which the participating agents can pool and coordinate their cognitive resources for immediate needs.

5.4.3. Genre as situated and distributed cognition

The theory of DC is particularly relevant to genre writing if we see text as a co-constructed entity within a given social, cultural, and material condition. It is commonly acknowledged in genre theory, especially in the NR perspective, that genre is constructed in situ, through collaborative contributions of participants (Berkenkotter & Huckin, 1993, 1995; Devitt, 1996; Freedman & Medway, 1994). Even in repetitive situations that may
look alike (e.g., weekly writing class sessions), genre can vary widely across the particularities of context. In explaining this context-sensitiveness, genre studies draw on situated learning theory (Lave & Wenger, 1991) that conceptualizes genre as situated cognition.

In situated learning theory, knowledge is organizational memory interpreted in individual-environment relationship and texts serve as vehicles for sharing knowledge (Barab & Roth, 2006). Genre, as a situated cognition, is socially and discursively constructed. Thus, knowing a genre is equal to engaging in social action (Miller, 1984), rather than possessing knowledge about the action. In practice, the knowledge of genre is distributed (as well as situated) between the participating agents, i.e., humans and artifacts, and material environment: no single expert possesses all the knowledge of a genre and not all the knowledge exists inside the heads of human participants. Rather, genre knowledge is distributed in artifacts such as printed volumes of journals, electronic databases, presentations in conferences, and intellectual talks. Genre is constructed in situ, through knowledge distributed among individual writers and cognitive artifacts. A successful performance of the target genre, therefore, depends on the knowledge that writers can pool from these various resources responding to situated rhetorical demands.

5.4.4. Cognitive division of labor

The theory of DC has a special relevance to genre-based pedagogy due to the nature of genre as distributed as well as situated cognition. Olick’s (1999) description of
genre as “social memory” highlights the distributed characteristic of genre. Given the
social and distributed characteristic of genre, DC conceptualizes writing as co-
constructed, multi-participant activity. While sharing much in common with situated
theory, the theory of DC further articulates the role of non-human artifacts in successful
coordination of resources. DC views non-human tools as “cognitive artifacts” with some
thinking ability, which amplify the cognition of the artifact user (Norman, 1993). These
artifacts can serve as a participant in cognitive division of labor, in which they assist the
artifact users by sharing the load of lower-order cognition (e.g., calculation and data
sorting), while allowing the users focus on higher-order cognition (e.g., planning and
organizing).

A successful cooperation between cognitive artifacts and human participants
results in a transformation of task (Carroll, 2003; Norman, 1993). For example, a
symbolic tool such as Arabic numerals may transform repetitive and laborious task of
memorization and physical operation (e.g., counting numbers with fingers) to abstract
manipulation (e.g., financial planning). Computational devices such as calculators and
application software have such transformative power (Carroll, 2003). Task transformation
is a hallmark of an intelligent cognitive artifact and the prerequisite for successful
performance in DC.

Transformation of the task in this study, i.e., lexicogrammatical performance in
writing, can be facilitated by using cognitive artifacts. Creating a genre-appropriate text is
a cognitively demanding activity that involves the recursive process of noticing
lexicogrammatical features and transferring them to a new context (Kirkland & Saunders,
The task, thus, involves a series of cognitive processes, i.e., selecting and reading genre exemplars, noticing the lexicogrammatical features, establishing and testing hypotheses, and recontextualizing the features in new contexts. An intelligent cognitive artifact can assist writers in such a demanding process through a cognitive division of labor. By isolating repetitive components in text construction (comparisons between the exemplar texts and the text under creation) and assigning them to an artifact, a writer can work on a higher level of cognition (logical inference of text-context relationship). The cognitive division of labor, in turn, eventually transforms the activity for the writers, as it becomes less of a reproduction of the target discourse and more of a creative activity of transforming the exemplar texts to their own writing.

### 5.4.5. Beyond data-driven learning towards distributed cognition

A corpus, if provided with a robust search interface, facilitates cognitive transformation of writing tasks. A corpus search engine offers some level of analytical assistance by retrieving relevant genre exemplars in a context-sensitive way. The assistance considerably narrows down the range of materials that a writer needs to review, and thus, reduces the cognitive loads. Eventually, the assistance may result in the transformation of the writing task, which, otherwise, would have involved repetitive and laborious work of locating and sorting example texts. With the support of the corpus search available, some of the work has been done for writer. In a division of labor, the corpus collects and sorts the genre exemplars, while writers take the creative role of a
decision-maker who is responsible for evaluating and recontextualizing the exemplar texts.

In contrast, with less interactive materials such as concordance lines, the task is can be extremely time consuming and may still not be successful. Limited in the capacity of identifying context-specific exemplar texts, a non-interactive concordancing task imposes overwhelming cognitive loads on its users. Specifically, its inability to process multi-word queries made it difficult for the writers to focus on higher-level cognitive function such as evaluation and appropriation of the source texts. Its limited ability to transform the task forced students to visually inspect the concordance output line by line and select potentially relevant lines.

In furthering the cognitive contribution of the corpus, DC serves as an appropriate theoretical framework. Although still very limited in its intelligence and capacity, the corpus and its interface in this study showed some potential for evolving into a more intelligent cognitive artifact and DC can serve as a guiding principle of the evolution. The next generation of corpus-based mediation must reflect the paradigm change that shifts away from DDL and moves toward the theory of DC. This change is possible through reconceptualization of L2 writers and their writing in the increasingly digitalized and artifact-mediated writing contexts.
5.5. Summary

This chapter sought to answer the research questions regarding the interactive pattern in LCI and the role of corpus is in enhancing L2 writers’ lexicogrammatical performance. The primary characteristic of interaction in LCI is its dialogic negotiation, which reflects the students’ problem solving in their composing processes. The dialogic interaction allows students to construct situated genre knowledge in response to their immediate lexicogrammatical challenges. In facilitating dialogic interaction and the negotiation, interactivity of the corpus is the key factor.

The corpus and its companion search engine enhance the focal students’ performance by addressing two crucial aspects of their needs: a) multi-dimensionality and b) situatedness. Multi-dimensionality of writers’ needs refers to the multiplicity of the needs that simultaneously touch upon several areas of linguistic dimensions, i.e., lexicon, morphology, syntax, and semantics. Situatedness refers to the inextricable integration of text and the particular writing situations. Corpus-based mediation addresses these needs through “on-line genre analyses,” i.e., fast and focused analysis of exemplar texts. The help that the corpus offered in this study bears significant similarity with the graduated and contingent help that an experienced tutor offers in a tutoring session. In its essence, LCI is a dialogue, in which a writer asks a question and receives an answer from the corpus. Tutoring emulation is the way in which the corpus provides contextualized source texts in response to the students’ idiosyncratic needs.

An emerging issue in LCI is the potential danger of plagiarism. In genre-based pedagogy, Flowerdew (1993) suggested that students can avoid plagiarism by analyzing
parallel authentic texts and transferring the findings to their own writings. The suggestion, however, has not materialized in practice due to its limitation of it methodology, i.e., non-interactive tasks using static concordances. A corpus can take a much more active role in preventing plagiarism than analysis of concordances, if equipped with a companion search engine and used at the time of independent writing. Some supporting evidence is found in the focal students’ interaction with the corpus. While prototypical plagiarism would mainly involve borrowing content and vocabulary, the borrowing in LCI was not limited to vocabulary and content but extended to syntax. Even though vocabulary in source texts does reappear in the student texts, the vocabulary items are (re)encoded in the syntactic structure in a way that it externalizes the students’ thoughts. Two important characteristics of LCI further distinguish the textual borrowing in LCI and electronic plagiarism. First, the textual borrowing, unlike plagiarism, in LCI takes place through intense textual negotiations. Second, as a result of the negotiations, there was a considerable difference between the source texts and borrowed texts in LCI. Through lexico-syntactic borrowing and dialogic construction, the focal students engaged in a composing process in which the fragments of their thoughts flesh out by incorporating additional lexicogrammatical items from the corpus. Through this process of defragmentation, the corpus offers a realistic way for students to borrow from the source texts, yet without plagiarizing.

In their reflections, the focal students reported their perception of effectiveness and efficiency of the corpus, while being critical about concordance analysis tasks and eventually stopped to use the concordancer. The findings of this study, then, are at odds
with the findings in the previous studies, which have generally reported positive attitudes toward concordance analysis. Unlike studies that imposed hypothetical contexts on students, the focal students of this study interacted with the corpus in realistic settings. The students described their corpus consultations as struggles to meet the challenges of writing at the time of independent writing. Offering help for independent writing requires mediated assistance. Although teachers cannot always be with their students, they can still help students through the corpus.

The theoretical framework for non-interactive, form-focused concordancing is Data-Driven Learning (DDL). Its conceptualization of language, language learning, and learner is problematic, as it assumes that the writers’ needs are determined by linguistic data and that random exposure to linguistic material results in the acquisition of a language. Thus, it does not recognize students’ agency that they exercise to decide what they want and need to learn. In DDL, language is reduced to a simplistic usage rule and collocations and learning is limited to form-focused analysis of concordance lines. DDL, thus, is incapable of recognizing and teaching a language as a complex semiotic system that encodes socially constructed meaning in lexicogrammar.

The theory of distributed cognition (DC) is an appropriate theoretical framework for corpus-based mediation. DC has a special relevance to genre-based pedagogy as well, as it recognizes genre as situated cognition and conceptualizes writing as co-constructed, multi-participant activity. Based on DC, a corpus, as a cognitive artifact, can assist writers in a cognitive division of labor, in which the corpus performs repetitive and time-consuming tasks, i.e., collecting and sorting genre exemplars, while writers take the
creative role of a decision-maker, being responsible for evaluating and recontextualizing the exemplar texts. The theory of DC informs the next generation of corpus-based mediation, which would put us in a better position to help L2 writers in the increasingly digitalized and artifact-mediated writing contexts.
CHAPTER 6

CONCLUSION

This study sought answers to the following questions: How can we enhance L2 writers’ lexicogrammatical performance in genre-based writing? How can we bridge the gap between the abstract contextual variables of genre (e.g., communicative purpose, relationship with the audience, modes of communication) and its textual realizations? These questions revolve around one fundamental issue: the transfer of L2 writers’ genre awareness to their textual performance. Genre-based writing pedagogy has attempted to address this issue through either explicit instruction or situated apprenticeship, both of which have met with only modest success. The alternative, as posited by the present study, is to improve the writers’ awareness and performance simultaneously through a corpus-based system equipped with a genre- and discipline-specific corpus and a companion search engine. The results show that the system was effective and efficient in helping L2 writers meet their lexicogrammatical challenges and thereby improve their performance in this regard. This chapter discusses the implications of the results for genre-based writing instruction as well as some of the study’s limitations. The chapter concludes by offering suggestions for future directions in corpus-based research on L2 writing.
6.1. Implications

This study finds that the corpus plays a facilitative role in enhancing the focal students’ lexicogrammatical performance. This finding has implications for genre-based pedagogy, genre theory, and writing research. Pedagogically, the study offers writing teachers a concrete means through which to help students during the very time that they are engaged in independent writing tasks. Theoretically, it addresses, to some extent, the issue of the teachability of genre as a situated discourse. Methodologically, the data triangulation techniques proposed can further enhance L2-writing research by combining screen recordings, writers’ reflections, and corpus search queries. The following sections discuss these implications in further detail.

6.1.1. Pedagogical implications: Integration of the corpus in writing pedagogy

The results of this study suggest that teachers can incorporate a corpus in their writing instruction for the practical benefit of students. Considering the time constraints on teachers, it is a demanding task to prepare first-year students for tertiary-level written genres such as reaction papers, book chapter reviews, and research proposals. For students, too, even concerted attempts with much time invested can still result in only modest improvements in lexicogrammatical performance. In trying to mitigate this difficulty, some researchers have suggested a partnership between ESL courses and content courses with a view to forming “learning communities,” in which students become ethnographers who explore both communities (e.g., Johns, 2008). In such a
partnership, writing teachers give general instruction on structure and lexicogrammar, while non-ESL teachers focus their instruction on the contents. Despite the pedagogical value of suggestions along these lines, however, two issues are noticeable: first, an ESL–content course partnership is not always possible, and second, the partnership, if formed at all, does not reduce the workload of lexicogrammar teaching, for which writing teachers are still entirely responsible.

This study suggests a different kind of partnership, in which the teacher, the students, and a corpus share the cognitive workload. In this partnership, the teacher focuses on areas of content and organization in the classroom in order to help students with activities that make high-cognitive demands, such as developing logical reasoning skills and rhetorical strategies, exploring target discourse communities, and connecting the students’ communicative purposes to the expectations of those communities. While providing generic instruction in these areas, the teacher relegates the tasks with lower-cognitive demands within the area of lexicogrammar (e.g., correcting grammatical errors and providing example sentences) to the students’ interaction with the corpus. Responding to the teachers’ generic instruction and feedback, the students perform self-initiated learning activities outside the classroom. As the teacher has delegated some of the responsibility for learning to them, the students must research the target genre. In their research, students delegate some of their workload to the corpus, which shares their workload by taking on tasks such as retrieving and sorting genre exemplar texts. As the corpus carries out this work, the students are able to focus on more creative tasks such as
on-line genre analysis. Table 6.1 describes just such an interaction between a teacher, students, and a corpus:

Table 6.1. Scenario for Cognitive Partnership

<table>
<thead>
<tr>
<th>Item</th>
<th>Teacher</th>
<th>Students</th>
<th>Corpus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>Raising students’ genre awareness in the classroom</td>
<td>Connecting teachers’ generic instruction to specific examples; self-learning through hypothesis testing</td>
<td>Providing examples for understanding course instruction and learning through hypothesis testing</td>
</tr>
<tr>
<td>Learning</td>
<td>Providing in-class genre exemplar analysis; developing students’ critical (meta) awareness their own writing</td>
<td>Carrying out self-initiated lexicogrammar activities (e.g., discovering collocation patterns; error correction)</td>
<td>Facilitating the students’ self-initiated activities with retrieving and sorting exemplar texts</td>
</tr>
<tr>
<td>Feedback</td>
<td>Detailing content and organization, while using generic guidelines to refer lexicogrammar and mechanics issues to students</td>
<td>Interpreting the teacher’s feedback based on concrete examples in interpreting the teacher’s feedback</td>
<td>Providing concrete examples to assist students</td>
</tr>
<tr>
<td>Text</td>
<td>Helping students to develop strategies for writing and revising in the classroom</td>
<td>Performing a micro-scale genre analysis to address idiosyncratic and contextualized needs</td>
<td>Enabling rapid genre analysis by retrieving situated and individualized exemplar texts for students</td>
</tr>
</tbody>
</table>
The strengths of the collaboration scenario in Table 6.1 are that realistic needs motivate the students’ self-initiated learning activities. In the scenario, students are autonomous, as they take responsibility for choosing what to learn and why. This scenario is achievable primarily because the students receive strong support from the corpus. The addition of the corpus renders this scenario fundamentally different from suggestions in form-focused concordancing, in which the students receive the responsibility for their own learning but are not provided with a realistic means to teach themselves. The scenario is quite different, too, from hypothetical improvisation, which attempts to turn students into (reluctant) linguists or ethnographers without realistically connecting those roles to the students’ learning needs. Distinct from such suggestions, the scenario in Table 6.1 does not impose any unrealistic identity on the students. Instead of focusing on such ethnographic activities as a long-term learning activity, the scenario shown concentrates on the benefits of taking a realistic approach to addressing the students’ immediate needs and harnesses the corpus in support of that effort.

While a corpus can add great advantages to genre-based instruction, it has none of the disadvantages of a random internet search. Using the Internet as a linguistic reference is not only ineffective but can also be detrimental to efforts to acquire academic literacy, as its texts represent neither appropriate language use nor target academic genres. By not providing an alternative reference, i.e., a specialized academic corpus, we are almost certainly leaving our students no choice but to rely on random Internet searches. Fortunately, it is relatively easy for teachers with little computer experience to compile a
corpus and implement a companion search engine as described in this study. As an appropriate precoded search engine became available at no cost in 2006, there are references and examples as well as user manuals available to support teachers in such work. With such support, a specialized corpus with a search engine is, in fact, one of the simplest tools that teachers can integrate into their instruction.

6.1.2. Theoretical implications: Teachability of genre

In genre-based perspectives on pedagogy, there is theoretical disagreement regarding whether genre is teachable. According to the linguistic perspectives (ESP and SFL), genres are somewhat teachable, as some of the key features of a genre can be described and taught explicitly. From the non-linguistic perspective (NR), however, genre is a cognitive phenomenon, and as such it is not formally describable, and thus, not teachable. Therefore, learning to perform in genres involves long enculturation processes. This study’s alternative approach to genre pedagogy, though, offers to bypass the debate by directly tapping into the corpus databases of genre exemplars to reflect the target genre as it evolves, and yet still providing explicit formal responses in accordance with the writers’ situated needs. In this way, explicit instruction does not have to be detached from context. In fact, learning in LCI is very similar to situated learning that occurs through cognitive apprenticeship. By performing the role of an expert in apprenticeship (e.g., a tutor), a corpus to some extent facilitates situated learning. Thus, corpus
consultation provides explicit and concrete responses that are still contextualized in the students’ particular writing situations.

6.1.3. Methodological implications: Documentation and interpretation of data

Two common methodological issues are of concern in current corpus-based writing research: (a) documentation and (b) interpretation of corpus-assisted composing processes. The documentation issue can be addressed by using the screen-recording technique proposed in this study. Using a proper research technique is particularly important when examining the effects of a corpus on students’ writing. As students normally draw on many correlated parts of their personal experiences as well as formal instruction, it is difficult to distinguish the influence of the corpus from other contributing factors without observing the real-time processes of writing. In enabling such observations, techniques such as screen recording should be considered as essential methods in writing research. By way of an analogy, the screen-recording data is no less important than are transcripts of oral data in speech research; and screen-recording software plays a role comparable to that of the audio-recorder in data collection. As it is difficult to study conversations without recording and transcribing them, it is equally difficult, if not more so, to study writing processes without recording them.

In some areas, screen recording has become a common technique. These include research on activity systems in writing (Geisler & Slattery, 2007), digital and technological literacy (McKee & DeVoss, 2007), and computer-mediated communication
(CMC) (Smith, 2008; Smith & Sauro, 2009). Smith (2008), in a study of self-repair in electronic chat, argued that CMC research should adopt screen-recording techniques to examine the processes of CMC, as a significant loss of data could arise if researchers examine only the end products, i.e., the chat transcripts. In writing research, we can make the exact same recommendation as that in Smith (2008); that is, screen recording (or any technique that allows real-time data collection) should be used as a primary method of data collection in investigating the writing process.

Furthermore, the data-triangulation method that this thesis proposed should be useful for interpreting data in corpus-based research. The method has useful implications for interpreting screen recordings and reflections. By including an additional layer of data, the corpus queries, to screen recordings, the technique enhances our inferences about student’s internal cognition of their behavior. While interpretation of screen recordings has relied mainly on the researchers’ intuition, the technique proposed in this study significantly reduces the role of intuition in making inferences by providing data that connects writers’ screen actions to their cognitive processes. As for interpreting reflections, this study’s method is of fundamental importance, as it helps us to avoid rendering naive analyses of the writers’ reflective narratives. Instead of the students’ narratives verbatim, this study systematically examined consistency across the triangulated data. In this approach, the interpretation should be consistent across students’ attitudes toward corpus consultation and their voluntary and continued use of the corpus. For example, positive evaluations should lead to a more frequent use of the corpus, while negative evaluations should lead to less frequent use of the corpus. Had any
inconsistencies been found, it would have been necessary to re-examine the students’ reflections.

6.2. Limitations of the study

6.2.1. Pedagogical issues

Pedagogically, perhaps the most obvious limitation of this study is the rather weak relevance of the exemplar texts to the focal students’ target genre. Relevance of genre is a key concern in genre-based instruction, as its central assumption is that the features of exemplar texts represent the features of the entire target genre. Indeed, use of exemplar texts that are not reflective of the genre certainly affect students’ genre performance negatively. In this study, the exemplar texts were only partially relevant to the target genres of the course. Ideal exemplar texts would be student papers that had been given high grades within comparable genres, i.e., summaries, reaction papers, and research papers. Due to the unavailability of these genre exemplars, this study used published academic journals as the exemplar texts. As written by experienced writers, these texts served as good writing examples. However, the texts did not precisely represent the genres that the students were to write as part of their. As a genre is a reflection of social expectations, this discrepancy is particularly problematic: the exemplar texts reflected the expectations of a discourse community of professional academic practitioners, while the audience for the focal students was their teacher. Some additional issues arose due to this discrepancy: As the exemplar sentences were drawn from the full-text research articles,
they were sometimes too technical for the undergraduate students to understand. While the students wrote on general topics consisting of language, language learning, and culture, the exemplar texts, as research studies, were highly specialized in particular disciplines, which accounts for the students’ difficulty in understanding some of the language.

In fact, the paucity of genre exemplars is an acute challenge to genre-based pedagogy, especially at the undergraduate level. While there are some databases of exemplars available to graduate students, e.g., conference proceedings and research articles, there is only one such collection of exemplar texts for undergraduate writers, which has only been available since December 2009. The Michigan Corpus of Upper-level Student Papers (MICUSP), compiled at the University of Michigan, is a collection of student academic-writing exemplars, i.e., papers that had been given an A grade. Consisting of more than 800 papers of different genres (e.g., reports, response papers) from 16 disciplines, the corpus should serve as a resource of perhaps unmatched usefulness in teaching academic genres to undergraduate writers. Unfortunately, as the data in the present study were collected in 2008, this corpus was not available when the research for the present study was being conducted.

Another limitation of this study is the relatively short period of the data collection. Although this study observed the focal students for an entire semester, the corpus queries were collected only during the last month of the semester. Search-query collection was belated, as the tutorial sessions took place in the second month of the semester. The short-term data collection limits the ability of this study to assess the learning potential of LCI
over a longitudinal instruction. Some important questions that this study cannot answer due to these limitations include these: Does LCI facilitate learning consistently and significantly over a semester? If learning occurs, in what areas do students develop the most and the least? What are the challenges that short-term observations may not capture? And, finally, how can teachers help students to meet those challenges?

6.2.2. Methodological issues

Two methodological limitations emerged during the study: (1) it was not always possible to identify the writer in the query log, and (2) it was not possible to conduct part-of-speech (PoS) searches.

Identifying the writers and their queries was a challenge for this study, as it was not always possible to map a writer to a search query. In the classroom, the students were asked to sign in so that their pseudonyms would be mapped to their queries. However, when they accessed the corpus from outside the classroom, e.g., a campus lab, it was impossible to determine who had queried what. An exception to this loss of information was when the students consulted the corpus from their dorm rooms. In these instances, with their permission, their queries could be traced by identifying the unique addresses assigned to their laptops.

Another methodological limitation was that the corpus search engine did not allow the students to search items by part-of-speech (PoS). For example, in looking for an adjective for “concept,” Jingjing tried “blurred concept” and found no match at all. Then,
she simply stopped the search and changed the original phrase to “the concept was problematic.” Figure 6.1 shows a hypothetical example of a PoS search that would have been more effective in such an instance:

<table>
<thead>
<tr>
<th>Query syntax</th>
<th>Query semantics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADJ + concept</strong></td>
<td>Retrieve all phrases and sentences with adjectives that are immediately followed by the noun “concept”</td>
</tr>
</tbody>
</table>

Figure 6.1. Part-of-speech query

Figure 6.1 shows that the search would have been more effective, if Jingjing could have simply included PoS information in the query ("ADJ + concept"), so that the corpus would have looked for all the adjectives preceding the noun “concept.” Had a PoS facility been included, many of the focal students’ problems would have been addressed with much greater efficiency. The corpus interface in this study did not offer such functionality, and while this may not have had a strongly detrimental on the students’ searching and writing could not have been optimal for those activities.

6.3. Future directions: Toward an expanded model of LCI

This study explored under-researched areas in both genre-based pedagogy and applied corpus studies. Based on the findings, the following sections discuss directions that could further LCI research.
6.3.1. Expanding the research areas of genre-based writing instruction

Although this study focused on the corpus, future research on LCI needs to explore ways to better coordinate the teacher’s instruction with the corpus consultation, rather than concentrating solely on the role of the corpus. For this purpose, two areas are of great interest.

First, as a new dimension of feedback research, we need to explore corpus-assisted feedback to identify what kind of feedback would lead to fruitful negotiation in LCI and lexicogrammatical development. Through written feedback, for example, teachers can encourage students to consult the corpus in order to test their hypotheses and find solutions to their immediate problems. In oral feedback (e.g., writing conference), teachers could use a corpus to organize the guidance they offer by following the principle of graduation and contingency as suggested by Aljaafreh and Lantolf (1994). Teachers can develop their own techniques as well. For example, they can either use a corpus to tap into the target discourse and provide contextualized examples, or they can help students to perform searches and assist them in a gradual and contingent way. This way, the teacher may facilitate situated learning by taking the role of an expert encouraging a student to become an active participant in exploring the target genre.

Second, future studies need to explore the issue of plagiarism further. This study has discovered that the corpus could be used to prevent plagiarism, and this is an aspect that future studies could build on. Certainly, textual borrowing in LCI can be a process of writing as well as learning, rather than plagiarizing. And, though current anti-plagiarism research has focused on “de-plagiarizing,” in which students revise plagiarized texts to
produce non-plagiarized texts, this study suggests that future research should focus on “defragmentation,” in which students borrow from source texts in order to construct their own new sentences. This line of research could allow us to resolve issues such as whether students can actually avoid plagiarism and produce high-quality texts through defragmentation; how we might facilitate defragmentation processes in diverse settings; what defragmentation in LCI could reveal about L2 writers’ composing processes; and how LCI could serve as an effective anti-plagiarism technique by facilitating on-line genre analysis. A large-scale corpus-based study is required to investigate how students could use the technique to appropriate source texts and yet avoid plagiarism.

Finally, the focal students’ queries suggest that the efficiency of LCI can be enhanced by providing a specialized corpus that consists of highly relevant texts, rather than a general corpus of academic English. A central tenet of genre-based pedagogy is that experiencing the contextualized use of texts, i.e., genre exemplars, facilitates development of genre knowledge. To be effective, the example texts must share the communicative purposes and expectations of the target audience. In other words, the texts should have genre and discipline in common with the course curriculum. The focal student’s query log, however, shows that the corpus system did not effectively retrieve the example sentences that addressed their needs. As a result, their queries are often repetitive and redundant. For example, Yining’s repetitive queries - “process that,” “process in which,” and “process of” – suggest that the system did not retrieve examples that were relevant with her writing purposes. At her first query, the response from the system was “a process approach to writing,” which was not relevant to her writing
purpose. The example came from a scholarly article that discussed cognitive processing in writing research, rather than a sentence that described “a process.” This irrelevant response is due to the discrepancy of genres: The students were writing a college-level response paper, while the texts in the corpus consisted of professional journal articles.

Capacity of a corpus system to retrieve relevant examples depends on the scope of the database as well - the narrower the scope is, the more relevant the results become. For example, a commonly used search engine, e.g., Google, retrieves results that may be of tangential relevance with the search purposes of L2 writers, as the scope of sample texts is broad. In comparison, a more academically oriented implementation of the engine, i.e., Google Scholar, serves the writers’ need more efficiently, as its database is closer to the target discourse, i.e., academic texts. The customized engine that the focal students used even further enhances the relevance since the scope of the database is narrower consisting of only academic texts and selected within relevant disciplines. A future implementation of the corpus system should be able to narrow down the scope of database even to a greater degree by including only the texts that are from the target genres in the course curriculum, e.g., including exemplary response papers and lab reports collected from undergraduate students, while excluding research papers written by graduate students and articles from professional journals.
6.3.2. Enhancing research methodology: Corpus query as linguistic research data

This study has pointed out that current genre-based research lacks appropriate data to allow us to describe and understand L2 writers’ composing processes. Even to date, we know little about how L2 writers analyze genre exemplars and attempt to transfer their findings into their own writing. The study has proposed to address the gap by providing real-time data, i.e., screen recordings and by analyzing the data using the corpus search queries. The findings of this study suggest that the focal students’ composing processes are not a linear process of transferring their genre knowledge to their writing. Rather, their writing processes are nonlinear, multidimensional activities that consist of their strategic efforts for problem-solving, distributed cognitive interaction between the writers and artifacts, and the resulting micro-development of their lexicogrammatical awareness.

In furthering our understanding of the composing processes inhering in genre-based writing, we can usefully draw on computational theories and techniques beyond our own field of writing research. In parallel with the emphasis on social contexts and the writers’ agency in genre theory, a similar movement has taken place in computational studies, especially in the area of Human Computer Interaction (HCI). In the past two decades, HCI has extended its research area to broadly examine human–artifact collaboration situated within sociocultural contexts (Kaptelinin & Nardi, 2003). As a theoretical background, HCI research draws on socially oriented positions including activity theory (Kaptelinin, 1996; Nardi, 1996) and the theory of distributed cognition (Hutchins, 1995). Methodologically, a number of computer-aided techniques have been
developed for documenting users’ interactions in real time. Doubtless, this theoretical framework and associated methods can be usefully adapted to our own area of writing research (Rosinsky & Squire, 2009).

LCI is an emerging area that promises to be of great potential benefit to L2-writing research. An important next step in this area is to conduct a larger-scale study to examine the development of L2 writers over long period through the various analytical methods such as analysis of corpus search queries and real-time data, and within diverse settings, including pedagogical as well as professional writing situations. Future research should also explore areas that to date have been largely under-researched, such as corpus-based curriculum design and assessment, corpus-assisted writing conferences and tutoring, and automatic corpus-query analysis. Such efforts are consistent with the post-process perspective in current writing research (Atkinson, 2003) and the growing interest in artifact-mediated language use (Kinginger & Belz, 2005; Thorne, 2003) in language pedagogy. Importantly, future research should develop a theoretical and methodological framework for LCI in order to offer valid implications for L2 writing pedagogy in contemporary writing contexts—contexts that are increasingly mediated, distributed, and collaborative.
Appendix

Informed Consent Form for Social Science Research
The Pennsylvania State University

Title of Project: An investigation of ESL writers’ learning and writing development

Principal Investigator: Kwanghyun Park, 305 Sparks Building, University Park, PA 16802 (814) 863-0031, kup133@psu.edu
Advisor: Dr. Celeste Kinginger, 208 Sparks Building, University Park, PA 16802 (814) 867-1373, cxk37@psu.edu
Other Investigator(s): Davi S. Reis, 305 Sparks Building, University Park, PA 16802 (814) 863-0031, dsr158@psu.edu

1. Purpose of the Study: The purpose of this research is to examine ESL students’ development in academic writing throughout a semester at the university level. By conducting this study, we hope to gain a better understanding about students’ writing development and teacher-student interaction.

2. Procedures to be followed: Participation in this study will involve allowing us to collect your written texts (drafts and final papers), and screen capture assignment and to videotape ten classroom sessions.

3. Discomforts and Risks: There are no risks in participating in this research beyond those experienced in everyday life. You may feel uncomfortable while we are audio/videotaping the interview and classroom sessions. But usually the discomfort decreases after the first few minutes.

4. Benefits: The benefits to participants include the opportunity to reflect on your writing experiences. The benefits to society include a deeper understanding of the writing processes of ESL students, and therefore, would entail some implications for better design of writing instruction.

5. Compensation: As compensation for participating in this study, you will be entered into a drawing for 4 (four) $25 (twenty-five dollar) gift certificates to a place of your choosing. Please note that early withdrawal from this study will make you ineligible for the drawing.

6. Duration/Time: Your participation in the research will take approximately 15 minutes to fill out the consent forms. If you choose to participate in the interview sessions, each session will take approximately 30 minutes.

7. Statement of Confidentiality: Your participation in this research is confidential. We will not reveal any personal information. In all cases, pseudonyms (i.e. names other than your own names or the names of any other student or person referred to in your writing) will be used.

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Once all data has been retrieved from the course’s ANGEL website, it will be stored and secured in a password-protected computer in a locked office (312 Sparks). Only Davi Reis will have access to the classroom observation recordings. Your confidentiality will be kept to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet by any third parties. The following may review and copy records related to this research: The office of Human Research Protections in the U.S. Department of Health and Human Services, Penn State University’s Social Science Institutional Review Board, and Penn State University’s Office for Research Protections.

8. **Right to Ask Questions:** Please contact Davi Reis at (814) 863-0031 with questions, complaints or concerns about this research. You can also call this number if you feel this study has harmed you. Questions about your rights as a research participant may be directed to Penn State University’s Office for Research Protections at (814) 865-1775.

9. **Voluntary Participation:** Your decision to be in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise.

10. **May the researcher use your video/audio recordings and writings in the future?** Please mark your initial next to two of the following four options below:

- [ ] I agree to allow my written products (i.e., short writing assignments, in-class writing tasks, online postings on ANGEL, drafts and final papers), audio taped individual meetings, and screen capture videos from ESL015 to be released to the principal investigator and the research team of this study for the purpose of investigating negotiation and development of ESL writers.

- [ ] I DO NOT agree to allow my written products (i.e., short writing assignments, in-class writing tasks, online postings on ANGEL, drafts and final papers), audio taped individual meetings, and screen capture videos from ESL015 to be released to the principal investigator and the research team of this study for the purpose of investigating negotiation and development of ESL writers.

    _____ I give my permission to be VIDEO taped.

    _____ I do not give my permission to be VIDEO taped.

You must be 18 years of age or older to consent to take part in this research study. If you agree to take part in this research study and the information outlined above, please sign your name and indicate the date below. You will be given a copy of this consent form for your records.

_____________________________________________  _____________________
Participant Signature      Date

_____________________________________________  _____________________
Person Obtaining Consent     Date


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Upton, T., & Connor, U. (2001). Using computerized corpus analysis to investigate the


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Spring 2010  Research Assistant (Lead programmer) for International Teaching Assistant (ITA) Corpus Project, Pennsylvania State University
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2008  Research Assistant for Applied Linguistics Project, Pennsylvania State University
2005- 2009  ESL015 Academic Writing II (7 sections), Pennsylvania State University
2005- 2006  ESL 015 Academic Writing I (2 sections), Pennsylvania State University
2002-2003  Principal investigator, Telecollaboration Project, Seoul National University, Korea and Kyoto University, Japan

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Award and Fellowship

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- Gil Watz Dissertation Fellowship, Center for Language Acquisition, Pennsylvania State University (Spring 2009)