

LANGUAGE LEARNING IN COMPUTER-MEDIATED COLLABORATIVE WRITING

A Dissertation

by

WEI JIANG

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Chair of Committee,	Zohreh R. Eslami
Committee Members,	Edie Cassell
	Laurie Dixon
	Wen Luo
Head of Department,	Michael de Miranda

May 2018

Major Subject: Curriculum and Instruction

Copyright 2018 Wei Jiang

ABSTRACT

This dissertation investigated the impact of computer-mediated collaborative writing on Chinese EFL learners' language learning and writing skills through examining both writing products and processes. The potential influence of dyadic type and language proficiency was also explored through quantitative and qualitative analyses. The study adapted a quasi-experimental pre- and post-test design and involved 135 non-native English speakers (NNES) and 45 native English speakers (NES). Participants completed two writing tasks online either with a partner or individually over six weeks.

The pre- and post-tests were designed to examine whether the language and writing skill developments from computer-mediated collaboration transferred into individual writing. Through analyses of the gain scores on language complexity, accuracy, fluency and overall performance, the findings revealed that intermediate proficiency learners had higher improvements than advanced proficiency learners over time. Although statistically significant differences were observed on fluency and overall performance across groups, the results did not show influence of writing modes, language proficiency and dyadic types on accuracy and complexity.

Language-related episodes (LRE), non-language-related episodes (NLRE), and uptakes in the text-chat logs and the collaborative writing texts were used to measure potential noticing and language learning. The analysis showed that the advanced NNES-NES dyads had a higher frequency of LREs, NLREs, and correct immediate and delayed uptakes. The in-depth qualitative analysis of nine selected dyads revealed that advanced learners were more engaged in interactions in both NNES-NES and NNES-NNES dyads. However, intermediate learners

showed more learning incidents, higher motivation and more confidence in NNES-NNES dyads than in NES-NNES dyads. The perception survey indicated that the NNES participants had a positive attitude to computer-mediated collaborative writing. The advanced learners in the NNES-NES dyads had the highest percentage of reporting self-perceived improvements and confidence in English writing.

The findings of this dissertation research indicate that computer-mediated collaborative writing is beneficial to Chinese EFL learners when they are actively engaged in interactions during the writing process. The study also confirmed that dyadic type and language proficiency affect learner's performance, with intermediate learners more likely to benefit from collaboration with NNESs and advanced learners more likely to benefit from collaboration with NESs.

ACKNOWLEDGEMENTS

First, I would like to thank my committee chair, Dr. Zohreh Eslami, who has opened the door to doctoral study for me since 2014. She has provided me with valuable advice and helped me with incredible patience to facilitate my becoming a novice researcher in Academia. With her support and faith in me, I have had the confidence and courage to achieve higher goals in my program and future career. Furthermore, I deeply appreciate my committee member, Dr. Edie Cassell, who has supported and encouraged me to overcome difficulties during the four years of my PhD study. My gratitude also goes to Dr. Laurie Dixon and Dr. Wen Luo, who have served on my committee and provided me with valuable guidance, input and support throughout this research process.

My thanks also go to my dear friends, Ms. Angelica Ribeiro, Ms. Jeonghyun Park, Ms. Angela Wang and Mr. Wei-Hong Ko, to name a few, who have been my living and research buddies at Texas A&M University. I also would like to extend my thankfulness to my father Mr. Dejie Jiang, my best friend Ms. Rong Xue, and my teacher Dr. Qinchao Xu and Ms. Mingming Jia, who generously and kindly collaborated with me and coordinated my dissertation study overseas.

Finally, I am very grateful for having the most supportive parents and husband in the world. Their constant encouragement, support and unconditional love have driven me to pursue my career and become a better person. Thanks for believing in me and lifting me to run this far and fly this high.

CONTRIBUTORS AND FUNDING SOURCES

Contributors

This work was supervised by a dissertation committee consisting of Professors Zohreh R. Eslami [advisor], Edie Cassell, and Laurie Dixon of the Department of Teaching, Learning and Culture and Professor Wen Luo of the Department of Educational Psychology.

The overseas coordination of this dissertation study was provided by Ms. Mingming Jia, Professors Dejie Jiang and Qinchao Xu of the College of Foreign Languages and Ms. Rong Xue of the College of Material Engineering at Qingdao University of Science and Technology, People's Republic of China.

All other work conducted for the dissertation was completed by the student independently.

Funding Sources

This dissertation study was funded by the Research Scholars Award from the College of Education and Human Development at Texas A&M University.

TABLE OF CONTENTS

	Page
ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iv
CONTRIBUTORS AND FUNDING SOURCES	v
TABLE OF CONTENTS.....	vi
LIST OF FIGURES	ix
LIST OF TABLES.....	x
CHAPTER I INTRODUCTION.....	1
Background of the Study	1
Statement of the Problem.....	3
Dissertation Outline	6
Definition of Terms.....	9
CHAPTER II LITERATURE REVIEW	12
Writing and Instructed Second Language Acquisition	15
Collaborative Writing	18
Definitions and Types of Collaborative Writing	18
Studies on Collaborative Writing.....	19
Computer-mediated Communication.....	28
Computer-mediated Communication in ISLA.....	29
CMC Technology in EFL Classrooms.....	31
Interactional Feedback	35
Studies on Computer-mediated Interactional Feedback	38
Conclusion	44
CHAPTER III EFFECTS OF COMPUTER-MEDIATED COLLABORATIVE WRITING ON INDIVIDUAL EFL WRITING PERFORMANCE.....	47
Introduction.....	47
Sociocultural Theory.....	50
Computer-Mediated Collaborative Writing.....	51
Interactional Feedback in Collaborative Writing.....	52
Gaps in Research.....	53
Research Questions.....	57

	Page
Method	58
Participants.....	58
Research Design.....	60
Materials	60
Procedure	62
Data Analysis	66
Results.....	70
Descriptive Statistics.....	70
Complexity.....	73
Accuracy	73
Fluency.....	73
Overall Performance	74
Discussion	77
Research Question 1	77
Research Question 2	81
Conclusions.....	86
Limitations and Future Directions	88

CHAPTER IV EXPLORING THE RELATION AMONG LANGUAGE PROFICIENCY, DYADIC TYPE AND LEARNERS' NOTICING IN ONLINE COLLABORATIVE WRITING 90

Introduction.....	90
Noticing.....	92
Computer-mediated Collaborative Writing	96
Research Questions.....	100
Method	101
Participants.....	101
Writing Tasks.....	103
Guidelines for Peer Interactional Feedback	104
Perception Survey	104
CMC Technology.....	105
Procedure	106
Data Analysis	107
Results.....	111
Quantitative Analysis.....	111
Qualitative Analysis.....	118
Discussion and Conclusion	137
The Role of NES and NNES in Collaborative Writing	137
Developmental Process of NNESs' Language Learning	141
Individual differences and Contextual Factors	142
Attitudes towards Computer-mediated Collaborative Writing	144
Implications.....	146
Limitations and Future Directions	148

	Page
CHAPTER V CONCLUSION.....	149
Summary.....	149
Pedagogical Implication.....	151
Limitation and Future Directions.....	153
REFERENCES	154
APPENDIX A INSTRUCTIONS FOR COLLABORATIVE WRITING	177
APPENDIX B PRE- AND POST- INDIVIDUAL WRITING TASKS GRADING RUBRIC..	179
APPENDIX C T-UNIT ANALYSIS AND ERROR CRITERIA.....	181
APPENDIX D GUIDELINES FOR INTERACTIONAL FEEDBACK	184

LIST OF FIGURES

	Page
Figure 2.2. Types and Subtypes of Interactional Feedback, reprinted from Nassaji (2015)	36
Figure 3.1. National College Entrance Exam, English Section Score Distribution and Participant Proficiency Levels	59
Figure 3.2. Example of Week 2 Interactional Feedback Instructions.....	65
Figure 4.1. National College Entrance Exam English Part - School Distribution and Proficiency Groups.....	102
Figure 4.2. Categories of Interactional Feedback, reprinted from Nassaji (2015)	118
Figure 4.3. Developmental Process of A-NNES in Dyad 48 on Subject-Verb Agreement....	134
Figure 4.4. Developmental Process of A-NNES in Dyad 48 on Punctuation Error	135

LIST OF TABLES

		Page
Table 2.1	Definition and Examples of Types of Interactional Feedback	37
Table 3.1	Participant's Groupings (n = 151)	61
Table 3.2	Study Timeline and Activities	63
Table 3.3	Examples of T-units.....	67
Table 3.4	Descriptive Statistics for Gain Scores of CAF and Overall Performance Measurements (n = 109).....	71
Table 3.5	Descriptive Statistics for Gain Scores of CAF and Overall Performance Measurements (Collaborative Groups vs. Individual Group)	72
Table 3.6	Statistically Significant Bonferroni Corrected Comparisons of the Measurements by Dyadic Type and Language Proficiency	75
Table 3.7	Summary of Statistically Significant ANOVA on Criteria of Overall Performance (n = 108).....	76
Table 3.8	Descriptive Statistics for Gain Scores CAF and Overall Performance Measurements (Advanced Proficiency vs. Intermediate Proficiency)	84
Table 4.1	Perception Survey Items	105
Table 4.2	Study Procedure.....	106
Table 4.3	Coding Criteria for LREs and NLREs.....	108
Table 4.4	Characteristics of LREs and NLREs	109
Table 4.5	Coding Criteria for Immediate and Delayed Uptake	110
Table 4.6	Frequency and Percentage of LREs and NLREs by Categories and Dyadic Type	112
Table 4.7	Descriptive Statistical Information for Frequency of LREs and NLREs	112
Table 4.8	Numbers and Percentages of LREs by Features and Dyadic Type	113
Table 4.9	Numbers and Percentages of NLREs by Features and Dyadic Type	114
Table 4.10	Numbers and Percentages of Immediate Uptakes by Sub-categories and Dyadic Type.....	115

Table 4.11	Numbers and Percentages of Delayed Uptakes by Sub-categories and Dyadic Type.....	116
Table 4.12	Summary of the Perception Survey Results (n = 53)	117
Table 4.13	Numbers of LREs by Dyads and Task Periods.....	132

CHAPTER I

INTRODUCTION

Background of the Study

Second language acquisition (SLA) research has been criticized for its insufficient relevance to language teachers. As Ortega (2005) stated, SLA research has a “decontextualized and mechanistic view of language and communication” (p. 324). In recent decades, the area of study known as instructed SLA (ISLA) emerged from the gradual attention on the value of instruction on SLA. As a "theoretically and empirically based field of academic inquiry" (Loewen, 2014, p. 2), ISLA emphasizes how instruction can benefit second language learning with optimized effects. Theoretically speaking, the focus of ISLA is on the cognitive process of language learning under systematic manipulations by another's instruction. Exploring the meaningful relations between language learning and instructions in ISLA research aims to fill the gap between practitioners and SLA research. However, ISLA studies are also criticized for not being ecologically valid, which indicates that isolating a specific classroom feature or activity to investigate its effectiveness on language learning in a laboratory setting is highly problematic (Hulstijn, 1997; Spada, 2005). The laboratory setting does not share the same nature as "normal" classrooms with real second language learners. Thus, the results of an experimental ISLA study cannot capture the complex interrelations among the contextual factors and the individuals in a classroom setting (Spada, 2005).

Luckily, ecologically oriented ISLA research has been viewed as the foreseeable future direction for SLA (Larsen-Freeman, 2018). As Benson (2017) stated, we are entering an era of "person-centeredness" in SLA research, in which recognizing the relationship between the

individual and language learning is the main concentration. Therefore, an increasing number of individual variables have been identified and examined in SLA and ISLA research, such as individual learning strategies, language proficiency, motivation, and attitude (Benson, 2017). Among the wide range of ISLA research topics, corrective feedback for writing in a computer-mediated setting has caught the attention from researchers and practitioner (Brown, 2012; Ferris, 2011; Spada, 2005; Polio, 2017). This trait of study risks of lacking ecological validity when studies are strictly controlled, in which types of corrective feedback are the criteria for grouping learners (Brown, 2012; Guenette, 2007; Liu & Brown, 2015; Spada, 2005), writing task designs do not permit learners to use various resources (Liu & Brown, 2015; Polio, 2017; Polio & Park, 2016), and writing in a computer-mediated context is limited to non-essay types of writing (Oliver, Grote, & Nguyen, 2014). With teachers tend to rely on research-based pedagogy while designing classroom activities (Spada, 2005), it is suggested that future studies on writing in ISLA should emphasize on the needs and concerns of second language teachers and learners.

As one of the language skills taught in classrooms, writing has long been viewed as a tool for communication and language learning. It is also a social activity in which texts are produced for a particular purpose or audience (Wang, 2015). Although writing has won its attention in classroom instructions, theoretically speaking, the role of writing for language learning is still a debated issue. Some SLA researchers argue that the two unique features of writing – slower pace and enduring record – engage learners in greater precision in language use than speaking (Williams, 2012). Moreover, writing can also foster a form-meaning connection to promote language learning (Cumming, 1990). On the other hand, some view oral language (i.e., speaking and listening) as the primary means for communication and language learning, and regard writing as only a vehicle for content learning (Ortega, 2012).

To show that writing is a means to facilitate learning, previous researchers have investigated different writing instruction approaches and their effectiveness. In the early 1980s, writing instruction shifted from a product-based approach to a process-based approach (Kitao & Saeki, 1992). This emphasis on the writing process leads researchers' attention to how learners cognitively process language and transfer it to a written form. Thus, to address both the process and product, the cognitive process model of writing redefined writing as a goal-directed thinking process in which writers need to repeatedly reflect written pieces in the process of writing (Flower & Hayes, 1981). In recent years, the emergence of task-based language teaching (TBLT) has further perfected the previous approaches and focused on engaging learners in meaningful interactions during the writing process (Brynes & Manchon, 2014). Such meaningful interactions can occur within the learners themselves through an internal cognitive process or with others, such as peers and teachers. The goal of TBLT is to bring learners into a modeled real-life situation and to learn through problem solving. Among the many effective writing tasks, collaborative writing tasks have surpassed other types in many aspects, such as learning motivation and quality of writing performance (e.g., Elola & Oskoz, 2010; Storch, 2005; Strobl, 2014). Theoretically speaking, interactions that occur during collaborative writing can significantly facilitate language learning, which is also substantiated from a sociocultural perspective (Lantolf, 2012; Lantolf & Thorne, 2006; Vygosky, 1978).

Statement of the Problem

Research on collaborative writing has been carried out in different settings and contexts focusing on a variety of issues including: the influence of collaborative writing on learning outcomes (e.g., Bikowski & Vithanage, 2016; Chen, Shih, & Liu, 2015; Storch, 2005; Strobl, 2014), the learning process during collaboration (e.g., Arnold, Ducate, & Kost, 2012; Li & Zhu,

2013), and learners and teachers' attitudes about collaborative writing (e.g., Bikowski & Vithanage, 2016; Storch, 2005; Wang, 2015). With the implementation of computer-mediated communication (CMC) technology in education, collaborative writing studies have shifted their attention from face-to-face settings to CMC settings (e.g., Arnold et al., 2012; Bikowski & Vithanage, 2016).

As a recognized approach, computer-mediated collaborative writing captures opportunities for language learning in both the writing process and product (e.g., Deng & Yuen, 2011; Drexler, Dawson, & Ferdig, 2007; Glogoff, 2005; Zhang, Song, Shen, & Huang, 2014). Though the effectiveness of computer-mediated collaborative writing for language learning is supported by recent studies, some issues identified through research still need further investigations (e.g., Jalili & Shakrokhi, 2017; Lai, Lei, & Liu, 2016; Yim & Warschauer, 2017; Aydın & Yıldız, 2014). This dissertation addresses these issues, such as the ecological validity of collaborative writing in an EFL context (Polio, 2017; Yim & Warschauer, 2017), the methodological issue of measuring learning in writing products (Bikowski & Vithanage, 2016), and the relationship between individual difference, and collaboration patterns and language learning (Lai et al., 2016). The following paragraphs briefly synthesize the problems addressed in this dissertation, which will be further discussed in the chapters below.

Centered in EFL contexts, technology is being widely used in people's life. However, only in recent years, computer-mediated technology has gradually been incorporated in language classrooms in EFL contexts (e.g., Brown, 2016; Kessler, Bikowski & Boggs, 2013; Krajka, 2012; Strobl, 2014; Lai et al., 2016; Paul & Liu, 2017; Woo, Chu & Li, 2013; Wang, 2015; Ware & O'Dowd, 2008). As more computer-mediated communication (CMC) technology being incorporated into EFL language classrooms, teachers need to alter their pedagogy and EFL

learners are required to transform their learning strategies. Instead of receiving information from teachers, learners now need to rethink how knowledge is shared and learned through collaboration and interaction, and how skills are acquired in a CMC setting (Stein, Glazer, Glassman, & Li, 2017). Therefore, a desperate need in ISLA research in EFL contexts is to work out an effective instructional approach for writing to enhance learners' exposure to computer-mediated language learning (Zhang, 2013) and facilitate students to become a successful learners in the CMC era (Stein et al., 2017).

Beside ecological validity in EFL contexts, understanding how collaborative writing facilitates language learning and writing development is another important issue, especially on how to measure improvement in learners' writing with reliability and validity. Although language complexity, accuracy and fluency (CAF) has been commonly used as measures in SLA writing research since Wolfe-Quintero, Inagaki, and Kim (1998) proposed the methods decades ago, the application of CAF in collaborative writing studies has been viewed as problematic (Bikowski & Vithanage, 2016). This problem derived from the writing products that are traditionally being measured, which is the collaboratively written text (Elola & Oskoz, 2010; Storch, 2005). However, this traditional method fails to examine whether the improvement in CAF and learned skills from collaboration could be internalized and transferred into individual writing (Liou & Lee, 2011; Shehadeh, 2011). Therefore, some researchers have proposed using an individual pre- and post-test design to measure the effect of collaboration in individual writing products. Though this has proved to be a more reliable and effective design, only limited studies have implemented this method (Bikowski & Vithanage, 2016; Jafari & Ansari, 2012; Shehadeh, 2011). Thus, further research is needed.

Furthermore, as Benson (2017) and Larsen-Freeman (2018) stated that we are entering a

person-centered era in ISLA research, the emphasis on individual difference in language learning and classroom instructions should not be overlooked. It has long been proven that individual differences, such as language proficiency, motivation and attitudes, can affect the results of language learning, especially when peer interaction is part of the learning process (e.g., Storch, 1998; William, 2001; Yang & Meng, 2013). Additionally, the collaboration patterns, referred to as dyadic type in this dissertation (e.g., non-native speakers collaborate with non-native speakers or native speakers collaborate with non-native speakers), are also shown to influence learning of the target languages (e.g., Bower & Kawaguchi, 2011; Kung & Eslami, 2015; Sotillo, 2005; Watanabe, 2008; Wu, Petit, & Chen, 2015). Although it appears that the individual differences and dyadic type should have a similar impact on learning through computer-mediated collaborative writing to learning through interactive tasks (e.g., Kung & Eslami, 2015), the process of learning a target structure in a task-based interaction could be different from learning from a writing task. Therefore, studies are needed to address the relationship among individual differences, dyadic type, and language learning in both collaborative writing process and product.

Dissertation Outline

The overall purpose of this dissertation is to address the above issues and provide practical implications for EFL language teachers so they can effectively implement CMC technology and collaborative writing in adult EFL classrooms. The following chapters focus on different aspects of computer-mediated collaborative writing using different methodological approaches.

Chapter Two is an extensive literature review focusing on theoretical and empirical findings on the relationships between writing and ISLA, and the role of CMC technology and its

implication in ISLA research in EFL contexts, and the impact of interactional feedback on the effectiveness of collaborative writing. This review examines the theoretical models that support the effectiveness of collaborative writing, such as the cognitive model of writing (Hayes & Flower, 1981), Sociocultural Theory (Vygotsky, 1978), Noticing Hypothesis (Schmidt, 1990), and Output Hypothesis (Swain, 1995, 1998). In addition, previous studies on collaborative writing and interactional feedback in various settings are also reviewed to explore the effects of different components of collaborative writing on individual learning. Last but not the least, this literature review also examines the study designs of previous research to inform the design of this dissertation study.

Chapter Three is a quasi-experimental empirical study that explores the effects of collaborative writing on individual language development through a pre- and post-test design. Three collaborative writing groups with different dyadic types and one individual writing group were established. The pre- and post-tests were rated and coded by the researcher of this dissertation and an English writing professor who is familiar with ISLA and writing assessment to ensure inter-rater reliability and inter-coder reliability. Coding of the T-units and clauses were used to further calculate CAF. A series of two-way MANOVA and ANOVA tests were performed on CAF and overall performance to examine the group differences. Specifically, this chapter examines how dyadic type and language proficiency influence the quality of learners' individual writing after completing two computer-mediated writing tasks by addressing the following research questions:

1. Do computer-mediated collaborative writing tasks enhance language complexity, accuracy, fluency and overall performance of individual writing texts?

2. If so, to what extent do dyadic type and language proficiency influence the effects of collaborative writing on individual writing texts with regard to language complexity, accuracy, fluency and overall performance?

Chapter Four investigates learners' interactions and collaborative process during two computer-mediated collaborative writing tasks, as well as each learner's perception of collaborative writing. Adapting a quasi-experimental multi-group design, three collaborative writing groups were formed and labeled based on dyadic type and language proficiency. The text-chat logs and the collaborative texts from these interactions were coded, quantified and analyzed. The language-related episodes (LRE), non-language-related episodes (NLRE) and uptakes were coded by the types and features and the inter-coder reliability was also measured. This chapter aims to further understand the relationships among learners' language proficiency, dyadic type and learners' noticing during the collaboration process by answering the following research questions:

1. What are the features and frequency of lexical, grammatical and mechanical LREs?
2. What are the features and frequency of NLREs?
3. What are the features and frequency of immediate and delayed uptakes?
4. How do language proficiency and dyadic type affect the learners' performance in terms of features and frequency of LREs, immediate and delayed uptakes?
5. What is the EFL learners' perception of computer-mediated collaborative writing using chats and *Microsoft Word*?

Definition of Terms

Second language acquisition (SLA). SLA “entails the study of the human capacity to learn languages other than the mother tongue and seeks to explain the wide range of individual variability that human beings exhibit in learning them” (Ortega, 2005, p. 318).

Instructed second language acquisition (ISLA). ISLA is a “theoretically and empirically based field of academic inquiry that aims to understand how the systematic manipulation of the mechanisms of learning and/or the conditions under which they occur enable or facilitate the development and acquisition of a language other than one’s first” (Loewen, 2014, p. 2). ISLA studies attempt to explore effective classroom instruction that can facilitate SLA.

Task. Task is “(1) a classroom activity or exercise that has: (a) an objective obtainable only by the interaction among participants, (b) a mechanism for structuring and sequencing interaction, and (c) a focus on meaning exchange; (2) a language learning endeavor that requires learners to comprehend, manipulate, and/or produce the target language as they perform some set of work plans” (Lee, 2000, p. 32)

Computer-mediated communication (CMC). CMC is defined as “the process of human communication via computers, involving people, situated in particular contexts, engaging in processes to shape media for a variety of purposes” (December, 1996, p.1)

Synchronous computer-mediated communication (SCMC). SCMC is a type of CMC setting in which people are able to engage in real-time communication via CMC technology, such as online chatting and instant messaging.

Asynchronous computer-mediated communication (ACMC). ACMC is another type of CMC setting in which communication happens in delayed time, such as emails.

Collaborative writing. Collaborative writing is defined as “an activity where there is a shared and negotiated decision-making process and a shared responsibility for the production of a single text that results in collective cognition related to language learning” (Storch, 2013, p.3).

Interactional feedback. Interactional feedback is defined as “feedback generated implicitly or explicitly through negotiation and modification processes that occur during interaction to deal with communication or linguistic problems” (Nassaji, 2016, p. 2).

Dyadic type. Dyadic type refers to features of pairs in pair work in language teaching and learning (Sotillo, 2005). This study will use three dyadic types: native speaker and advanced proficiency non-native speaker, native speaker and intermediate proficiency non-native speaker, advanced and intermediate proficiency non-native speakers

Noticing. Noticing is referred as the conscious attention to language input, which may appear in a form of verbal report (Schmidt, 1990). Verbal report refers to evidence in later language production that shows potential learning. Traditionally, researchers assume that existence of learning evidence implies potential noticing. However, such verbal reports may not occur in all circumstances.

Language-related episode (LRE). LRE is “any part of a dialogue where the students talk about the language they are producing, question their language use, or correct themselves or others” (Swain & Lapkin, 1998, p. 326).

Non-language-related episode (NLRE). Storch and Wigglesworth (2007) define NLRE as a parallel structure of LRE and refer it as any dialogue in which learners discuss writing-related issues (e.g., text structure and content selection).

Uptake. Uptake is learners' responses following the feedback, ranging from modified output to simple acknowledgment of receipt of the feedback (e.g., "yes", "Ok"; Lyster & Ranta, 1997).

Language accuracy. Language accuracy refers to "the degree of deviancy from a particular norm" (Housen & Kuiken, 2009, p. 463).

Language complexity. Language complexity means "[t]he extent to which the language produced in performing a task is elaborate and varied" (Ellis, 2003, p.340).

Language fluency. Language fluency is characterized as the "perceptions of ease, eloquence, and 'smoothness' of speech or writing" (Housen & Kuiken, 2009, p. 463)

T-unit. T-unit is "one main clause plus whatever subordinate clauses happen to be attached to or embedded within it" (Storch, 2005, p. 157)

CHAPTER II

LITERATURE REVIEW

Writing is one of the most important components of instructed second language acquisition (ISLA; Ortega, 2012). As a complex process, successful writing requires adequate linguistic knowledge and writing skills as well as instructions on writing (Lee, 2005). The challenges language learners face in writing may result not only from linguistic knowledge and writing skills, but also from whether they receive appropriate instruction (Ortega, 2012). In the 1980s, writing instruction shifted from a product-based to a process-based approach (Kitao & Saeki, 1992). Then Flower and Hayes (1981) further proposed the cognitive process model in writing that linked the product and process as a whole. In recent decades, more emphasis has been laid on how classroom instruction can effectively promote learning through both writing product and process. In addition, as more studies focus on the theoretical implications of different writing approaches in the classroom (Loewen, 2014), researchers have become more aware of the ecological validity of these studies (Spada, 2005; Polio, 2017). Thus, discovering effective approaches to writing instruction in actual language classrooms has become the primary purpose of ISLA studies on writing.

Task-based language teaching (TBLT), is one ecologically valid instructional approach that has shown to be effective in various classroom settings (TBLT; Long, 1985). It concerns the relations among learners' needs, class content, pedagogical strategies, as well as assessments of learners' achievements (Long, 1985). The purpose of TBLT is to enhance language learning through the process of completing a meaningful task with real-life purposes, either individually or collaboratively (Ellis, 2003; Long, 1985). In writing, specifically, the assessment of learning

can be achieved through the product and process. Moreover, with respect to effective writing tasks, research has underscored the benefits of collaborative writing tasks over individual tasks (e.g., Elola & Oskoz, 2010; Storch, 2005; Strobl, 2014).

Recently, there has been an increasing interest in collaborative writing in language classrooms and the way in which it promotes SLA (Dobao, 2012; Kim, 2008; Swain & Lapkin, 1998). Robust evidence from previous research supports the benefits of collaborative writing on language learning and writing development (e.g., Bikowski & Vithanage, 2016; Chen, Shih, & Liu, 2015; Elola & Oskoz, 2010). Through collaboration, learners are able to increase the quantity and quality of their writing (e.g., Armstrong & Retterer, 2008; Drexler, Dawson, & Ferdig, 2007), receive more opportunities for noticing linguistic gaps (e.g., Amir, Ismail, & Hussin, 2011; Li & Zhu, 2013), enhance their motivation for learning (e.g., Alvarez, Espasa, & Guasch, 2011; Zhang, Song, Shen, & Huang, 2014), and build learning communities (e.g., Amir et al., 2011). However, collaborative writing may not be consistently effective in all contexts. For instance, a considerable amount of literature indicates that compared to face-to-face settings, computer-mediated communication (CMC) can potentially maximize the learning effect from collaboration (Armstrong & Retterer, 2008; Chen et al., 2015; Gutierrez, 2008). Moreover, how peers interact and approach errors and revisions also affects the final result of the tasks (Li & Zhu, 2013; Nassaji, 2016; Zhang et al., 2014).

As CMC has emerged as an area of research in ISLA (Li & Zhu, 2013), some studies have demonstrated that computer-mediated collaborative writing could similarly or better facilitate language learning, writing development, and meaningful interactions than collaborative writing in face-to-face settings (e.g., Armstrong & Retterer, 2008; Chen et al., 2015; Drexler et al., 2007; Li & Zhu, 2013; Wang, 2015; Warschauer, 1997; Zhou, Simpson, & Domizi, 2012).

Moreover, theoretically speaking, more meaningful interactions imply more opportunities for learning and noticing (Schmidt, 1990). This argument is made convincingly from an interactionist perspective and supported by numerous studies on peer interactions for collaborative writing purposes (e.g., Alvarez et al., 2011; Amir et al., 2011; Guasch, Espasa, Alvarez, & Kirschner, 2013; Zhang et al., 2014). Additionally, online interactions have become more convenient and necessary when CMC technology is widely used in language education. Research that has looked into the effect of CMC on peer interaction shows potential benefits of CMC on language learning, but at the same time, brings to light other issues related to learning through CMC (AbuSeileek & Abualsha'r, 2014; Bower & Kawaguchi, 2011; Shintani, 2015). One of the major issues is to identify in what context learners can benefit the most from computer-mediated learning tasks. This is more of a concern when complex cognitive activities are needed for completing a task needing multiple skills. Computer-mediated collaborative writing is a complex task and learners need to have adequate communicative competence for effective interaction and be capable of transferring the knowledge gained through interaction to written language (Brooks & Swain, 2009). Therefore, the components of computer-mediated collaborative writing that can be manipulated for better learning outcomes needs further examination.

To center this review on computer-mediated collaborative writing, only studies related to CMC and collaborative writing, as well as peer interactions were explored. Factors that contribute to the effectiveness of computer-mediated collaborative writing range from micro factors like individual differences and collaboration patterns (e.g., Kung & Eslami, 2015; Sotillo, 2005; Watanabe, 2008) to macro factors like the task design and technology used for collaboration (Yim & Warschauer, 2017). In addition, because peer feedback is shown to

influence collaborative writing, it is also necessary to explore the impact of peer feedback on the successfulness of collaborative writing tasks. Despite a growing body of literature on computer-mediated peer feedback, very limited studies have looked at how it contributes or hinders collaborative writing during the writing process (Shehadeh, 2011; Soleimani, Modirghamene, & Sadghi, 2017). Therefore, this review aims to provide an extensive overview of the current research and potential issues in computer-mediated collaborative writing studies and to set up a rationale for this dissertation study. To clearly outline this review, we follow the structure below. First, the relation between writing and ISLA is discussed, including definitions, features, as well as an explanation of theoretical models and instructional approaches. Second, we take a closer look at collaborative writing, in which various types of collaborative writing are introduced and synthesis of current research is presented. Next, we dive into the relationship between CMC and ISLA and further explore the role of CMC in collaborative writing in an EFL context specifically. Last but not the least, how peer interactional feedback plays a role in collaborative writing is discussed.

Writing and Instructed Second Language Acquisition

Before we discuss the connection between writing and ISLA, the defining features and scope of ISLA need to be addressed. As mentioned above, ISLA emphasizes the functions of instruction in the process of language learning (Ellis, 2005). It is defined as a “theoretically and empirically based field of academic inquiry that aims to understand how the systematic manipulation of the mechanisms of learning and/or the conditions under which they occur enable or facilitate the development and acquisition of a language other than one’s first” (Loewen, 2014, p. 2). Thus, ISLA is concerned with both pedagogical aspects of language learning and theoretical inquiries of the relationship between instruction and second language learning.

As one of the major skills, writing is viewed to facilitate learning through greater precision in language use (Williams, 2012) and form-meaning connections (Cumming, 1990). Although it has been argued by some researchers that writing is only the carrier for content learning (Ortega, 2012), one cannot deny the role of writing in SLA as learners can benefit from both the writing process and writing product. From a pedagogical perspective, how to effectively teach writing has been investigated for decades. Since the 1980s, the instructional focus shifted from product to process as researchers and teachers began to realize that product does not reveal all aspects of learning (Kitao & Saeiki, 1992). To lay emphasis on both product and process, Flower and Hayes (1981) proposed the cognitive process model of writing in the early 1980s. This model viewed writing as a goal-directed thinking process, in which writing is broken into a set of sub-goals. To achieve the final goal, learners need to evaluate the writing quality in each phase guided by the sub-goals. This cognitive process enables learners to make progress towards the final written product, and also to focus on translating thoughts into words and reprocessing language cognitively. However, this model only emphasized the importance of both writing products and processes, and did not shed light on how teachers can develop an effective instructional approach for writing on the basis of this model.

From a practitioner perspective, TBLT has emerged and further matured in ISLA research in the past several decades (Ellis, 2003; Long, 1985; Van den Branden, 2016). As a research-based pedagogy with emphasis on language learning processes, TBLT holds the potential of being interactive and ecologically valid (Ellis, 2003). The process of learning through tasks requires information exchange and negotiation of meaning and forms to achieve the final goal. Tasks are designed based on real life setting, which can be “(1) a classroom activity or exercise that has: (a) an objective obtainable only by the interaction among

participants, (b) a mechanism for structuring and sequencing interaction, and (c) a focus on meaning exchange; (2) a language learning endeavor that requires learners to comprehend, manipulate, and/or produce the target language as they perform some set of workplans” (Lee, 2000, p. 32). Implementing tasks as part of classroom instructions could avoid isolating one strategy or activity from classrooms (Spada, 2005). Instead, tasks bring the outside resources into classrooms, prioritize meaning over form, meanwhile, taking form learning and development of communicative language into account (Ahmadian, 2011; Van den Branden, 2016). Moreover, Swan (2005) states that TBLT should be advocated in real classrooms because it is learner-centered with emphasize on natural language use, which allows teachers to cater task designs to learners’ needs.

Moreover, Vygotsky's (1978) sociocultural theory provides a solid theoretical foundation for TBLT, as sociocultural theory recognizes human cognitive development as a socially mediated process in which language plays an essential mediating role. Effective interactions for language learning purposes require successful language mediations, such as negotiation for co-constructing knowledge and problem solving (Swain, 2000; Van Lier, 2002). Compared with individual learning tasks, collaborative learning tasks entails a higher level of interactions (AbuSeileek & Abualsha’r, 2012; Lantolf & Thorne, 2006; Rassaei, 2014). Furthermore, scaffolding, as a sociocultural construct, facilitates the development of linguistic competence and interlanguage development in a learner’s zone of proximal development (ZPD), which is a favorable and supportive cognitive learning space (Mirzaei & Eslami, 2015). Extracted from the pioneer literature on sociocultural theory, ZPD is referred to as “the distance between the actual developmental level, as determined by independent problem solving, and the level of potential development as determined through problem solving under adult guidance, or in collaboration

with more capable peers” (Vygotsky, 1978, p. 86). Taking this perspective into consideration, collaboration offers more opportunities for scaffolding where learners tackle linguistic issues and mediate language learning during interactions (Mirzaei & Eslami, 2015; Storch, 2005).

In EFL writing specifically, the benefits of TBLT has been acknowledged and supported by a considerable numbers of studies (Byrnes & Manchón, 2014; Plakans, Gebril, & Bilki, 2016). Specifically, collaborative writing tasks have gained its attention, as it facilitates language learning and writing development through intense interactions during the writing process (Elola & Oskoz, 2010, 2017; Wang, 2015; Zhou et al., 2012). To obtain an empirical explication of the effects of collaborative writing on language learning and writing development, selected studies on collaborative writing are presented as follows.

Collaborative Writing

Definitions and Types of Collaborative Writing

The nature of collaborative writing has given it several definitional features. From the process of collaborative writing, Storch (2013) defined collaborative writing as “an activity where there is a shared and negotiated decision-making process and a shared responsibility for the production of a single text that results in collective cognition related to language learning” (p.3). Similarly, Dale (1994) stated that collaborative writing stresses the interaction among students and the context of writing (shared document). From a pedagogical perspective, Louth, McAllister, and McAllister (1993) defined collaborative writing as multiple people contributing to the writing process. All the definitions provided above share the same feature - that the end product of collaborative writing is a shared responsibility.

Collaborative writing can be classified into different types. Haring-Smith (1990) presented the following three types: serial writing, compiled writing and co-authored writing.

Serial writing is the type where multiple individuals work on a text in a sequence. For instance, a supervisor compiles the work for a report from each employee and sends it out to the next employee for further evaluation (Kittle & Hicks, 2009). Compiled writing requires each writer to contribute to a specific part of the text without peer feedback, where limited negotiation and collaboration occur. Co-authored writing allows joint-writing and joint-editing to happen. The end product is a collaborative piece with multiple authors rather than a collection of individual pieces. Similarly, Louth et al. (1993) categorized collaborative writing into two types: interactive writing and group writing. Interactive writing requires peer interactions but each author is only responsible for their own writing. Group writing is similar to Haring-Smith's classification of co-authored writing, in which multiple authors are responsible for one piece of writing. From a pedagogical perspective and a student-centered view, co-authored writing or group writing allows maximum interactions among learners, which is also the collaborative pattern most of the current literature on collaborative writing has adapted.

Studies on Collaborative Writing

A closer look at the studies on collaborative writing reveals several issues. First of all, these studies are conducted in either CMC settings (e.g., Arnold, Ducate, & Kost, 2012; Bikowski & Vithanage, 2016) or face-to-face settings (e.g., Gutierrez, 2008; Storch, 2005). Second, most studies on collaborative writing have been carried out in ESL/EFL contexts (e.g., Chen et al., 2015; Li & Zhu, 2013), with a number of studies in other foreign language contexts, such as Spanish as a Foreign Language (e.g., Elola & Oskoz, 2010) and German as a Foreign Language (e.g., Strobl, 2014). Third, the issues investigated in research on collaborative writing cover a wide range, including the influence of collaborative writing on learners' writing ability and language learning (e.g., Bikowski & Vithanage, 2016; Chen et al., 2015; Drexler et al., 2007;

Storch, 2005; Strobl, 2014), the interactional features of collaborative writing (e.g., how learners work together in one task) (Arnold et al., 2012; Li & Zhu, 2013), students' attitudes toward collaborative writing (e.g., Bikowski & Vithanage, 2016; Drexler et al., 2007; Storch, 2005; Wang, 2015), and the influence of dyadic type or language proficiency on collaborative writing outcomes (e.g., Alvarez et al., 2011; Guasch et al., 2013; Zhang et al., 2014).

Another important issue worth exploring is how these studies measured the language learning in collaborative writing. Some of the studies have compared the collaboratively and individually written products without a pre- and post-test design (e.g., Elola & Oskoz, 2010; Storch, 2005; Strobl, 2014). They simply compared the quality of the products written by multiple authors to those from a single author to examine which type of writing is more beneficial. However, this comparison cannot be viewed as an equal comparison because with multiple writers putting efforts on writing one piece, collaborative writing could potentially have a higher quality than individual writing, which is a reflection of one individual learner's effort. Some other researchers, on the other hand, have proposed and incorporated individual pre- and post-tests to examine differences within the group (e.g., Bikowski & Vithanage, 2016; Jafari & Ansari, 2012; Shehadeh, 2011). These researchers investigate whether the gains from a collaborative writing experience can be internalized or transferred onto individual writing.

Moreover, beside the methods for quality measurement, what constructs constitute the quality of written products also needs to be considered. Language complexity, accuracy, and fluency (CAF) are found to be the commonly measured constructs (e.g., Elola & Oskoz, 2010; Storch, 2005; Strobl, 2014). CAF represents different dimensions of writing, such as how the forms of the written language deviate from the native norm (accuracy), how the written language is elaborated or varied in terms of lexis and morphosyntax (complexity), and how smooth the

writing production is (fluency) (Ellis, 2003; Housen & Kuilen, 2009). These measures and constructs have been frequently applied in studies on the influence of collaborative writing on learners' language learning and writing ability, in which a writing product is the primary carrier of language gains.

Different from the above research, another group of studies examines mainly how learners interact during the collaboration process and how the amount and quality of interactions influence the final product and the process of SLA (e.g., Arnold et al., 2012; Gutierrez, 2008; Noël & Robert, 2004). This group of studies lays emphasis on the possible learning instances through the writing process. Measuring learning through the writing process usually consists of both qualitative and quantitative methods, such as analyzing the frequency and features of language-related episodes for potential learning. Commonly embedded in collaborative writing studies, interviews or surveys on learners' attitudes and perceptions of collaborative writing are also used as a supplementary measure to understand the effectiveness of collaborative writing (Bikowski & Withanage, 2016; Drexler et al., 2007; Storch, 2005; Wang, 2015). Guided by the above synthesis of previous studies, the following section presents an extensive selection of studies, categorized and sequenced by their research purposes.

Studies on Writing Products. The following two studies compared collaborative writing with individual writing by measuring the texts produced in a collaborative mode versus an individual mode among ESL/EFL learners. Chen et al. (2015) studied the effects of different types of collaborative writing tasks on the content of blog writing among adult EFL learners. Thirty-four EFL learners in Taiwan were paired into 17 dyads. Each dyad completed four open-type tasks (descriptive writing tasks) and six closed-type tasks (decision making writing tasks) in ten weeks using Skype and Blogger. Researchers examined the change in writing quality using

idea units. In addition to the tasks, all learners completed a set of self- and peer-appraisals for self- and peer-evaluation on their contributions. A linear regression analysis on task type and idea units showed that closed-type tasks were more likely to produce more idea units than open-type tasks. Moreover, as the task preceded, the idea unit counts increased, which indicated growth of writing skills and language learning over time.

Storch (2005) conducted a study among adult intermediate ESL learners to compare the effects of collaborative writing and individual writing. Learners were voluntarily placed in either a paired collaborative writing group or an individual writing group (working alone). Then they completed one writing task (i.e., analyzing a data commentary text) either in pairs or by themselves. The written product of both groups and recordings of oral interactions from the collaborative writing group were collected and analyzed. Written products were analyzed for CAF using T-units and clauses. Due to the small sample size, a non-parametric Mann-Whitney U test was conducted for quantitative analysis on CAF. The results indicated a better but not statistically significant learning outcome in complexity and accuracy in collaborative texts than in individual writing. On the contrary, the individual writing samples had higher fluency levels than the collaborative text samples. A possible explanation is that collaborative groups were engaged in joint-planning and joint-editing, which allowed learners to construct more succinct and concise writing than learners in individual writing groups.

Different from the above two studies, the following ones adapted a pre- and post-test design to measure language gains among EFL/ESL learners. Bikowski and Vithanage (2016) examined the impact of collaborative writing on individual writing performance in a CMC context among adult ESL learners. Learners were divided into different proficiency groups based on TOEFL iBT scores or completion of an intensive English program. All participants

individually completed a set of pre- and post-tests on writing, which were measured by an analytic rubric on overall performance. The experimental group completed four in-class web-based collaborative writing tasks, while the control group completed the same tasks individually. Through an independent t-test comparison of the scores from the pre- to post-tests, researchers found that collaborative groups outperformed individual groups in the post-tests on overall performance and concluded that collaborative writing is an effective treatment for language learning and writing development.

Similarly, Jafari and Ansari (2012) conducted a study on the effects of collaborative writing on individual language learning among adult intermediate EFL learners in Iran. Learners were placed in either an experimental group (a collaborative writing group) or a control group (an individual writing group, working alone) based on their own choices. All learners completed an individual Solution Placement Test (including an argumentative writing section) before the tasks and an individual argumentative writing post-test. Two argumentative writing tasks were assigned to both groups during the writing sessions. The accuracy of the post-tests was measured by T-units. The results of an independent t-test of accuracy measure in the post-tests showed that collaborative writing has a positive impact on learners' writing.

In addition to the studies on EFL/ESL language learning and writing development, a number of researchers have examined the effect of collaborative versus individual writing tasks with foreign language learners learning languages other than English. Elola and Oskoz (2010), for example, examined the effect of individual writing and collaborative writing on CAF in *wikis* with adult Spanish as a Foreign Language learners. All participants completed two argumentative essays collaboratively (the first essay) and individually (the second essay) in class and revised the two essays after class. During collaboration, participants were engaged in either

written or oral interactions. CAF was measured for quality of written products and tested by independent t-tests and a non-parametric Mann-Whitney U test. The results did not show any statistically significant difference between the two groups. However, the analysis of writing process informed that learners' performance differed during the study when working collaboratively or individually.

In addition, Strobl (2014) investigated the difference between collaborative writing and individual writing using *Google Docs* among advanced adult German as a Foreign Language learners in the Netherlands in terms of CAF, content, and coherence. Participants were divided into two groups. Adapting a counter-balanced design, at the first time point, group one completed a synthesis individual writing task while group two completed a synthesis collaborative writing task. At the second time point, the two groups switched the writing tasks. For the written product analysis, the errors-per-word ratio was measured for accuracy, the total number of words was measured for fluency, a “balanced complexity” algorithm (Schulze, Wood, & Pokorny, unpublished manuscript) was used for complexity, and a holistic scale measured the overall performance (content and coherence). Independent t-tests and a non-parametric Mann-Whitney U test were conducted to detect the group differences in terms of the quality of written products. The results showed no statistically significant difference on accuracy and complexity between collaborative and individual texts. However, overall performance was statistically higher in collaborative texts than in individual texts.

The above studies showed that, in general, collaborative writing has a positive influence on language learning in ESL/EFL contexts. Specifically, collaborative writing was shown to facilitate writing development and semantic richness (e.g., Chen et al., 2015) and enhance accuracy and complexity in written products (e.g., Storch, 2005; Jafari & Ansari, 2012) as well

as the overall performance (e.g., Bikowski & Vithanage, 2016; Storch, 2005). On the other hand, in other FL contexts, collaborative writing did not show similar benefits (e.g., Elola & Oskoz, 2010; Strobl, 2014). For example, Strobl (2014) found no statistically significant gains in language accuracy and complexity between collaborative and individual writing groups in German as Foreign Language learners. This result may be due to the advanced language proficiency among the learners, which left limited space for improvement. Elola and Oskoz (2010) also found similar results with their Spanish as Foreign Language learners and stated that the small sample size may have caused their insignificant findings.

Studies on Writing Process. In this line of research, how learners interact and approach errors and revisions are identified through analysis of interaction transcripts. Arnold et al. (2012) conducted a study on German as a foreign language writing in *wikis* and investigated the difference between collaboration and cooperation on writing performance. Collaboration was the situation in which learners took responsibility for revising texts written by themselves and peers. Cooperation represented the group of learners who only revised their own writing in the final product. Three intact German language classes participated in the study. The task was designed based on a German novel. Learners were divided into groups of two to four and completed a *wiki* page based on the novel. Class one only received the topic, whereas, classes two and three received additional structured guidance from the instructor. After the treatment, two interaction patterns were shown based on learners' performance: collaboration and cooperation. Through T-unit analysis, the results showed that in the collaboration condition, more changes were made on content and structure than in the cooperation condition. However, the two conditions showed similar results on form related changes (e.g., format, spelling, punctuation, word order and lexical revisions).

Similar to Arnold et al. (2012), Li and Zhu (2013) studied the interaction patterns during small group collaboration using *wikis* among EFL learners. Learners were asked to complete three collaborative writing tasks: narration, exposition and argumentation. Researchers used units of language functions (e.g., agreement and suggestion) and a grounded approach (i.e., categorizing data under themes that emerge from the data) to analyze the interaction and interview data. Three interaction patterns were identified: collectively contributing/mutually supportive (i.e., equal contributions), authoritative/responsive (i.e., unequal contributions with one person taking control over the task), and dominant/withdrawn (i.e., unequal contributions with one person being left out). The findings indicated that collectively contributing/mutually supportive groups revealed the most learning opportunities during interaction, followed by the authoritative/responsive groups. Dominant/withdrawn groups provided the least learning opportunities.

Kessler et al. (2012) examined the features of web-based academic collaborative writing using *Google Docs* among 38 advanced ESL learners in the United States. Learners grouped themselves based on their academic fields. Researchers selected three groups from the study and conducted a case study. Using language-related contributions (LRCs; e.g., revisions on forms) and non-language related contributions (NLRC; e.g., editing on format), Kessler et al. analyzed learners' collaborative written products and interaction scripts. The findings showed that instead of following the sequence of planning, writing and editing, the three stages occurred simultaneously in *Google Docs*. In addition, each learner contributed differently during collaboration. However, the level of contribution did not affect the overall quality of the collaborative written products.

The above studies suggest that types of collaboration (e.g., Arnold et al., 2012) and how learners interact (e.g., Kessler et al., 2012; Li & Zhu, 2013) can influence the outcome of collaborative writing, considering the possible learning opportunities each condition can provide. The findings of these studies echoed the previously stated benefits of co-authored writing, that is through joint-planning and joint-editing, learners can receive more learning opportunities (e.g., Li & Zhu, 2013) and build a stronger sense of collaboration (e.g., taking responsibility for editing their peers' writing; Arnold et al., 2012).

As a supplementary measure, researchers also investigated learners' perceptions and attitudes regarding collaborative writing. In general, learners showed positive attitudes and were willing to engage in more collaborative activities. For instance, Chen et al. (2015) used a Likert-scaled survey to examine learners' attitudes, from which a high level of satisfaction with the collaborative writing experience was reported. Bikowski and Vithanage (2016) indicated that learners in collaborative writing group liked the in-class web-based collaborative writing tasks, believed the tasks helped with their writing, and further recommended these tasks for future classes. The majority of the learners in Storch (2005) study also believed that collaborative writing offered more learning opportunities and helped them improve their overall writing ability. Similarly, Elola and Oskoz (2010) reported that learners felt collaborative writing could enhance the overall quality of their writing. However, some learners indicated that they had more freedom to manipulate the text to suit their personal style and work with their own pace and schedule in individual writing.

As discussed above, although studies generally reported positive findings of collaborative writing, several issues still need further investigation. First, one needs to know what types of technology can better promote collaborative writing (e.g., Armstrong & Retterer, 2008; Li &

Zhu, 2013). The facilitative role of CMC has been recognized by previous research (Alvarez et al., 2011; Liu & Sadler, 2003). However, the ecological validity of computer-mediated language learning in EFL context is still in need of further studies (Stein, Glazer, Glassman, & Li, 2017). Second, as an essential component of collaborative writing, peer feedback is closely associated with learner's attitude, learning motivation and engagement in the collaboration process (Elola & Oskoz, 2017). In a technology driven world, how computer-mediated peer feedback impacts individual writing and language learning have gained gradual attention in ISLA research in the past decades (Chen, 2016). However, the mediating role of peer feedback for interactions in collaborative writing context still needs further studies (Cho, 2017; Gutierrez, 2006). As Cho (2017) states, how learners perceive and implement peer feedback during computer-mediated collaborative writing is one of the primary mediating factors for their interaction. Understanding how computer-mediated peer feedback functions in the writing and revising process may provide an insight into how to effectively design computer-mediated collaborative writing activities in language classrooms. Therefore, to address the above two issues, the following sections further discuss the features and functions of CMC technology and peer feedback, and their relationship with collaborative writing.

Computer-mediated Communication

The development of CMC technology brings both challenges and opportunities for language learners and teachers (Li & Storch, 2017). CMC technology has the features of not only linking information but also connecting people (Warschauer, 2009). Early in the 70s, technology was mainly viewed as a container for information (Lam & Kramsch, 2002). Gradually, CMC technology has become a machine for information processing and problem solving, which represents “the process of human communication” (December, 1997, p.1) and the "...medium,

and engine of social relations” (Romiszowski & Mason, 1996, p. 398). SLA research started to consider the role of CMC technology in the early 80s, when CMC technology functioned as a "transparent environment" for interactions and learning (Lam & Kramersch, 2002, p.144). Since then, CMC has constituted an emergent area of research in SLA (Warschauer & Kern, 2000), and later in ISLA (Loewen, 2004).

Computer-mediated Communication in ISLA

CMC has been viewed as a facilitator and carrier of language learning in second language classrooms. Research has shown that CMC can promote language learning and is well-received by teachers and learners (e.g., Kim, 2014; Liu & Sadler, 2003; Warschauer, 2013). Some benefits CMC provides that surpass face-to-face communication are the potential of providing more opportunities for noticing the linguistic gaps (e.g., Bower & Kawaguchi, 2011; Kim, 2014; Shintani, 2015), enhancing collaboration and facilitating interactions (e.g., Alvarez et al., 2011; Liu & Sadler, 2003), promoting authoring flexibility, content creation and knowledge generation (e.g., Elola & Oskoz, 2010), and enhancing intercultural communication (e.g., Zeiss & Isabelli-García, 2005). Moreover, the quality and quantity of teacher and peer feedback provided in a CMC setting may also increase during interactions (e.g., Drexler et al., 2007; Guichón, Bétrancourt, & Prié, 2012).

However, as a relatively newly developed area, integration of CMC in ISLA has some limitations. In a synthesis study of CMC, Kim (2008) found possible drawbacks of using CMC technology for educational purposes include issues of communication management, lurking, lack of sense of ownership, and teacher-centered and dissemination-based instruction. The first issue identified is that less structured and coordinated tasks might cause communication management issues, and thus proper monitoring of learners’ working processes is essential to ensure the

success of CMC tasks (e.g., Arnold et al., 2012; Zhang et al., 2014). Second, lurking occurs when the users only read information online, but do not participate and engage in online interactions and activities with others. Third, the sense of ownership/authorship may be lacking when publishing writing online. For example, if the authorships of a *wiki* page do not show in public, the learner's effort is not publically recognized, which could discourage the learner from actively engaging in online interactions. The last limitation Kim noted is that most CMC technology is teacher-centered and used for dissemination-based instruction. For instance, learners construct a *wiki* page under the instruction and guidance of a teacher and that leaves the learners with little to no control over the structure and content of the *wiki* page.

Empirical studies also identified some other constraints of using CMC technology in actual instructions. For instance, Ho and Savignon (2007) compared asynchronous CMC and FTF peer reviews among EFL learners and reported there was a relative lack of oral interaction and timely feedback in the asynchronous CMC setting. Kim (2014) compared FTF communication and synchronous CMC interactions and found that learners in the synchronous CMC setting were more likely to avoid attending to communication breakdowns and writing errors during online interactions than in the FTF setting. Moreover, Liu and Sadler (2003) investigated FTF and CMC interactions and found that the lack of non-verbal communication (e.g., facial expressions and gestures) in the CMC setting made the FTF setting more effective for peer interaction and language learning.

Although such limitations can potentially hinder learning, researchers have tried different approaches to minimize such drawbacks. Research indicates that effective use of CMC technology for collaborative writing should be engaging, beneficial for both individual and

collaborative learning, and feasible for the specific context (e.g., Bikowski & Vithanage, 2016; Wang, 2015; Drexler et al., 2007).

CMC Technology in EFL Classrooms

In general, among a variety of CMC technologies that can function for online collaboration and interaction, *Google Docs* (e.g., Bikowski & Vithanage, 2016; Strobl, 2014; Zhou et al., 2012), *wikis* (e.g., Arnold et al., 2012; Li & Zhu, 2013; Wang, 2015), and *blogs* (e.g., Amir et al., 2011; Armstrong & Retterer, 2008; Drexler et al., 2007; Zhang et al., 2014) are by far the most commonly used tools for collaborative writing. Furthermore, in some contexts, a combination of tools (e.g., chatting software and *Microsoft Word*) have been effectively implemented (e.g., Bloch, 2002; Liaw, 1998).

Successful computer-mediated collaborative writing is greatly influenced by the selection of technology, so the availability and stability of the technology used should be considered (Zhang et al. 2014). Not only researchers, but also language teachers should be familiar with the learning context and learners' capability of using the CMC technology (e.g., Chen et al., 2015). Although people are widely using technology for different purposes in their daily life, CMC technology is not yet popular and integrated effectively in EFL writing classrooms (Asu & Perrotti, 2017; Paul & Liu, 2017; Zhang, 2013). A few number of existing studies on CMC technology and EFL writing that are conducted in a classroom setting (Lai, Lei, & Liu, 2016; Strobl, 2014; Woo, Chu, & Li, 2013; Zhang et al., 2014) have provided valuable evidence for the ecological validity of computer-mediated writing tasks in EFL settings. However, language learning in a classroom setting is associated with many factors (Polio, 2017), these studies have not yet touched upon how computer-mediated collaborative writing tasks can be effectively designed considering the classroom settings in a specific EFL context (Stein et al., 2017).

Taking China as an example, although some studies have acknowledged the affordance of CMC technology in EFL classrooms in China (Lai et al., 2016; Song & Usaha, 2009; Zeng, 2017), the use of technology for instructional purposes can be challenging to both EFL teachers and learners. Research shows that Chinese teachers have some challenges in implementing technology into their classrooms (Mei, Brown, & Teo, 2017). According to Mei, Brown and Teo's (2017) study among 295 preservice EFL teachers in China, lack of timely technical support, administrative policy constraints, tightly controlled internet access, and paucity of empirical studies have caused limited use of computer-mediated pedagogy. Despite the limited support and resources, the teachers acknowledged the value of CMC in EFL classrooms. Therefore, it is essential for future empirical studies to pay careful attention to the contextual factors and learners' needs to better inform EFL teachers in China of the effectiveness of CMC technology (Bai, Mo, Zhang, Boswell, & Rozelle, 2016; Mei et al., 2017).

As mentioned above, the value of CMC technology in EFL classrooms in China has not been overlooked (Mei et al., 2017). As supported by several studies, when activities are carefully designed and tailored to the contexts, the benefits of computer-mediated language learning are observed (Bai et al., 2016; Zeng, 2017). Specifically, when technology is used for interaction and collaboration purposes, the learning process is shown to have more potential for improvements in communicative language use and linguistic knowledge (Lai et al., 2016; Song & Usaha, 2008). For instance, Song and Usaha (2009) explored the difference between electronic peer feedback using Moodle and face-to-face peer feedback among Chinese EFL university students. Twenty students in an English writing class signed up for the study and were divided into electronic and face-to-face groups. After receiving training on how to provide peer feedback, the participants were asked to complete an individual argumentative essay as part of an assignment for the class.

Each learner produced three drafts and received feedback from their peers in the classroom or through Moodle during the process. Afterwards, the feedback and revisions were quantified and coded for types and the writing drafts were rated. Based on the researchers' analysis, the face-to-face group outperformed the electronic group in terms of quantity of feedback, but the electronic group generated higher quality feedback and writing samples.

Another study that supports the affordance of CMC technology in EFL interactive tasks was done by Zeng (2017). Zeng focused on how learners perform differently in collaborative dialogues by comparing face-to-face and SCMC communication using QQ, a commonly used chatting software in China. Thirty-two EFL students completed two collaborative tasks (dictogloss and jigsaw) in dyads. The text-based online chat and oral conversations were recorded and analyzed using language-related episodes (LREs). Focus, outcome and types of LREs were identified. The results indicated that the SCMC setting generated a higher frequency of LREs than the face-to-face setting. Moreover, SCMC LREs mainly focused on orthographical errors followed with correct resolutions or self-corrections. In the face-to-face setting, on the other hand, most LREs led to incorrect revisions and needed further assistance from the instructor.

In addition, Lai et al. (2016) found that learners' performance during the computer-mediated collaboration is strongly associated with their attitude towards the use of CMC for learning. Lai et al. examined the performance of Chinese EFL university students in wiki-based collaborative writing and learners' attitude towards the CMC-based learning. Ninety-five university students were recruited and divided into 22 collaborative groups with multiple members. The participants were required to complete three argumentative collaborative writing projects on a researcher-designed wiki page over nine weeks. A set of perception surveys was

distributed before and after the study. Selected participants also attended an interview with one of the researchers after the study was completed. From the quantitative and qualitative analysis of the survey and interview results, as well as the archived performances on wikis, the researchers found that the labor division during collaboration is associated with learners' attitudes toward wiki-mediated collaborative writing. The groups that had more equal peer contribution in the collaboration process reported a more positive attitudes towards the collaborative writing experience; whereas the groups that had unequal peer contribution during collaboration (one person dominate the process) reported a less positive attitude.

Drawing from the studies discussed above, when a computer-mediated language learning task is carefully designed and is user-friendly, learners would have positive attitude towards the learning task, which can have a facilitative role on learning. For instance, Zeng (2017) used a learner-familiar tool that lowered computer anxiety and optimized the learning effect. Choosing a different approach, Lai et al. (2017) designed the wiki interface for the task by incorporating multimedia resources and Chinese translations that made learners become more comfortable with navigating in an unfamiliar online environment. Similarly, Song and Usaha (2009) provided learners with a 6-hour training session on how to provide peer feedback and how to use Moodle for computer-mediated interaction to ease the learners' computer anxiety.

Although studies on computer-mediated collaborative writing among EFL learners have shown positive results, the number of studies conducted in Chinese EFL setting is limited (Mei et al., 2017). As Liu, Lin, and Zhang (2017) pointed out, Chinese EFL teachers' intention of using technology for classroom teaching is tightly associated with their perceptions of ease of use and the usefulness of the CMC technology. Moreover, their perceptions are derived from supporting evidence provided by empirical studies and whether they are familiar with the tools. Therefore,

to advance the use of CMC technology in teaching practice in Chinese EFL educational settings, more studies are needed to investigate effective task design catering to the contextual factors to provide EFL teachers in China with empirical evidence and practical teaching strategies.

Interactional Feedback

Besides the specific type of CMC technology used, feedback is an essential component that mediates the interactions during computer-mediated collaborative writing. Understanding how feedback is given and processed can provide us with insights about the learning potential of CMC interactions during the process of collaborative writing (Cho, 2017; Elola & Oskoz, 2017). Nassaji (2016) defined any type of feedback that is given in a communicative context as interactional feedback. Having the same nature as corrective feedback, interactional feedback facilitates learning by drawing learners' attention to the linguistic gap between learners' actual linguistic ability and the target language (Nassaji, 2016; Nassaji & Swain, 2000; Schmidt, 1990). The conscious awareness of the linguistic gap is commonly referred to as noticing (Schmidt, 1990, 2001). From an interactionist perspective, noticing can potentially lead to language learning; negotiation and information exchange can enhance the opportunities for noticing (Chen, 2016). Compared with traditional corrective feedback, interactional feedback is a part of negotiation and can be exchanged in a mutual direction; that is, the provider of feedback can also be the receiver when the counterparty initiates a negotiation. Thus, communicative strategies, such as clarification requests, repetitions or recasts, transmit interactional feedback between interlocutors. Moreover, interactional feedback comes in a variety of forms: it can be oral or written, implicit or explicit, and offered in either face-to-face or CMC settings (Nassaji, 2016). Nassaji (2015) categorized interactional feedback into two major types: reformulation and elicitation (see Figure 2.2).

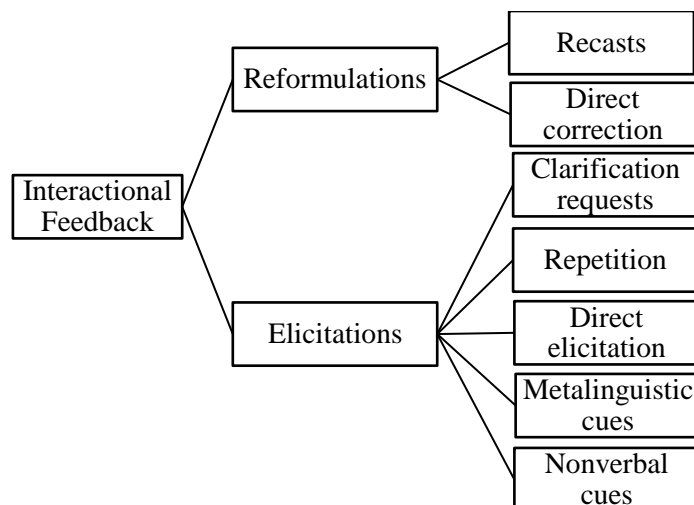


Figure 2.2. Types and Subtypes of Interactional feedback, reprinted from Nassaji (2015)

Reformulations are strategies that rephrase the learners' erroneous utterances into a correct form, such as recasts and direct corrections. This type of interactional feedback is viewed as an input-providing strategy because learners receive language input through the feedback. On the other hand, elicitation prompts the learner to correct his/her erroneous language form by providing cues and hints for self-repairing (Lyster & Ranta, 1997). Although subtypes of reformulation and elicitation share the same features described above, each subtype has its unique characteristics. Table 2.1 provides definitions and examples for each subtype of interactional feedback.

Computer-mediated Interactional Feedback. As previously stated, CMC technology plays an important role in ISLA research. An increasing number of studies have found that the context (i.e., FTF and CMC) in which interactional feedback is provided influences the effects of interactional feedback on language learning (e.g., Guichón et al., 2012; Lee, Cheung, Wong, & Lee, 2013; Liu & Sadler, 2003; Wang, 2015). Evidence from previous studies indicates that computer-mediated interactional feedback has a facilitative function for a higher quality and

Table 2.1

Definition and Examples of Types of Interactional Feedback

Types of Interactional Feedback		Definition	Example
Reformulation	Recasts	A recast consists of the teacher's reformulation of all or part of a student's utterance that contains at least one error within the context of a communicative activity in the classroom (Nassaji, 2015, p.47)	S: I leaved earlier yesterday. T: Okay, so you left earlier yesterday.
	Direct correction	Direct correction refers to "utterances that both rephrase the learner's erroneous utterance into a correct form and also clearly indicate to the learner that his or her utterance is erroneous in some way by using very explicit words or phrases." (Nassaji, 2015, p. 52)	S: I leaved earlier yesterday. T: Don't say leaved, say left.
Elicitations	Clarification requests	Clarification requests refer to "feedback that occurs when the teacher or an interlocutor does not fully understand a learner's utterance and asks for clarification." (Nassaji, 2015, p. 53)	S: I leaved earlier yesterday. T: You what?
	Repetition	Repetition refers to "feedback that repeats all or part of the learner's erroneous utterances with a rising intonation." (Nassaji, 2015, p. 54)	S: I leaved earlier yesterday. T: I leaved?
	Direct elicitation	Direct elicitation is "feedback that attempts more overtly to push the student to provide the correct form." (Nassaji, 2015, p. 54)	S: I leaved earlier yesterday. T: I...?
	Metalinguistic cues	Metalinguistic cues are "feedback types that provide the learner with metalinguistic information." (Nassaji, 2015, p. 54)	S: I leaved earlier yesterday. T: You need a past tense.
	Nonverbal cues	Nonverbal cues refer to any type of nonverbal feedback (Nassaji, 2015).	S: I leaved earlier yesterday. T: (Frowning)

quantity of revisions (e.g., Liu & Sadler, 2003), higher learning motivation (e.g., Wang, 2015), and more evidence of noticing (e.g., Wang, 2015). Therefore, in the following sections, we first review studies on computer-mediated interactional feedback in language learning tasks. Then we synthesize the findings of previous studies to show the variables that could influence the effectiveness of computer-mediated interactional feedback.

Studies on Computer-mediated Interactional Feedback

Studies on computer-mediated interactional feedback mainly investigated the influence of types of computer-mediated interactional feedback on language learning (e.g., AbuSeileek & Abualsha'r, 2014; Guichón et al., 2012), the impact of providers (i.e., teacher and peer) of computer-mediated interactional feedback on language learning (e.g., Rodgers et al., 2014; Wu et al., 2015), the effect of computer-mediated interactional feedback on language learning in SCMC and APMC settings (e.g., Bower & Kawaguchi, 2011, Shintani, 2015), and the influence of dyadic type and language proficiency on the effects of computer-mediated interactional feedback (e.g., Sotillo, 2005; Watanabe, 2008). An overview of the above studies indicates several aspects that need to be addressed.

Measurement of Learning. Studies have employed a variety of measurement approaches, ranging from uptake to different pre- and post- test measures (Nassaji, 2016) to provide evidence of learning during interaction. One of the measures used as evidence of learning is language-related episodes (LREs) (e.g., Cho & MacArthur, 2010; Nguyen, 2012; Qi & Lapkin, 2010; Shintani, 2015; Storch & Wigglesworth, 2010; Wu, Petit, & Chen, 2015). Language-related episode (LRE) is “any part of a dialogue where the students talk about the language they are producing, question their language use, or correct themselves or others” (Swain & Lapkin, 1998, p. 326). Each LRE has three parts: a trigger, feedback, and an optional

uptake (Ellis & Shintani, 2015). Uptake, a verbal cue that can potentially signal noticing and learning, appears as a delayed modified output, a simple acknowledgment of the feedback (e.g., “yes”, “Ok”), or an immediate correction followed by the feedback (Loewen & Philp, 2006; Lyster & Ranta, 1997; Sheen, 2004). Theoretically speaking, when a verbal cue exists, one can assume that there is some level of learning. However, such a verbal report may not occur in all circumstances, such as when a learner is aware of an error but does not show any signs to signal his/her awareness. Thus, the lack of verbal reports does not always indicate failure of noticing. When learning occurs through writing, both types of LREs, immediate and delayed uptakes, have been used and suggested as reliable measures of potential noticing and language learning (e.g., Ellis & Sheen, 2004; Qi & Lapkin, 2001; Shintani, 2015; Wigglesworth, 2005; Wigglesworth & Storch, 2012).

Explicit vs. Implicit Interactional Feedback. Research shows that the effects of computer-mediated interactional feedback vary depending on its level of explicitness. Previous studies have shown that explicit interactional feedback is more beneficial for learners than implicit feedback (e.g., AbuSeileek & Abualsha’r, 2014; Alvarez et al., 2011; Guardado & Shi, 2007). For instance, AbuSeileek and Abualsha’r (2014) examined the effect of types of written computer-mediated interactional feedback on adult EFL learners’ writing performance. Each learner completed an essay writing task (write a short essay to answer a question) and a revision task (revise a writing sample containing 35 errors). Learners were divided into four groups: one group received computer-mediated direct interactional feedback from their peers using the “track changes” function in *Microsoft Word*, the second group only received recast, the third group received metalinguistic feedback, and the control group did not receive any feedback. Direct feedback only consists of an indication of the error and a correction, whereas metalinguistic

feedback also contains metalinguistic information and comment about the error. Researchers used the writing task to measure learners' writing performance and the revision task to measure the quality of computer-mediated peer interactional feedback. The results showed that computer-mediated interactional feedback enhanced L2 learners' overall writing performance, especially on lexical appropriateness and spelling. Direct interactional feedback provided through the "track changes" function was the most effective interactional feedback on learners' writing performance, followed by recast and metalinguistic feedback.

Similar results were found in Nassaji (2009). Aiming to investigate the effects of recast and elicitations on incidental learning in ESL dyadic interactions, forty-two ESL learners were instructed to participate in task-based interactions in Nassaji's study. As shown by research, recast and elicitation may vary in the degree of explicitness (Ellis & Sheen, 2006; Loewen & Philp, 2006). The findings confirmed that more explicit forms of feedback resulted in higher rate of immediate and delayed correction compared to implicit forms. Moreover, he claimed that both recast and elicitations could be beneficial for ESL learners. However, more explicit forms of recast seemed to have more prominent benefits for second language learning compared to that of elicitations.

Feedback Provider. Besides explicitness of feedback, the initiator of interactional feedback can also play an important role in the effectiveness of interactional feedback. Interactional feedback usually occurs in teacher-peer interaction or peer-peer interaction (e.g., Bradley, 2014; Nguyen, 2012; Wu, 2006; Wu et al., 2015). Traditionally, feedback is provided mostly by teachers (Wu, 2006). As learner-centered learning is getting more attention, an increasing number of studies in recent decades direct their attention to peer feedback. Studies show that when a peer was the provider of interactional feedback, learners benefited more from

the feedback compared to teacher feedback (e.g., Nguyen, 2012; Novakovich, 2016; Wu, 2006; Wu et al., 2015). For instance, Wu et al. (2015) conducted a study among adult EFL learners to compare teacher interactional feedback and peer interactional feedback. Their findings showed that peer interactional feedback directed learners' attention to local areas (e.g., grammar, vocabulary and spelling) and resulted in better learning outcomes. Similarly, Wu (2006) examined the differences between teacher interactional feedback and peer interactional feedback among low-intermediate EFL learners and found that although peer computer-mediated interactional feedback did not result in an improvement in language accuracy, it helped learners with learning of pragmatic functions (e.g., giving compliments and critiques). In this study, the researcher attributes the limited impact of interactional feedback on language accuracy to the low proficiency of the learners. In addition, peer interactional feedback can facilitate learning through interactions and negotiations of meaning (e.g., Drexler et al., 2007; Yang, Badger, & Zhen, 2006); provide more opportunities for noticing linguistic gaps (e.g., Bradley, 2014; Nguyen, 2012); enhance learning motivation (e.g., Bower & Kawaguchi, 2011; Novakovich, 2016; Vurdien, 2013); and promote self-reflection (e.g., Zhang et al., 2014). On the other hand, the effect of peer interactional feedback also varies in different settings.

However, some studies show that learners may have the tendency to prefer and accept teacher interactional feedback, believing that teacher interactional feedback is more trustworthy and authentic than peer interactional feedback (e.g., Guasch et al., 2013; Wu, 2006). For example, Guasch et al. (2013) state that learners were more willing to accept teacher interactional feedback when the feedback focused on complex language structures. Wu (2006) also states that teachers were able to capture errors in relatively advanced language structures because the proficiency gap between the teacher and learners is bigger than the gap between

learners. Therefore, if peers have the language proficiency and expertise in the target language, it is plausible that peer feedback could be equally or more beneficial for second language learning (Reichert & Liebscher, 2012).

Dyadic Type and Language Proficiency. For peer interactional feedback to function effectively, one must consider learners' linguistic background and language proficiency. Therefore, dyadic type and learner's language proficiency are two essential aspects in peer-peer interactions. Dyadic type refers to the composition of the dyad, in which interactions could occur between a native speaker and a non-native speaker, or between two non-native speakers (Sotillo, 2015). Studies on interactional tasks have taken these two factors into consideration (e.g., Kung & Eslami, 2015; Sotillo, 2005; Watanabe, 2008). However, only a limited number of studies have investigated the influence of dyadic type and language proficiency in a writing context (e.g., Nguyen, 2012; Wu et al., 2015). Below, we present each of these studies to provide an overall picture of how dyadic type and language proficiency affect peer-peer interactions.

Kung and Eslami (2015) examined the difference between NNES-NES dyads and NNES-NNES dyads for the effectiveness of incidental focus on form on language learning in a SCMC setting. Three dyadic types were formed: lower-proficiency NNES-NES dyads, higher-proficiency NNES-NES dyads and lower- and higher-proficiency NNESs dyads. Researchers used LREs to examine the differences in peer interactions and individualized tailor-made tests to measure learning outcomes. The results showed that NNES-NES dyads with both lower- and higher-proficiency learners produced significantly more LREs than the NNES-NNES dyads. However, dyadic type and language proficiency did not influence learners' test performance differently.

In another study that also used interactional tasks, Sotillo (2005) examined the influence of dyadic type on computer-mediated negative feedback in a SCMC setting among NESs and advanced and high-intermediated proficiency NNEs. The learners formed six dyads: three NNEs-NES dyads and three NNEs-NNEs dyads. All dyads completed four communicative tasks and one problem-solving task using *Yahoo! Instant Messenger*. Analysis of participants' interaction showed that the NNEs-NNEs dyads generated more focus-on-form episodes (i.e., the same as LREs) than NES-NNEs dyads and the advanced NNEs in NNEs-NNEs dyads provided more feedback than NESs in NNEs-NES dyads.

Adapting a case study approach, Watanabe (2008) explored the influence of language proficiency on peer interactions. Three adult EFL learners completed two three-stage tasks including pair writing, pair noticing (e.g., learners compare the original writing with the revised version and notice the errors) and individual writing with both higher- and lower-proficiency peers respectively. The three EFL learners were also interviewed before and after the task by the researcher in Japanese, the learners' first language. The communication scripts were analyzed to identify the interactional differences. The results showed that the more proficient learners played the dominant role in peer interactions, which provided fewer learning occasions for the lower-proficiency partner. In addition, learners' attitudes were positively correlated by amount of engagement in peer interactions. For instance, learners showed a positive attitude toward engagement in collaborative patterns (e.g., equal contributions) and a negative attitude toward engagement in dominant or passive patterns.

As for writing specifically, Nguyen (2012) examined the effects of blog-mediated peer interactional feedback on language learning among adult EFL learners with different levels of language proficiency. The findings revealed that blog-mediated writing with peer interactional

feedback benefited learners in terms of development of writing skills for the acquisition of both local (e.g., grammar, spelling) and global (e.g., content, structure) aspects. Moreover, learners with lower language proficiency showed less engagement and confidence in providing peer interactional feedback to their peers. Wu et al. (2015) conducted a study on computer-mediated individual writing tasks among adult EFL learners. Analysis of the written products and peer interactional feedback showed that higher-proficiency learners provided more accurate peer interactional feedback and lower-proficiency learners had less confidence in providing peer interactional feedback but had more improvement on writing performance than higher-proficiency learners.

Further, to our knowledge, no study has directly explored the relations among dyadic type, language proficiency and peer interactional feedback in a computer-mediated collaborative writing context. A recently published study by Hsieh (2017) investigated how proficiency gap between learners influence the collaborative patterns among ESL learners while completing computer-mediated a collaborative writing task. Though Hsieh states that with the assistance from external resources, such as online information and dictionary, lower proficient learners contributed equally during the writing process as the higher proficient learners, she did not further examine how the learners' proficiency affects their language learning. Therefore, drawing from the evidence given by previous studies, we can only assume that since the effect of these two factors do exist in other conditions, they presumably should have some impact on learners performance during a collaborative writing process.

Conclusion

This literature review provided a detailed overview of the issues discussed in the previous research on collaborative writing and ISLA. Supported by ISLA and guided by several

theoretical frameworks, researchers have noticed the educational affordances of collaborative writing on language learning (Swain, 2000; Van Lier, 2002). The benefit computer-mediated collaborative writing could offer covers a large scope, from quality of writing to learning of specific target forms, from provision of peer interactional feedback to motivation for writing and learning, to name a few (e.g., Bikowski & Vithanage, 2016; Jafari & Ansari, 2012). Highly recognized and acknowledged, computer-mediated collaborative writing has been widely implemented in today's language classrooms as a relatively mature instructional activity. Yet such a prevalent approach is still in its inception phase in China, a country with the largest number of English language learners (Spires, 2017). Therefore, to further facilitate and examine the applicability of this approach in a Chinese EFL context, the following questions still need to be addressed for that specific context.

First, one needs to be aware of which CMC technology teachers can integrate in collaborative writing tasks. To help answer the question, technology not only needs to be accessible but also needs to fit the learners' ability and needs, especially computer literacy. Thus, researchers and teachers need to be mindful of how learners interact with each other and how the interactions affect the learning outcomes, especially in collaborative contexts.

Second, one needs to know in what collaborative patterns learners can benefit the most from collaborative writing tasks. Considering language proficiency and dyadic type can influence peer interaction and the effects of peer interactional feedback (e.g., Kung & Eslami, 2015; Sotillo, 2005; Watanabe, 2008), their potential impact in collaborative writing should be taken into consideration. The proficiency gap between learners and the partnership of learners can largely influence their engagement and confidence during interaction and their attitude towards collaboration (Wu et al., 2015). Therefore, further investigation is needed to address the

relations of dyadic type, language proficiency and language learning in collaborative contexts.

Building on the knowledge gained in this review, this dissertation study aims to obtain a comprehensive understanding of how Chinese EFL learners can benefit from collaborative writing tasks and provide valuable implications for teachers to effectively implement such writing tasks with their classes. Adapting a pre- and post-task design, the study has a three-fold focus divided between chapters three and four. Chapter Three focuses on how computer-mediated collaborative writing influences learners' individual writing products under different conditions. Chapter Four focuses on how learners perform differently during the collaboration process when paired with native speakers and language learners with different proficiency, and on the learners' perceptions and attitudes towards computer-mediated collaborative writing.

CHAPTER III

EFFECTS OF COMPUTER-MEDIATED COLLABORATIVE WRITING ON INDIVIDUAL EFL WRITING PERFORMANCE

Introduction

The widespread use of technology in language classrooms has directed researchers' attention to seeking effective classroom instruction. Instructed second language acquisition (ISLA) research aims at this direction through the investigation of meaningful relations between instruction and second language acquisition (SLA) (Loewen, 2014). Although current ISLA studies have provided valuable understandings of technology-based instruction, the ecological validity of this strand of studies has not been sufficiently addressed (Grigornko, Sternberg & Ehrman, 2000; Spada, 2005; Polio, 2017). Criticism on the ecological validity issue of ISLA mainly targets at experimental ISLA studies in a laboratory setting, in which individual classroom feature or activity is being isolated from a classroom setting (Spada, 2005). The decontextualized features and activities, even shown to be beneficial for second language learning, may not be as effective in a classroom setting since the influence from contextual factors cannot be captured in a laboratory setting (Bensen, 2017; Hulstijn, 1997; Larsen-Freeman, 2018). Moreover, the design of teaching practice is largely informed by research-based pedagogy as teachers rely on evidence from empirical studies for classroom instructions (Liu, Lin, & Zhang, 2017; Mei, Brown, & Teo, 2017; Spada, 2005). Thus, identifying ecologically valid instructional approach for second language classrooms should be the primary focus for future ISLA research (Larsen-Freeman, 2018).

As an ecologically valid approach, task-based language teaching (TBLT) has been well-researched and evolved in the past decades (Long, 1985; Ellis, 2003). Learning through tasks means that learners engage in meaningful interactions for problem solving and language learning within naturalistic contexts. As the field of computer-mediated language learning growing, the integration of computer-mediated communication (CMC) technology continues to increase in TBLT (González-Lloret & Ortega, 2014; Ziegler, 2016). The use of technology in task design brings opportunities for collaborative learning, as CMC has the features of facilitating collaboration and interaction (Alvarez et al., 2011). Moreover, technology-mediated TBLT has significant advantages for learners to use and acquire English in a situated context (Skehan, 1998; Ellis, 2003). Among various computer-mediated collaborative learning tasks, research has shown collaborative writing tasks to be practical and effective in classroom settings (e.g., Elola & Oskoz, 2010, 2017; Li & Zhu, 2017; Oskoz & Elola, 2014; Strobl, 2014).

Informed by Vygostky's (1978) Sociocultural Theory, interactions occurred during collaborative writing can facilitate language learning (e.g., Lantolf & Thorne, 2007; Kim, 2014; Wang, 2015). Compared with individual writing, collaborative writing requires learners to engage in negotiation of meaning and form, problem solving, and shared decision-making. Moreover, collaborative writing can also enhance language learning and development of writing skills in terms of language complexity, accuracy, and fluency (CAF) (e.g., Dobao, 2012; Liou & Lee, 2011; Strobl, 2014), as well as overall performance (e.g., Storch, 2005; Jafari & Ansari, 2012). What's more, previous empirical studies reveal the teachers and students have positive attitudes towards computer-mediated collaborative writing practices and acknowledge the benefits of collaborative writing on language learning (e.g., Bikowski & Vithanage, 2016; Chen, Shih, & Liu, 2015).

Accelerated by the development of technology, computer-mediated collaborative writing has received more attention in the field of ISLA. A growing body of work has examined the influence of computer-mediated collaborative writing on learning outcomes (e.g., Storch, 2005), collaborative patterns and interactional features (e.g., Li & Zhu, 2013), teachers' and students' attitudes (e.g., Wang, 2015), the effects of task types and learner's background on collaboration (e.g., Wu, Petit, & Chen, 2015), as well as the influence of CMC technology on writing performance (e.g., Arnold, Ducate, & Kost, 2012). While the advantages of computer-mediated collaborative writing are supported by SLA theories and a great number of empirical studies, only a limited number of studies have investigated the effectiveness of CMC technology on writing performance of Chinese EFL learners (Lai, Lei & Liu, 2016; Sun & Qiu, 2014). Additionally, the effects of collaboration on individual learner's language gain and writing performance are less examined in this strand of studies (e.g., Bikowski & Vithanage, 2016; Jafari & Ansari, 2012; Shehadeh, 2011). Moreover, research on peer interactions has underscored the influence of dyadic type and language proficiency on language learning (Chen & Eslami, 2013; Eslami & Kung, 2016; Watanabe, 2008). However, such impact is not sufficiently addressed in collaborative writing settings (e.g., Soleimani, Modirghamene, & Sadghi, 2017; Wu et al., 2015).

Therefore, to address the issues mentioned above, this study aims to examine whether the language learning and writing development gained from collaborative writing could be transferred to individual writing. Additionally, using a pre- and post-test design, the study investigates the influence of dyadic type (NES-NNES vs NNES-NNES) and learner's language proficiency on the effectiveness of collaborative writing regarding individual writing in terms of CAF and overall writing performance. The findings can provide Chinese EFL teachers with insights on the feasibility and benefits of linguistically- and culturally-responsive computer-

mediated collaborative writing for their EFL writing classroom. Below, we will first discuss the underlying theoretical support for collaborative writing. Then we will provide a rationale for this study by reviewing previous empirical studies on computer-mediated collaborative writing and the importance of peer interactional feedback for collaborative learning.

Sociocultural Theory

Interaction is viewed as the primary path for learning according to Vygotsky's (1978) Sociocultural Theory. Only through interaction can individuals engage in higher order cognitive activities to facilitate language mediation (Lantolf & Thorne, 2006). Aligned with sociocultural theory, successful collaborative writing requires learners to engage in higher order cognitive activities through interactions, which include planning, co-constructing knowledge, problem-solving, and meaning-making activities (Rassaei, 2014; Swain, 2000). Scaffolding and the zone of proximal development (ZPD), two important sociocultural constructs, need to be considered when discussing sociocultural learning activities. Scaffolding, which is regarded as other-regulated learning, involves expert-novice assisted activities (Wood, Bruner, & Ross, 1976). Collaboration allows mutual scaffolding among learners, in which learners can both provide feedback as an expert and receive assistance from others as a novice (e.g., Storch, 2005). ZPD, which is regarded as self-regulated learning, represents “the distance between the actual developmental level, as determined by independent problem solving, and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). From a sociocultural perspective, other-regulated learning will eventually transfer to self-regulated learning; meanwhile, collaboration and meaningful interaction play a facilitative role in this process (Lantolf & Thorne, 2006).

Computer-Mediated Collaborative Writing

Collaborative writing refers to activities in which multiple writers share the responsibility of producing a single text through sharing, negotiating and decision-making (Storch, 2013). The final product of collaborative writing is for the outcome of collective learning. Collaborative writing can be categorized into three types based on features of the process: serial writing, complied writing, and co-authored writing (Haring-Smith, 1994). Among the three types, co-authored writing requires a joint effort from all collaborators in every stage of writing (i.e., planning, writing, and editing). The intensive and consistent interaction throughout the collaboration process can provide more learning opportunities for language learners (e.g., Li & Zhu, 2013), increase learners' sense of collaboration (e.g., Arnold, Ducate, & Kost, 2012), and yield better learning effects (e.g., Bikowski & Vitanage, 2016).

In addition, the development of computer technology and the internet has taken ISLA research into an emergent area where CMC technology becomes an essential part of teaching and learning (Li & Zhu, 2013). A variety of CMC technologies, such as wikis (e.g., Elola & Oskoz, 2010), blogs (e.g., Arslan & Şahin-Kızıl, 2010), and *Google Docs* (e.g., Bikowski & Vithanage, 2016), as well as *Microsoft Word* and emails (e.g., Bloch, 2002; Liaw, 1998), has been widely implemented in collaborative learning activities. Careful selection of technology is prerequisite for successful collaborative writing. Since limited availability and stability of technology, learner's lack of ease and familiarity with the technology may hinder the effectiveness of computer-mediated language learning (e.g., Zhang, Song, Shen, & Huang, 2014), teachers need to become aware of the learning context and learners' capability of using CMC technology to select the most effective and proper tool, especially in EFL settings (e.g., Chen et al., 2015).

The benefits of computer-mediated collaborative writing in EFL settings have been acknowledged by a number of studies (e.g., Aydın & Yıldız, 2014; Chao & Lo, 2011; Liou & Lee, 2011). CMC technology is shown to positively affect collaborative writing on task design and collaboration process (e.g., Glogoff, 2005; Li & Zhu, 2013), learners' writing and learning motivation (e.g., Armstrong & Retterer, 2008), and writing quality (e.g., Wang, 2015). For instance, Li and Zhu (2013) found that using wikis for collaborative writing gave learners more flexibility in working collaboratively. Moreover, Armstrong and Retterer (2008) examined the effect of collaborative blogging on adult learners' writing motivation and found that using CMC technology increased both learning motivation and writing confidence in learners. In addition, using CMC technology can yield better learning outcomes in terms of writing content, structure and grammatical accuracy (e.g., Wang 2015). Though these studies have supported the benefits of using CMC technology for EFL writing, it is only in recent years that this educational technology has begun to receive attention in Chinese EFL classrooms (Paul & Liu, 2017).

Interactional Feedback in Collaborative Writing

As a critical component of collaborative writing, interactional feedback is often used by learners to exchange information during the writing process. Interactional feedback refers to the “feedback generated implicitly or explicitly through negotiation and modification processes that occur during interaction to deal with communication or linguistic problems” (Nassaji, 2016, p. 2). Different from traditional written corrective feedback, provision of interactional feedback in collaborative settings occurs during interaction and communication. Compared with interactional feedback in face-to-face (FTF) contexts, learners who receive computer-mediated interactional feedback can make greater quantity and quality revisions in later drafts (e.g., Liu & Sadler, 2003), have a higher motivation to write, and gain more learning opportunities (e.g., Wang,

2015). In terms of feedback provider, peer interactional feedback and teacher interactional feedback are shown to function equally well with language learning (e.g., Wu, 2006; Wu et al., 2015). However, learners tend to believe that teachers' interactional feedback is more accurate and acceptable than peer interactional feedback because teachers are more linguistically competent than learners' peers (e.g., Wu, 2006). On the other hand, peer interactional feedback has more merit in some aspects that may be lacking in teacher's interactional feedback. For instance, peer interactional feedback can facilitate peer interaction and collaboration (e.g., Drexler, Dawson, & Ferdig, 2007), which raises the opportunities for noticing linguistic gaps (e.g., Bradley, 2014). Peer interactional feedback can also enhance learning motivation (e.g., Novakovich, 2016) and promote self-reflection (e.g., Zhang et al., 2014). Informed by aforementioned studies, this study the EFL learners were engaged only in peer interactional feedback during collaboration.

Gaps in Research

Although previous studies have supported the effectiveness of computer-mediated collaborative writing and the facilitative role of interactional feedback, it is not clear whether the positive findings resulted from the use of CMC technology, measurement tools used to assess language learning, or other variables such as dyadic type and individual differences.

CMC Technology. The majority of studies on collaborative writing have involved web-based technologies, such as *Google Docs* (e.g., Kessler, Bikowski & Boggs, 2013; Krajka, 2012; Strobl, 2014), wikis (e.g., Lai et al., 2016; Woo, Chu & Li, 2013; Wang, 2015) and others (e.g., Brown, 2016; Ware & O'Dowd, 2008). These technologies enable writing and editing by multiple learners to occur concurrently in one document in an online setting. Based on evidence from empirical studies, the value of computer-mediated collaborative writing tasks has also been

acknowledged by administrators and practitioners in EFL contexts. For instance, the Chinese national college English curriculum reformation emphasizes the importance of technology-mediated tasks and proposes that English teachers in China should adapt this approach in their teaching practice (Paul & Liu, 2017).

Although supported by administrators, the actual implementations of this approach present challenges for Chinese EFL teacher as well as learners. One of the challenges is teachers' lack of familiarity in incorporating computer-mediated learning tasks into their classroom instructions (Liu et al., 2017; Mei, Brown, & Teo, 2017). Contextual factors, such as less technical support (Mei et al., 2017), large class sizes ranging from 40 to 50 students per language class (Paul & Liu, 2017; Rao & Chunhua, 2014), higher work load to maintain and monitor the learning process (Bai, Mo, Zhang, Boswell, & Rozelle, 2016), strictly controlled internet access (Mei et al., 2017), and lack of evidence from empirical studies (Liu et al., 2017; Mei et al., 2017) are all factors that may impede the integration of technology in English language teaching in China. Furthermore, since students lack sufficient exposure to educational technology (Paul & Liu, 2017; Zhang, 2013), learning experiences based on the use of CMC context may cause computer anxiety hindering EFL learning. These challenges are not necessarily only limited to Chinese EFL classrooms. As technology is developing in a shooting speed, many people in different contexts and different countries are globally facing practical challenges in using technology for language classroom instructions (Asu & Perrotti, 2017). Therefore, to advance the development of computer-mediated TBLT in classrooms, teachers need to be informed of how to effectively design and incorporate technology-mediated collaborative language learning tasks considering the contextual factors and learners' needs (Asu & Perrotti, 2017; Paul & Liu, 2017).

Measurement. Traditionally, language complexity, accuracy and fluency (CAF) have been used for assessment of writing development in SLA (e.g., Bikowski & Vithanage, 2016; Plakans, Gebiril, & Bilki, 2016; Storch, 2005; Strobl, 2014). Collaborative writing texts are a joint-effort product. Meanwhile, measuring CAF of the collaborative texts overlooks the influence of the collaboration effort on individual language learning and writing development (e.g., Bikowski & Vithanage, 2016). For instance, Elola and Oskoz (2010) and Storch (2005) both compared the writing products of a collaborative writing group and an individual writing group through CAF. The result of these studies implies how a text written by one author and a text written by multiple authors differ in terms of quality. As Bikowski and Vithanage (2016) states this comparison cannot effectively examine how the collaborative writing experience affects individual learning. In the "person-centered" era of ISLA research (Bensen, 2017), the effectiveness of instructional approaches is justified based on how activities or tasks affect individual learners' language development. Therefore, to obtain a better understanding of how individual learners could benefit from collaborative writing, studies have suggested examining whether the gained linguistic knowledge and writing ability from collaboration can be internalized and transferred into individual writing (e.g., Liou & Lee, 2011; Shehadeh, 2011).

However, only a limited number of studies have investigated the connection between collaborative writing and individual learning (Bikowski & Vithanage, 2016; Jafari & Ansari, 2012; Shehadeh, 2011). Using a pre- and post-test design, Bikowski and Vithanage (2016) and Jafari and Ansari (2012) examined the effect of collaborative writing on individual writing performance. By evaluating learners' individual overall writing performance in the pre- and post-tests, both studies found that the collaborative groups outperformed the individual groups. However, these two studies did not measure other dimensions of writing, such as CAF. In light

of the abovementioned studies, the current study employs a pre- and post-test design and measures the individual writing products in terms of both CAF and the overall performance to find a more comprehensive understanding of the connections between collaborative writing and individual writing development.

Dyadic Type. Dyadic type in this study refers to NES-NNES groups vs NNES-NNES groups collaborating with each other. Studies have shown that dyadic type can influence language learning and writing development (e.g., Bower & Kawaguchi, 2011; Kung & Eslami, 2015; Sotillo, 2005; Watanabe, 2008; Wu et al., 2015). Furthermore, learner's linguistic competence has shown to affect their performance during interactions. For instance, Kung and Eslami (2015) found that non-native English speakers (NNES) performed differently during interactions in terms of producing language-related episodes when paired with either another NNES or with a native English speaker (NES). However, the outcome measures (tailor-made tests) did not show significant difference among the different dyadic groups. Sotillo (2005) also noticed that NNES-NES and NNES-NNES dyads performed differently during interactions in terms of the quantity of focus-on-form episodes. However, there does not seem to be any study that has directly investigated the impact of the dyadic type in a collaborative writing context.

Language Proficiency. From a sociocultural perspective, the language gap between the interlocutors can influence the learning process through scaffolding (e.g., Storch, 1998; William, 2001; Yang & Meng, 2013). Also suggested by previous studies, language proficiency can affect the individual language development during collaboration and interaction (e.g., Watanabe & Swain, 2007) and learners' participation in peer interaction (e.g., Watanabe, 2008). Moreover, it seems that compared with lower-proficiency learners, higher-proficiency learners have more confidence in leading the collaboration process and interaction. However, some studies showed

that lower-proficiency learners were as active as higher-proficiency learners in NNES-NES interactions (e.g., Kung & Eslami, 2015). Although language proficiency is a critical factor with potential influence on peer interaction, it is only in recent years that studies have started to direct attention to the relationship between language proficiency and learning outcomes in collaborative writing (e.g., Soleimani et al., 2017).

As mentioned by Colpaert (2006), successful implementation of technology requires careful analysis to ensure alignment with the learners' needs and their linguistic and digital competencies. In addition, to enhance the ecological validity of computer-mediated language learning tasks and encourage teacher to incorporate this type of tasks in classrooms, task designs need to pay close attention to the contextual factors (Benson, 2017). Moreover, because of importance of evidence provided by empirical evidence for classroom instructions, it is essential to have future ISLA research on computer-mediated collaborative writing in classroom settings to reveal how collaboration may affect individual learning.

Research Questions

The current study aims to investigate the effectiveness of collaborative writing on individual writing performance considering dyadic type and language proficiency. Through quantitative analyses of the individual pre- and post-tests regarding CAF and overall performance, this study addresses the following research questions:

1. Do computer-mediated collaborative writing tasks enhance language complexity, accuracy, fluency and overall performance of individual writing texts?
2. If so, to what extent do dyadic type and language proficiency influence the effects of collaborative writing on individual writing texts regarding language complexity, accuracy, fluency and overall performance?

Method

Participants

Participants for this study were 45 NESs from the United States and 135 NNESs from China. The NESs were pre-service teachers enrolled in an ESL methods course at a major research university in the southern United States. Participation in this study met the field experience requirement for the course for the pre-service teachers. Using convenience sampling, 135 first-year college students from the College of Foreign Languages and the College of Material Engineering at a research university in northeastern China were recruited as NNES participants. The NNESs completed the study as an extracurricular activity for the freshman English writing class. After eliminating the participants who did not complete the study, 109 NNESs and 40 NESs remained in the pool.

The language proficiency of the NNESs was measured using their scores from the National College Entrance Exam English section, which examines senior high school students' English language ability in listening, reading, and writing. The NNESs were selected and divided into two proficiency groups based on this score ($M = 121$, $SD = 2.96$). Based on a self-reported background survey, 30% of the NNESs reported that they had studied English for five to ten years and 68% had studied English for more than ten years. Therefore, the groups were labeled as intermediate and advanced proficiency. The advanced proficiency group (A-NNES) included students in the top 25% (≥ 127 out of 150, $M = 130.45$, $SD = 3.53$) and the intermediate proficiency group (I-NNES) included those in the bottom 25% (≤ 116 out of 150, $M = 108.61$, $SD = 9.26$; see Figure 3.1) of scores. To test the group difference between the two proficiency, a pairwise t-test was performance. The results indicated statistically significant difference between the two groups' proficiency level, $t(66) = 17.72$, $p < .001$. The English language learning

experiences included formal school education (100%), along with private tutoring (9%) and language training institutes (28%).

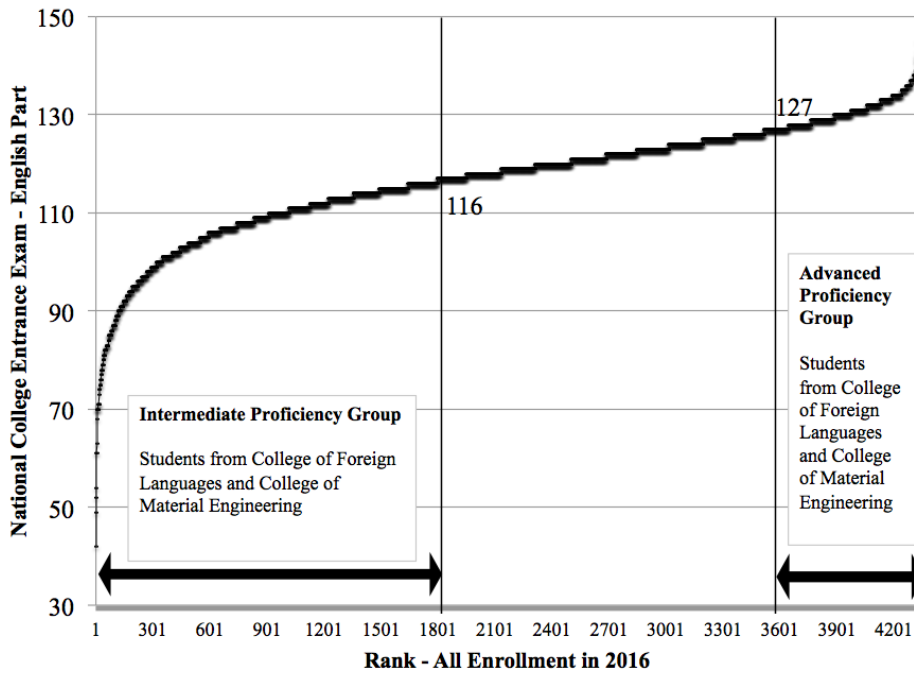


Figure 3.1. National College Entrance Exam, English Section Score Distribution and Participant Proficiency Levels

To ensure participants received accurate and clear instructions, a professor in the English program and two advisors from the participating departments of the Chinese university coordinated and supervised the NNES participants during this study. The researcher of this study and the English writing class teacher in China rated the writing pre- and post-tests inter-rater reliability was examined. The coordinators and the rater received training on the study protocol from the researcher and exchanged information on the progress of the study throughout the study period.

Research Design

The current study examined how different dyadic types and levels of language proficiency play a role on the effect of collaborative writing on EFL learners' individual writing performance within a six-week period. Using a multi-group pre- and post-test design, the participants were divided into three collaborative writing groups and one individual writing group. Table 3.1 shows the number of dyads and participants in each group. Participants in the collaborative writing groups completed two collaborative writing tasks with either a partner of a different language proficiency or a native language speaker partner using *Microsoft Word* and QQ, a highly reliable multi-functional chatting software that has been used in previous CMC language learning studies (Yang, Zhu, Jin, & Li, 2018; Zeng, 2017). With providing text-, voice- and video-chats, English and Chinese translation, online and offline file transfer, QQ offers synchronous and asynchronous communication options for online collaboration. Based on the background survey, the NNES participants had all used QQ for more than five years and were familiar with its embedded functions. Sufficient training and practice of using QQ were provided to NES participants in two class sessions during Week 1. The individual writing group completed the same tasks individually in *Microsoft Word*. In addition to the two writing tasks, the NNESs in both groups took writing pre- and post-tests individually on paper.

Materials

Two writing tasks were used as treatments during the study. The tasks were designed based on a pilot study among a similar group in the same population in this study. The pilot study was conducted one semester before the current study among a similar NNES and NES

Table 3.1

Participant's Groupings (n = 151)

Groups	Dyadic Type	Number of Dyads	Number of Participants
Collaborative Writing Groups	A-NNES & NES	22	44
	I-NNES & NES	18	36
	A-NNES & I-NNES	18	36
Individual Writing Group*	None	None	35

Notes: *n*, total number of participants; *, Individuals in the Individual Writing Group were either A-NNES or I-NNES.

group from the same population. None of the participants from the pilot study participated in this study. Different from this study, the pilot study lasted for four weeks and participants only completed one collaborative writing task using the same CMC tools. After the pilot study was concluded, the NNES participants were asked to fill out a survey on their topics of interest in English academic writing. A list of topics was provided in the survey, with an open-ended question for participants to add any topics of their interest that were not listed. The survey results showed that the most preferred academic writing topic was *education system in different cultures*. This was further confirmed by the English teachers in China for cultural appropriateness and ecological validity.

The purpose of this study was to enhance individual NNES's English writing ability (i.e., content, coherence, cohesion and text structure) and linguistic competence, and also provide opportunities for NESs to practice ESL teaching strategies to fulfill the course requirement. The participants were made familiar with subtopics related to the topic, and provided with available references and criteria for successful academic writing (see Appendix A for an example). A

description of the study procedure and the collaboration process were distributed to both NNES and NES participants. All materials were written in both English and Chinese for clarity.

Individual pre- and post-tests were used to examine the individual language and writing gains before and after the computer-mediated collaborative writing tasks. For both pre- and post-tests, the NNES participants were asked to handwrite an argumentative essay within 30 minutes on paper in a large classroom proctored by the coordinators. The essay questions for the pre- and post-tests essays were selected from the Independent Writing questions bank in the Official TOEFL iBT® Tests Volume 2 (1st Edition) and Official Guide to the TOEFL (4th Edition). The essay questions were closely related to the task topic to make sure the content knowledge required for the tests and writing task is equivalent. The following example is the question selected for the pre-test.

Example 1:

Is the ability to read and write more important today than in the past? Why or why not?

Use specific reasons and examples to support your answer.

Procedure

The study lasted for eight weeks. In Week 1, all participants attended an orientation and training on using QQ and *Microsoft Word* for collaboration, which was conducted by the researcher and the coordinators. During the orientation session, both NNES and NES participants completed a background survey to report their language learning experiences, language teaching experiences, and self-perceived computer literacy. The survey was designed in the participants' native language to ensure clarity. At the end of the training session, the NNES participants were given the pre-test. A post-test was given to the participants one week after the study completion.

A brief description of the activities completed by the collaborative groups and individual group during the study is shown in Table 3.2 below.

Table 3.2

Study Timeline and Activities

Time	Activities
Week 1	<i>All Participants:</i> Orientation; Training on technology; Background Survey <i>NNES Participants Only:</i> Individual Pre-test
Week 2	<i>Task 1 Collaborative groups:</i> Joint-planning and first draft joint-writing <i>Individual group:</i> Planning and first draft writing
Week 3	<i>Collaborative groups:</i> 1. Practice activity on providing peer feedback 2. Exchange peer feedback <i>Individual group:</i> Receive peer feedback
Week 4	Edit and finalize task 1
Week 5	<i>Task 2 Collaborative groups:</i> Joint-planning and first draft joint-writing <i>Individual group:</i> Planning and first draft writing
Week 6	<i>Collaborative groups:</i> Exchange peer feedback <i>Individual group:</i> Receive peer feedback
Week 7	Edit and finalize task 2
Week 8	<i>NNES Participants Only:</i> Individual Post-test

Collaborative Writing Groups. The collaborative groups were involved in co-authored collaborative writing. While performing the tasks, each dyad engaged in joint-planning and joint-writing during Week 2 and joint-editing in Week 3 and Week 4 for the first task. Any interactions needed for completing the tasks occurred through online text-chat using QQ. Due to the time difference (13 hours) between NES and NNES participants, only text-chat was used.

Moreover, NNEs' oral language proficiency was not measured in the NECC English part. Therefore, text-chat was selected to control for the potential influence of oral language proficiency. The joint-writing and joint-editing processes were completed through sending updated Microsoft Word files back and forth. The participants received weekly instructions on how to complete the following week's activities two days before the next week started. The instructions were written in both English and Chinese to ensure participants knew the guidelines to follow.

During Week 2, each dyad was connected using the provided QQ account and email address of their partner. After becoming familiar with each other through informal conversation for two days, the dyads received the task instructions from the researcher and the coordinators. Each dyad was asked to choose one sub-topic from the prompt or a related topic of his or her interests with direction to complete Task 1 collaboratively in from Week 2 to Week 5. During Week 2, the dyads discussed the content selection, overall structure, and labor division for Task 1. After completing the first draft of Task 1 in Week 2, the dyads exchanged synchronous peer interactional feedback through QQ during Week 3. Although there was a time difference between the NNEs and NES participants, they were instructed to schedule their interactions at times when they were both available for the tasks. Before exchanging synchronous interactional feedback, participants completed a practice session of how to provide peer feedback using text-chat. The weekly instructions also consisted of a sample of how synchronous peer interactional feedback should be provided compared with the traditional written corrective feedback on writing (see Figure 3.2).

The participants were asked to exchange feedbacks through chats. In Week 4, the dyads revised the essay based on the feedback they had exchanged. By the end of Week 4, both

Original Text / 原文	Traditional Way / 传统模式
<p>In the past decade, teachers starts to realize that tests may not be the best way to review student's learning. In China, testing have a long history. Students and teachers used to this learning style. In the US, testing is not the only standard to evaluate students performance.</p> <p><i>(Second paragraph of an essay written by both authors)</i></p>	<p>In the past decade, teachers starts to realize that tests may not be the best way to review-assess student's learning. (Transition) To compare testing culture in China and the US, we will discuss how the history influences the system of testing in both countries. In China, testing have has a long history. Students and teachers are used to this learning style. (examples) In the US, testing is not the only standard to evaluate students' performance. (examples)</p>
Feedback Discussion / 讨论修改方案	
<p>Jane: I like overall, our second paragraph looks good. However, I think we can revise it to make it better.</p> <p>Ming: Yes, I agree.</p> <p>Jane: Let's talk about content first.</p> <p>Ming: Okay.</p>	<p>Yellow: suggestions of where and how to revise 黄色: 修改哪里和如何修改</p> <p>Blue: Reasons and examples of the suggestion 蓝色: 为什么要修改以及修改范例</p> <p>Gray: clarification questions 灰色: 对不明白的地方进一步提问, 澄清理解</p> <p>You don't need to color code in your chat logs. 在你们的聊天记录中不需要用颜色标记。</p>
<p>Jane: I like how we talk about the differences between China and US. But do you think it might be better if we add some examples for each culture? I think examples can help us strengthen our claims.</p> <p>Ming: Yes, I agree. However, what kinds of examples should we include? I'm not sure how to write examples for the Chinese culture.</p> <p>Jane: What do you mean? Like for the US culture, I can add information on other ways to evaluate students' performance to show that testing is not the only way.</p> <p>Ming: Oh, I see. Then I can add information like when we study, our only purpose is to get higher grades in tests. Test is everything.</p> <p>Jane: Yeah, that's good.</p> <p>Ming: Great!</p>	<p>Discuss feedback on content 关于内容修改方案的讨论</p>
<p>Jane: For transition, I think before we start to talk about the difference between China and US, we may need to a transition.</p> <p>Ming: Why?</p> <p>Jane: Because our first sentence is a general statement, the Chinese and American educations are examples. We need to transition to shift from statement to examples. Some like "To compare testing culture in different culture, we discuss the difference between American and Chinese culture."</p>	<p>Discuss feedback on transitions and organizations 关于转折语(连接语)及结构修改方案的讨论</p>

Figure 3.2. Example of Week 2 Interactional Feedback Instructions

participants in the dyads finalized the essay together during interactions and submitted the essay for Task 1 to the coordinators. From Week 5 to Week 7, the dyads completed the second collaborative writing task under the same direction without attending the practice session.

Individual Writing Group. The individual writing group received the task instructions on the same day as the collaborative groups. During Week 2, the participants selected a topic for the Task 1 following the guidelines provided and wrote the first draft individually in *Microsoft Word*. During Week 3, the individual first drafts were distributed to the students ($n = 15$) in another section of the same English writing class for peer feedback. The reason for choosing students in another session was to prevent face-related issues as well as other possible

intervening issues to the extent possible. As the quality and quantity of teacher feedback and learners' attitudes to teacher feedback are shown to differ from peer feedback (Cho & MacArthur, 2010; Yang et al., 2006), only peer-feedback was used in this study for all the groups. Each of these students provided feedback on one or two individual essays. The students who provided the peer feedback had language proficiency closer to the advance proficiency group ($M = 127.23$, $SD = 3.62$). Before giving feedback on the essays, the students completed a training session on providing feedback as a classroom activity. Then the individual group participants received the essay with peer feedback and revised the essay during Week 4. By the end of Week 4, the finalized essays for Task 1 were submitted to the coordinators. From Week 5 to Week 7, the Individual Group repeated the same steps for Task 2.

Data Analysis

To investigate the language and writing skill development, the pre- and post-tests were analyzed using a variety of CAF measures as well as overall performance. A series of Analysis of Variance (ANOVA) and Multivariate Analysis of Variance (MANOVA) along with necessary follow-up analyses were performed to examine the group differences.

T-unit has been used by previous studies as the basic unit to measure CAF (Elola & Oskoz, 2010; Sachs & Polio, 2007). T-unit is defined as (1) an independent clause with an attached or embedded dependent clause and (2) an independent clause only (Hunt, 1970; Park, 2008). Table 3.3 shows the examples of T-units from the pilot study. The T-unit coding criteria design is based on Park (2008), and includes definitions and examples of T-units, clauses, and errors (see Appendix B). The researcher coded the T-units in the pre- and post-tests (i.e., the numbers of T-units, error-free T-units, and clauses per T-units). Twenty percent of the tests (44 tests) were randomly selected and coded by one of the coordinators (the English major professor)

for inter-coder reliability. The calculated kappa coefficient was 0.89. The disagreements on T-unit coding were further discussed between the researcher and the coordinator.

Table 3.3

Examples of T-units

Example	Number of T-units	Number of clauses	Structure*
[The teacher encourages students to think by themselves].	1	1	[C]
[The atmosphere is very active, (which can also improve their thinking ability)].	1	2	[C (C)]
[The classroom of Chinese is a kind of rectangle space with many row of the same desks], [and every student has its fixed seat].	2	2	[C] + [C]

Notes: *Structure represents how each T-unit and clause is identified, C = clauses.

Individual writing pre- and post-tests were assessed for CAF following previous research (e.g., Plakans et al., 2016; Storch, 2005; Strobl, 2014). Additionally, aligned with previous research, an analytic rating rubric of overall performance was used as a means to evaluate writing quality (e.g., Bikowski & Vithanage, 2016). Using both CAF measures and overall performance assessment can provide a better understanding of language and writing development of the learners.

Accuracy refers to “the degree of deviancy from a particular norm” (Housen & Huiken, 2009, p. 463). This construct was measured by percentage of error-free T-units (e.g., Elola & Oskoz, 2010; Sachs & Polio, 2007), calculated by the following function.

$$\text{Percentage of error-free T-units} = \left(\frac{\text{number of error-free T-units}}{\text{number of T-units}} \right) \times 100\%$$

Complexity, as the size, elaborateness, richness and diversity of a learners' interlanguage system (Ellis, 2009; Housen & Huiken, 2009), was measured using T-units and clauses (e.g., Iwashita, Brown, McNamara, & O'Hagan, 2008; Park, 2008). The use of a combination of measurements is recommended to capture the complexity of writing (Park, 2008). Therefore, the current study used T-unit complexity ratio, dependent clauses per clause, and the average number of words per T-unit to measure the language complexity of students' writing (Liou & Lee, 2011; Park, 2008; Ortega, 2003). T-unit complexity ratio is calculated using the following function.

$$\text{T-units complexity ratio} = \left(\frac{\text{number of clauses per T-units}}{\text{number of T-units}} \right) \times 100\%$$

Fluency is an indicator of learner's ability to compose and produce the target language in real time (Housen & Huiken, 2009; Wolfe-Quintero, Inagaki, & Kim, 1998). Fluency is a measurement for language production speed and automaticity. In this study, the time for NNES participants to complete the pre- and post-tests was limited to 30 minutes for each test. Aligned with measures used by other researchers for assessing fluency (Plankans et al., 2016; Watanabe, 2008; Foster & Skehan, 1999; Storch, 2005; Jalili & Shahrokhi, 2017), overall number of words, number of T-units, and number of clauses were used in this study to measure writing fluency.

To investigate the overall performance of the participants in the tests, a 100-point analytical rubric was developed based on the official TOEFL iBT® Independent Writing rating rubric, including six criteria of grammar, vocabulary, sentence structure, content, text structure, coherence and cohesion (see Appendix C). The average rating of each set of pre- and post-tests by the researcher and another rater using the same rubric accounted for the overall performance. The inter-rater reliability was 0.864 for the pre-test and 0.857 for the post-test using Cronbach's alpha.

After calculating all the measurement scores for the pre- and post-tests, the scores were analyzed to answer the two research questions. First, the gain scores of each measure were calculated through subtracting the post-test scores from the pre-test scores. Second, the gain scores were tested for homoscedasticity, linearity, normality and outliers to make sure the data met the assumptions of MANOVA and ANOVA. Third, descriptive statistics were conducted on all variables. Fourth, a series of MANOVA and ANOVA tests were performed to analyze the main effects and interaction effects of dyadic type and language proficiency on the gain scores of each measurement as well as the group difference between collaborative groups and individual groups.

Three separate two-way MANOVA tests were performed on the gain scores of complexity (i.e., complexity ratio, dependent clauses per clause, average length of T-units), fluency (i.e., overall word count, number of T-units, and number of clauses), and the overall performance (i.e., grammar, vocabulary, sentence structure, content, text structure, coherence and cohesion). Univariate ANOVA and pairwise *post hoc* comparison were performed as follow-up analysis to determine the group differences with the Bonferroni adjustment. Two-way ANOVA along with Tukey *post hoc* comparisons were run to examine the same effects on the gain scores of accuracy (i.e., percentage of error-free T-unit) and overall performance respectively and to locate the group differences. For all MANOVA and ANOVA tests, a complex pairwise *post hoc* comparison was also conducted to locate the difference between the collaborative groups (NNES-NNES and NNES-NES) and the individual group to analyze performance difference. STATA/SE 15.1 for *Mac* was used to do the analyses.

Results

The results showed that participants with different dyadic types and levels of language proficiency performed significantly different on overall performance, accuracy and fluency in the individual writing pre- and post-tests. However, the changes in the complexity between pre- and post-tests did not show a significant difference among the different groups of participants. Moreover, dyadic type and language proficiency had a statistically significant main effect on a number of measures. There was no interaction effect of dyadic type and language proficiency on the CAF measures and the overall performance.

Descriptive Statistics

Table 3.4 presents the descriptive statistics of the gain scores for the CAF measurements, overall performance, and each overall performance sub-construct by dyadic type and language proficiency level. Table 3.5 shows the descriptive statistical information on different variables by collaborative group versus individual group. The gain scores represent the changes between the pre- and post-tests.

Positive gain scores indicate improvement in the post-test measures compared to the pre-test, whereas negative gain scores signal decrease in post-test measures compared with the pre-test measures. Based on the descriptive statistical information, the overall performance and its constructs showed improvement across all groups, except grammar for the I-NNES individual group. For accuracy, there was little or no improvement between pre- and post-test measures. Furthermore, the complexity of the writing decreased in the post-test compared to the pre-test or remained the same between the two tests. As for fluency measures, there was a large variance in overall numbers of words across the learners. The numbers of T-units and clauses showed improvement in the post-tests, except for the advanced learners in the NNES-NES group.

Table 3.4

Descriptive Statistics for Gain Scores of CAF and Overall Performance Measurements (n = 109)

Measurement	NNES & NNES			NNES & NES			Individual		
	A (n = 17)	I (n = 18)	Total (n = 35)	A (n = 22)	I (n = 18)	Total (n = 40)	A (n = 17)	I (n = 17)	Total (n = 34)
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Accuracy	0.14 (0.16)	-0.02 (0.23)	0.06 (0.21)	-0.05 (0.15)	-0.02 (0.16)	-0.4 (0.15)	0.12 (0.21)	0.02 (0.14)	0.07 (0.19)
Complexity									
T-unit word count	-0.86 (1.64)	-0.49 (2.63)	-0.67 (2.18)	-0.31 (1.58)	0.15 (3.01)	0.15 (3.01)	-1.28 (2.36)	-0.99 (1.88)	-1.13 (2.11)
Complexity ratio	0.02 (0.25)	0.05 (0.24)	0.04 (0.24)	0.03 (0.22)	-0.04 (0.23)	0.001 (0.22)	0.05 (0.23)	-0.03 (0.24)	0.01 (0.23)
Clauses Ratio ¹	0.02 (0.11)	0.03 (0.13)	0.03 (0.12)	0.02 (0.10)	-0.01 (0.12)	0.003 (0.11)	0.03 (0.11)	-0.002 (0.08)	0.01 (0.10)
Fluency									
Overall word # ²	2.59 (43.35)	15.72 (54.28)	9.34 (49.01)	-1.24 (39.53)	8.00 (30.16)	3.03 (35.38)	-4.00 (42.86)	19.06 (35.50)	7.52 (40.48)
T-unit #	1.18 (3.21)	2.06 (4.65)	2.06 (4.65)	-0.43 (3.31)	0.33 (4.61)	-0.08 (3.93)	1.82 (4.42)	2.71 (4.22)	2.26 (4.28)
Clauses #	2.12 (5.25)	3.78 (6.34)	2.98 (5.81)	-0.48 (4.60)	0.001 (4.20)	-0.26 (4.37)	3.71 (6.23)	3.82 (5.58)	3.76 (5.83)
Overall Performance	5.13 (6.69)	10.72 (5.55)	8.00 (6.67)	9.55 (7.40)	11.94 (7.36)	10.65 (7.38)	1.99 (7.42)	8.86 (6.63)	5.42 (7.76)
Vocabulary	1.43 (1.28)	2.00 (1.41)	1.72 (1.36)	1.46 (1.42)	2.19 (1.72)	1.80 (1.59)	0.02 (1.52)	1.09 (1.85)	0.56 (1.75)
Grammar	0.70 (1.74)	2.17 (1.92)	1.45 (1.96)	2.12 (2.25)	2.54 (2.10)	2.31 (2.16)	-0.55 (1.69)	0.98 (1.97)	0.21 (1.97)
Sentence Structure	1.40 (1.78)	2.12 (1.18)	1.72 (1.53)	2.52 (1.91)	2.75 (1.70)	2.75 (1.70)	0.53 (2.20)	2.60 (1.53)	1.56 (2.14)
Text Structure	1.07 (1.77)	2.33 (2.53)	1.72 (2.25)	2.42 (2.04)	2.44 (1.86)	2.43 (1.93)	1.05 (2.46)	1.71 (1.89)	1.38 (2.18)
Content	0.49 (1.01)	1.05 (0.97)	0.78 (1.02)	0.56 (1.16)	1.12 (0.94)	0.82 (1.09)	0.54 (0.94)	1.40 (0.71)	0.97 (0.93)
Cohesion	0.15 (0.98)	0.93 (0.83)	0.55 (0.97)	0.46 (1.04)	0.90 (1.18)	0.66 (1.11)	0.48 (0.89)	1.09 (1.02)	0.78 (0.99)

Notes: The scores presented are gain scores calculated by post-test scores and pre-test scores on each measurement; A, Advanced proficiency group; I, Intermediate proficiency group; ¹ Clauses Ratio, number of dependent clauses per clause; ² #, number.

The comparison between collaborative and individual writing groups was conducted by combining collaborative groups (collaborative groups) with the individual group. As indicated in Table 3.5, both the combined collaborative group and the individual group showed improvement in the post-test on the CAF measures and the overall performance scores, except for the complexity measured by T-unit word count. Moreover, all groups had similar amounts of improvement on accuracy and complexity.

Table 3.5

*Descriptive Statistics for Gain Scores of CAF and Overall Performance Measurements
(Collaborative Groups vs. Individual Group)*

Measurement	Collaborative Groups (<i>n</i> = 74)		Individual Group (<i>n</i> = 34)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Accuracy	0.01	0.19	0.07	0.19
Complexity				
T-unit word count	-0.37	2.26	-1.13	2.11
Complexity ratio	0.02	0.23	0.01	0.23
Clauses Ratio ¹	0.01	0.11	0.01	0.10
Fluency				
Overall word # ²	6.01	42.19	7.52	40.48
T-unit #	0.73	4.02	2.26	4.28
Clauses #	5.32	5.58	3.76	5.83
Overall Performance	9.40	7.13	5.42	7.76
Vocabulary	1.76	1.47	0.56	1.75
Grammar	1.91	2.10	0.21	1.97
Sentence Structure	2.20	1.73	1.56	2.14
Text Structure	2.09	2.10	1.38	2.18
Content	0.80	1.05	0.97	0.93
Coherence & Cohesion	0.61	1.04	0.78	0.99

Notes: ¹ Clauses Ratio, number of dependent clauses per clause; ² #, number

Complexity

The two-way MANOVA on the three measures of complexity yielded no statistically significant differences between the groups, $Wilks' \lambda = .90$, $F(10, 202) = 1.07$, $p = .38$. The results indicated that there was no significant change in complexity across different dyadic types and different levels of language proficiency. Also there was no significant change in complexity between the combined collaborative group and the individual group.

Accuracy

The two-way ANOVA performed with dyadic type and level of language proficiency as independent variables and language accuracy as the dependent variable indicated statistically significant results on the overall corrected model with a large effect size, $F(5, 102) = 3.52$, $p < .01$, $\eta_p^2 = .15$. Moreover, the difference in accuracy was statistically significant across different dyadic types with a medium effect size, $F(2, 102) = 3.91$, $p < .05$, $\eta_p^2 = .07$. The Tukey HSD *post hoc* test on dyadic type indicated that the individual group statistically increased more than the NNES-NES group on language accuracy. The results also showed a statistically significant difference between advanced and intermediate language proficiency learners on accuracy with a small effect size, $F(1, 102) = 4.46$, $p < .05$, $\eta_p^2 = .04$, with the advanced group had more gain than the intermediate group. However, no statistically significant interaction effect of dyadic type and proficiency on accuracy was found, $F(2, 102) = 2.84$, $p = .06$.

Fluency

The two-way MANOVA on fluency measures did not yield statistical significance on the overall model, $Wilks' \lambda = .80$, $F(15, 276.5) = 1.58$, $p = .08$. However, there was a statistically significant main effect of dyadic type on the fluency measures with a medium effect size, $Wilks' \lambda = .85$, $F(6, 200) = 3.85$, $p < .05$, multivariate $\eta^2 = .08$. Additionally, the difference between the

advanced and intermediate learners in fluency was not statistically significant, *Wilks' λ* = .96, $F(3, 100) = 1.44, p = .24$. The interaction effect of dyadic type and proficiency was also not statistically significant for fluency, *Wilks' λ* = .98, $F(6, 200) = .42, p = .86$.

To further examine the group differences in fluency by dyadic type, a univariate ANOVA test as follow-up analysis indicated significant differences among different dyadic types on the number of T-units, $F(2, 102) = 3.13, p < .05, \eta^2 = .06$, and the number of clauses, $F(2, 102) = 5.89, p < .01, \eta^2 = .10$. The pairwise *post hoc* comparison for the two variables by dyadic type showed that the gain scores of T-unit count for the NNES-NES group ($M = -0.08, SD = 3.93$) was significantly lower than the individual group ($M = 2.26, SD = 4.28$). Moreover, the mean gain score for the number of clauses for the NNES-NES group ($M = -0.26, SD = 4.37$) and the individual group ($M = 3.76, SD = 5.83$) were also significantly different, as well as the NNES-NES group and the NNES-NNES group ($M = 2.97, SD = 5.81$). The complex pairwise comparison showed that the individual group had a significantly larger gain on fluency regarding clause count in the post-test measures compared with the collaborative groups as shown in Table 3.6.

Overall Performance

The two-way ANOVA test on gain scores for overall performance by dyadic type and language proficiency was statistically significant on the overall model with a large effect size, $F(5, 102) = 5.17, p < .001, \eta_p^2 = .20$. Further, the overall performance across the three dyadic type was significantly different, $F(2, 102) = 5.44, p < .01, \eta_p^2 = .10$. The Tukey HSD *post hoc* test showed that the NNES-NES group had higher increase than the individual group on overall performance score. Moreover, I-NNESs and A-NNESs performed significantly differently in terms of gain scores in overall performance, $F(1, 102) = 13.87, p < .001, \eta_p^2 = .12$, with the

Table 3.6

Statistically Significant Bonferroni Corrected Comparisons of the Measurements by Dyadic Type and Language Proficiency

Comparisons	Dependent Variables	Mean Diff.	Std. Error	95% Confidence Interval	
				Lower Limit	Upper Limit
NNES-NES vs. Individual	Overall	5.32**	1.62	1.38	9.26
	Vocabulary	1.27**	0.36	0.39	2.16
	Grammar	2.12***	0.46	0.99	3.24
	Sentence Structure	1.07*	0.41	0.08	2.07
	Accuracy	-0.10*	0.04	-0.22	-0.002
	Fluency				
	Clause Count	-4.02**	1.27	-7.03	-1.01
NNES-NNES vs. Individual	Overall				
	Vocabulary	1.16**	0.37	0.26	2.06
	Grammar	1.23*	0.47	0.07	2.37
NNES-NNES vs. NNES-NES	Fluency				
	Clause Count	3.22*	1.26	0.24	6.22
Advanced vs. Intermediate	Overall	-4.95***	1.33	-7.59	-2.31
	Vocabulary	-0.79**	0.30	-1.38	-0.20
	Grammar	-1.14**	0.38	-1.89	-0.39
	Sentence Structure	-1.04**	0.35	-1.72	-0.37
	Content	-0.66**	0.19	-1.03	-0.29
	Cohesion	-0.61**	0.19	-0.99	-0.23
	Accuracy	0.07*	0.03	0.004	0.14
Collaborative vs. Individual	Overall	3.98*	1.52	0.97	6.99
	Vocabulary	1.22***	0.32	0.57	1.85
	Grammar	1.69***	0.43	0.85	2.54
	Fluency				
	Clause Count	-2.49*	1.14	-4.75	-0.24

Notes: * Bonferroni corrected $p < .05$, ** Bonferroni corrected $p < .01$, *** Bonferroni corrected $p < .001$

intermediate group showing greater gains than the advanced group with a medium effect size. On the other hand, dyadic type and level of language proficiency together did not have any interaction effect on the overall performance, $F(2, 102) = 1.03, p = .36$.

To further investigate the effects of dyadic type and level of language proficiency on each construct of the overall performance, a two-way MANOVA was performed. Dependent variables included gain scores on vocabulary, grammar, sentence structure, text structure, content, coherence and cohesion. The overall model was statistically significant, $Wilks' \lambda = .49, F(30, 390) = 2.51, p < .001$, multivariate $\eta^2 = .16$. In addition, the results of the follow-up univariate ANOVA tests showed that performance on vocabulary, grammar, and sentence structure were significantly different across the three dyadic types. Furthermore, the two proficiency groups performed significantly different on vocabulary, grammar, sentence structure, content and cohesion. Table 3.7 shows the summary of the ANOVA results for the above variables.

Table 3.7

Summary of Statistically Significant ANOVA on Criteria of Overall Performance (n = 108)

Source	Dependent Variables	SS	df	MS	F	η_p^2
Dyadic Type	Vocabulary	34.84	2	17.42	7.34**	0.13
	Grammar	81.39	2	40.69	10.50***	0.17
	Sentence Structure	25.18	2	12.59	4.13*	0.08
Language Proficiency	Vocabulary	16.76	1	16.76	7.07**	0.07
	Grammar	34.90	1	34.90	9.00**	0.08
	Sentence Structure	28.84	1	28.84	9.45**	0.09
	Content	11.63	1	11.63	12.32**	0.11
	Cohesion	10.01	1	10.01	10.07**	0.09

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$

To examine the group differences, Tukey HSD *post hoc* test was performed for the statistically significant effects from the follow-up univariate ANOVA tests. As shown in Table 3.6, the NNES-NNES group made more gains than the individual group on vocabulary and grammar; the NNES-NES group gain score was significantly higher than the individual group gain score on vocabulary, grammar and sentence structure. Further, I-NNESs had higher increase than the A-NNESs on vocabulary, grammar, content and cohesion. In addition, the combined collaborative groups had more gains than the individual group on overall performance score, as well as the vocabulary and grammar construct.

Discussion

To further explore the influence of dyadic type and language proficiency on the effectiveness of collaborative writing and whether the language and writing development related to collaborative writing experience can be transferred into individual writing, this study was conducted. The study adapted a pre- and post-test design and measured the individual writing gain scores of CAF and overall performance. The results related to the two research questions addressed are discussed below.

Research Question 1

Do collaborative writing tasks enhance language complexity, accuracy, fluency and overall performance of individual writing texts?

The results of this study indicated that both collaborative and individual writing groups had certain level of improvement in the post-test compared to the pre-test considering CAF and overall performance. However, the collaborative groups only had a significantly higher improvement than the individual group on overall performance. For fluency measured by numbers of clauses, the individual group gained more than the collaborative groups.

The findings of this study are consistent with other research that compared collaborative written texts with individually written texts on CAF measures (Elola & Oskoz, 2010; Dobao, 2012; Jalili & Shahrokhi, 2017; Storch, 2005; Strobl, 2014; Watanabe, 2014). Storch (2005) study findings revealed that collaborative groups produced texts with lower fluency but higher overall score. Elola and Oskoz (2010) found a significant gain in fluency in the individual writing group but no significant difference on complexity and accuracy gains between the two groups. These findings are confirmed by Strobl's (2014) and Jalili and Shahrokhi's (2017) studies as well.

One of the findings in this study that needs to be highlighted is that the individual group had higher gains in fluency than the collaborative writing groups. As studies that examined learners' gains through pre- and post-test design did not cover the fluency dimension of writing (Bikowski & Vithanage, 2016; Shehadeh, 2011), there is no research-based evidence that could explain such a difference between collaborative and individual writing groups. On the other hand, this finding could be a result of learners' performance during the writing process. As Elola and Oskoz (2010) mentioned, to complete a collaborative writing task, learners would devote more time to negotiate, which leaves less time for writing practices. It is possible that participants in the collaborative writing groups in this study spent more time on the negotiation and exchange of interactional feedback, whereas the participants in the individual writing group focused entirely on writing. Therefore, the individual group may end up getting more practice on writing than the collaborative groups. Compared with accuracy and complexity, fluency may be a dimension that takes less time to improve. As Baba and Nitta (2014) mentioned, the change of fluency can be easily influenced by learners' approach to writing, such as shifting the overall writing structure or adding examples or more explanations. Hence, a potential explanation for

this finding is that participants in the individual writing group may have had more time for writing practice than those in the collaborative groups, and thus the practice effect was reflected in the fluency gain in the post-test. However, to justify the validity of this explanation, an in-depth analysis of the writing process and individual interviews are needed.

As for overall performance, findings of this study align with Bikowski and Vithanage (2016) and Shehadeh (2011) study findings that show collaborative writing led to a significantly higher improvement on overall performance in the individual post-tests. The current study also found significant effects of collaborative writing on overall performance gain scores, especially the vocabulary and grammar criteria, as well as a noticeable positive influence on sentence and text structure criteria of the analytic rubric. However, collaboration did not facilitate improvement of overall performance on content selection, coherence and cohesion, which do not resonate with Shehadeh's findings. It is plausible that within 30 minutes period, learners in this study did not have enough time to plan and edit the content and the structure of the writing during the pre- and post-tests, and as a result, improvement in content, coherence and cohesion was not noticeable.

Additionally, it is important to note that the results of the grammar criteria in the overall performance did not align with the accuracy measure using T-unit. Grammar and accuracy share the same definitional feature, which is how learner's ability differs from the native norm (Housen & Kuiken, 2009). Theoretically, the participants should have had similar gains in grammar and accuracy. However, the findings of this study revealed that participants had a significant improvement in the overall performance in terms of grammar, but little gain in accuracy. One of the explanations could be how grammar and accuracy were measured. In this study, grammar was rated as one criteria of the overall performance using the analytic scale based on the TOEFL

iBT® Independent Writing Rubric. Accuracy, on the other hand, was measured by the percentage of error-free T-unit. Raizi (2016) used the TOEFL iBT® Independent Writing Rubric in an academic writing class and concluded that this rubric may not be an appropriate measure for syntactic maturation of writing. As accuracy was measured by T-unit, which is a syntactic unit, using the analytic scale of overall performance to measure grammar may not adequately reflect accuracy gains in this study.

In addition to the possible influence from measurements, another explanation for the discrepancy of grammar and accuracy results could be the rater effect. Gebril (2009) indicated that the rater effect - whether raters were adequately trained and had real-time experience on using the rubric - could interfere with the rating results. Gebril considered real-time experience as being a professional rater for assessing writing in standardized tests. In this study, the two raters attended a one-hour training session on how to rate the pre- and post-tests using the analytic rubric. Although the Cronbach's Alpha inter-rater reliability for the overall performance of both the pre- and post-tests showed a good consistency between the two raters ($\alpha > .80$) (Streiner, 2003), for the grammar criteria only, the inter-rater reliabilities were slightly above the cut value for acceptable consistency ($\alpha > .70$; $\alpha_{\text{pre-grammar}} = 0.76$, $\alpha_{\text{post-grammar}} = 0.75$). Based on these results, it is possible that more training sessions may be needed for raters to be able to consistently use the analytic rubric measurement tool. Hence, future studies need to consider the validity of the adapted overall performance analytic rubric and ensure that the raters are adequately trained and experienced in using the particular rubric on every criterion.

Research Question 2

To what extent do dyadic type and language proficiency influence the effects of collaborative writing on individual writing texts regarding language complexity, accuracy, fluency and overall performance?

The results related to the second research question showed that dyadic type and language proficiency have a significant or noticeable influence on how collaborative writing affected individual writing performance considering CAF and overall performance. However, the two variables did not yield any interaction effect on these measures.

Dyadic Type. No published studies on computer-mediated collaborative writing have directly investigated dyadic type as an intervening variable. Although we observed nine significant between-group differences on accuracy, fluency and overall performance measures (see Table 3.6), six differences were found between the NNES-NES and individual groups, two occurred between the NNES-NNES and individual groups, and only one difference showed that the dyadic arrangement, NNES-NNES or NNES-NES, had a significant impact on one of the measures of fluency.

Comparing the dyadic groups, although no significant difference was observed on learners' improvement on accuracy, the gain scores of NNES-NNES dyads ($M = 0.06$, $SD = 0.21$) and NNES-NES dyads ($M = -0.4$, $SD = 0.15$) were noticeably different, as the NNES-NNES dyads had a higher gain in accuracy than the NNES-NES dyads. This result on language accuracy resembles the findings from Eslami and Kung (2016), which measured the influence of dyadic type on learners' incidental learning through online collaborative language learning tasks. Their findings from a tailor-made post-test also showed that learners in the NNES-NNES dyads had better performance than learners in the NNES-NES dyads on linguistic knowledge measures.

Differently, the performance difference between the two dyadic groups in this study has smaller difference than that of Eslami and Kung's study. This could be due to the assessment tool used. Eslami and Kung used a tailor-made test that directly assessed the potentially learned items; whereas this study used T-unit analyses, which may not capture each individual learning based on their interactions and LREs. Moreover, a number of studies (e.g., Elola & Oskoz, 2010; Park, 2008; Plakans et al., 2016; Sachs & Polio, 2007; Storch, 2005; Strobl, 2014) have indicated that using T-unit to analyze accuracy may loss information on how errors change in each T-unit. Therefore, more detailed analysis, such as interlanguage analysis (Korte, 2008; Laufer & Nation, 1995), is recommended for future studies.

Another finding on how dyadic type affects learners' language gain in the post-test is that NNEs-NES interactions were not necessarily more effective than NNEs-NNEs interactions. It is widely assumed by educators that NESs are can provide more and more beneficial feedback to the learners than NNEs (Cook, 1999). However, some studies have indicated that in terms of peer interactions and form-related negotiations, NNEs-NNEs dyads may be more effective than NES-NNEs dyad interactions (Reichert & Liebscher, 2012; Storch, 2002; Watanabe, 2008). This is also reflected in the current study. Although the result of overall performance indicated that learners in the NNEs-NES dyads had a higher gain than the learners in the NNEs-NNEs dyads, the results on fluency and accuracy showed otherwise. It appears that collaborating with NNEs could be more beneficial for fluency and accuracy gains and collaborating with NESs can be more beneficial in overall performance. As indicated by different researchers (e.g. Aslan, 2017; Matsuda, 2018), NNEs have outnumbered NESs and it is not necessary or practical for EFL teachers to easily have access to NESs. To better understand the effects of NES-NNEs dyadic

type with NNES-NNES dyadic types with same or different language proficiency levels on different components of language development in interactions, further research is needed.

Language Proficiency. Besides dyadic type, learners' language proficiency is the other factor that we examined in this study. As shown in Table 3.8, I-NNESs had higher gains on fluency and overall performance than A-NNESs. Among the six criteria of the overall performance, five of the criteria showed significantly higher improvements in the post-test of the I-NNESs. Likewise, Bikowski and Vithanage (2016) reported that lower proficiency learners had a greater improvement than higher proficiency learners after computer-mediated collaborative writing practices. However, this finding may result from the fact that initially higher proficiency learners could have less room for improvement than initially lower proficiency learners (Oxford, 1997).

On the other hand, accuracy measured by T-units showed that the advanced learners had a higher gain than the intermediate learners did. This result echoed the findings by Soleimani et al. (2017) and Storch and Wigglesworth (2007) that higher proficiency learners may benefit more from collaborative writing on accuracy. Research shows that advance learners are more proficient, thus they have higher cognitive capacity for processing language input, and transferring the input into language intake (Storch, 1998; Williams, 2001). Moreover, Storch and Wigglesworth (2007) examined advance learners' focus during collaborations and found that negotiations on grammar and lexis were the main focus in their interactions. Therefore, analysis of participants' interactions will provide us with insights on the areas of language that different language proficiency learners may focus more and if the focus of negotiations on these aspects transfer to their individual writing.

Table 3.8

Descriptive Statistics for Gain Scores CAF and Overall Performance Measurements (Advanced Proficiency vs. Intermediate Proficiency)

Measurement	Advanced (<i>n</i> =55)		Intermediate (<i>n</i> = 53)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Accuracy	0.06	0.19	-0.01	0.18
Complexity				
T-unit word count	-0.78	1.88	-0.43	2.56
Complexity ratio	0.04	0.23	-0.003	0.23
Clauses Ratio ¹	0.02	0.10	0.01	0.11
Fluency				
Overall word # ²	-0.91	41.07	14.17	40.87
T-unit #	0.76	3.72	1.68	4.53
Clauses #	1.62	5.54	2.51	5.64
Overall Performance	5.85	7.75	10.54	6.55
Vocabulary	1.01	1.54	1.77	1.70
Grammar	0.85	2.21	1.91	2.07
Sentence Structure	1.53	2.11	2.49	1.48
Text Structure	1.58	2.17	2.17	2.10
Content	0.53	1.03	1.18	1.00
Coherence & Cohesion	0.37	0.97	0.97	0.99

Notes: ¹ Clauses Ratio, number of dependent clauses per clause; ² #, number

Besides overall performance and accuracy, the results on complexity showed that both proficiency groups had a limited amount of gain in the post-tests. This finding resembles previous research on collaborative writing that shows complexity tends to take a longer time to improve compared to other components of language use (Jalili & Shahrokhi, 2017; Liou & Lee, 2011; Soleimani et al., 2017; Strobl, 2014). Also it should be noted that learners in this study had certain levels of language proficiency based on the measurements we used. Interactions between learners with lower proficiency levels may yield to different findings. As shown by (Dobao, 2012), beginning learners had a noticeable improvement on complexity over time. Therefore, it

could be that learners in this study had less room for improvement based on their level of language proficiency and during a short period of time.

Additionally, T-unit analysis may not be the only and the best measure to use to capture complexity. Some researchers have questioned the desirability of using T-unit analysis as the only measure to assess complexity (Korte, 2008; Qi, 2014), as learning smaller linguistic units (e.g., vocabulary and phrase), cannot be captured by T-unit analysis. A longer duration of practice with more intensity is recommended for learners to be able to develop writing complexity. Moreover, adapting a different measure, such as interlanguage analysis, may provide more evidence of learners' development of writing complexity.

In terms of fluency, it is interesting to see that the I-NNESs had a higher gain than the A-NNESs. Baba and Nitta (2014) tracked two beginning EFL learners' writing using repeated tasks for two consecutive semesters and found that at certain point during the writing process, the learners retained a similar level of complexity and a lower level of accuracy, attempting to achieve a higher level of fluency in their writing. Baba and Nitta argued that the main reason for a dramatic increase in fluency was from writing repeated tasks. One of the learners was able to add more elaborations and the other learner learned how to properly break the text into different paragraphs, which lead to a higher fluency with simpler sentence structures. Baba and Nitta's findings can explain the findings of this study that showed I-NNES learners had a higher gain in fluency, but less on accuracy and complexity, as the tasks and the pre- and post-tests were from the same genre with similar topics. A further investigation of participants' interactions will provide a more in-depth explanation for this finding.

Overall, the findings of this study revealed that dyadic type and language proficiency affect EFL learners' individual writing performance after completing two computer-mediated

collaborative writing tasks. Knowing that the NNES-NNES and NNES-NES interactions were each beneficial to EFL learners in different aspects, we are able to confirm the facilitative role of NESs and NNEs in collaborative writing context on different qualities of learners' individual writing. Furthermore, though language proficiency had an impact on individual writing, how the improvements in CAF and overall performance are related to the amount and type of peer interaction is still not clear. Therefore, a follow-up study should examine the collaboration process to explore relationships among computer-mediated collaborative writing, peer interactions and individual language learning.

Conclusions

This chapter presented an empirical study that examined the effectiveness of computer-mediated collaborative writing on individual performance and the potential influence from dyadic type and language proficiency adapting a quasi-experimental pre- and post-test design. Data was gathered from 135 NNEs with advanced and intermediate language proficiency and 45 NESs. Individual pre- and post-tests was assessed using a variety of measurements on CAF and overall performance. A series of two-way MANOVA and ANOVA was performed to examine the group differences on the effects of dyadic type and language proficiency on CAF and overall performance.

This study was situated in a Chinese EFL class context. Another purpose of this study was to investigate how computer-mediated collaborative writing affects Chinese EFL learners' development of linguistic knowledge and writing skills, considering the learners' individual differences and the features of the study context. The findings showed that computer-mediated collaborative writing tasks facilitate Chinese EFL learners' individual growth in English writing, mainly their overall writing performance and fluency. Although language complexity and

accuracy did not show significant improvements in the post-test, some level of gain was observed, especially among NNES-NNES dyads. Moreover, learners with different language proficiency benefited from the computer-mediated collaborative writing tasks in different aspects, as A-NNES participants had higher gains in accuracy and I-NNES learners had higher gains in fluency.

The findings of this study regarding the effect of dyadic type on learning echoed previous research on computer-mediated peer interactions (Eslami & Kung, 2016). However, the group differences observed in this study have a smaller amount of difference in their performance than shown in the findings of Eslami and Kung (2016). The type of assessment measure used could be related to the difference in findings. Eslami and Kung used a tailor-made test to measure language gain, which can capture more information on individual learner's growth based on their own LREs in interactions. However, in this study we used T-unit analyses for CAF measures. Moreover, evidence from other studies on peer interactions suggests that the impact of dyadic type and language proficiency could be more noticeable when the learning process and development is examined in different interactions over time (Sotillo, 2005; Watanabe, 2008; Yoon, 2017). It is recommended for further research to adapt a more in-depth analysis, such as tailor-made tests (Eslami & Kung, 2016) or interlanguage analysis (Korte, 2008; Qi, 2014), to capture more evidence of language learning and writing development. An investigation of the collaboration process will enable us to have a clearer understanding of how dyadic type and language proficiency affects learning during the process of collaborative writing.

Informed by this study, NNES-NNES interactions can be equally or, in some areas, more beneficial for second language learning than having NES partners. As the number of NNESs surpasses the number of NESs in today's world (Aslan, 2017; Cook, 1999) and NESs are not

always accessible to language teachers in EFL context, it is important for EFL teachers to be aware of what NNEs can contribute to each other in peer collaborative writing context. Thus, the findings of this study add to the investigation of computer-mediated collaborative writing and further confirm the value and feasibility of using computer-mediated collaborative tasks in EFL contexts.

Limitations and Future Directions

Although this study confirmed the positive impact of computer-mediated collaborative writing in EFL class settings, the study has several limitations that offer opportunities for future research. First, the length of the study was relatively short. Polio (2017) stated that in second language writing, longitudinal studies that allow tracking learners' progress over a period of time longer than one semester or year could yield better outcomes. Therefore, longer duration is recommended for future studies on computer-mediated collaborative writing. Second, about one third of the NNEs participants were English major students, which could have impacted the results. Although by the time of the study, the participants were only in their first semester at the university, one cannot deny that the English major participants could have brought what they have learned in other non-writing English major classes into these tasks or have higher motivation for language learning. We limited this influence to minimum by selecting the other participants from a college that has a higher requirement of English in their curriculum. It is still recommended for future studies to either control this variable or measure students' motivation for language learning and writing development or to randomize the sample and include students from different disciplines. Third, this study only used T-unit analyses to measure CAF, the results might be more individualized if a tailor-made test or interlanguage analysis were used.

Therefore, further research could consider having a relatively smaller sample size and design tailor-made tests or perform interlanguage analysis to measure language gains in writing.

CHAPTER IV
EXPLORING THE RELATION AMONG LANGUAGE PROFICIENCY, DYADIC TYPE
AND LEARNERS' NOTICING IN ONLINE COLLABORATIVE WRITING

Introduction

The primary focus of instructed second language acquisition (ISLA) is to investigate effective instructional approaches that can promote second language acquisition (SLA) in classroom settings (Loewen, 2014; Ortega, 2012). However, this strand of studies has been criticized for taking individual classroom feature or activity away from a class setting into a laboratory setting to investigate its effectiveness (Hulstijn, 1997; Spada, 2005).

Decontextualizing instructions from class settings is problematic and may lack ecologically validity (Spada, 2005). As ecologically oriented instruction is gaining importance in ISLA research (Larsen-Freeman, 2018), the emphasis of ISLA studies is no longer limited to how instruction can benefit second language learning. Instead, individual factors, such as student's educational background, language proficiency, motivation and attitudes, and the relation between individual and language learning have become the primary focus in recent ISLA research (Bensen, 2017; Polio, 2017).

Since the early 1980s, task-based language teaching (TBLT), which captures the complex relations among individual, classroom instruction and natural language use, has become a significant topic in SLA and later in ISLA research (Byrnes & Manchón, 2014; Ellis, 2003; Hismanoglu & Hismanoglu, 2011; Van den Branden, 2006). The topics covered in TBLT research range from a theoretical perspective of the effectiveness of task-based language learning in SLA to practical task design in classrooms (Gilabert, Manchón, & Vasylets, 2016). Although

ideally, TBLT research aims to inform language teachers of the benefits of using tasks in classroom instruction, studies on computer-mediated second language writing could have overlooked the ecological validity of task design (Brown, 2012; Ferris, 2011; Spada, 2005; Polio, 2017). For instance, studies investigated the effectiveness of one type of instruction or one type of feedback would divide participants into treatment groups and control groups in general (Brown, 2012; Liu & Brown, 2015; Polio & Park, 2016). Although the findings may show the effectiveness of the examined instruction or types of feedback, the results coming from a laboratory setting cannot be generalized into real class settings (Spada, 2005), as a laboratory cannot resemble the complex relations among students, teachers, and other contextual factors in a classroom. To address this issue, Polio (2017) and Byrnes and Manchón (2014) suggested that investigation of the effectiveness of a writing approach should be situated in real language learning contexts.

Evidently, the emphasis on learning during the writing process have long been captured, with Flower and Hayes (1981) stating that an effective writing activity should provide adequate learning opportunities during the writing process and Kitao and Saeki (1992) indicating that the process of writing should be viewed as a crucial indicator for learning. Moreover, studies on collaborative writing tasks highlight the importance of investigating writing process, as the process of collaborative writing can optimize language learning through interactions (e.g., Li & Zhu, 2013; Storch, 2005; Storch & Wigglesworth, 2010). The investigation of language learning in writing processes has posited the potential learning effects for the processing of feedback (Byrnes & Manchón, 2014). In other words, how language learning occurs during the writing process is highly depending on the forms and functions of feedback in writing. In addition, the emergence of computer-mediated communication (CMC) has further advanced the investigation

of writing process. Computer-mediated collaborative writing has shown to promote interactions (e.g., Kim, 2014; Liu & Sadler, 2003), and, as a result, enhance the quality of writing (e.g., Bikowski & Vithanage, 2016; Wang, 2015; Drexler, Dawson, & Ferdig, 2007) and facilitate language processing during collaboration (e.g., Bradley, 2014; Elola & Oskoz, 2010).

Therefore, to better understand how learning occurs during the writing process and to inform teachers of the benefits of computer-mediated collaborative writing on second language learning, task design in empirical studies needs to be ecologically oriented considering the contextual factors, such as the classroom settings, and individual differences. To address the above issue, this study investigates the collaborative writing process of EFL learners while completing two online collaborative writing tasks in different dyadic types (NNES-NES vs NNES-NNES), considering the EFL learners' individual differences and the study context. In addition, this study also examines EFL learners' perceptions of computer-mediated collaborative writing tasks. Below, we will first review the theoretical perspective of how learning occurs through noticing and how learning is measured during the learning process. Then we will center the review on computer-mediated collaborative writing, with close attention on peer feedback and individual differences.

Noticing

Interactions provide learners with language input and also require learners' output. During the interaction, learners' attention is drawn to the linguistic gaps they have in producing the language (Schmidt, 1990; Swain, 1985). Similarly, interactions during collaborative writing facilitate learning, as supported by Interactionist Theory (Long, 1981). Collaborative tasks can provide learners with more opportunities for learning, and this learning potentially comes from

noticing the linguistic gaps between learners' knowledge and the target forms (e.g., Amir, Ismail, & Hussin, 2011; Li & Zhu, 2013; Watanabe, 2008).

The awareness of linguistic gaps is conceptualized as noticing (Robinson, 1995; Schmidt, 1990, 2001), which by definition is the "conscious apprehension and awareness of input" (Schmidt, 2001, p. 26). When learners are consciously aware of the mismatch between their language production and the target forms, language learning could occur. Informed by Schmidt's (1990) Noticing Hypothesis, noticing is the necessary and sufficient mechanism for SLA. Gass (1997) claimed that without noticing, input could be hardly transformed into intake. A weaker version of the Noticing Hypothesis argues that noticing is necessary but not sufficient for SLA (Lai & Zhao, 2006). Regardless of how noticing is considered in the process of SLA, it is an essential cognitive learning mechanism in SLA and in the negotiation process (Lai & Zhao, 2006; Robinson, 1995; Schmidt, 2001; Gass, 1997). As a result, consideration of how task design can promote noticing in the domain of EFL writing is of importance in current ISLA inquiry (Polio, 2017).

To understand how language input and output provides potentials for noticing, theorizing the role of input and output will provide a better picture of the underlying process of SLA. Language input, especially feedback, is an effective stimulus to promote noticing and further learning (e.g., Lyster, 2001; Robinson, 1995; Schmidt, 2001; Sheen, 2010; Wigglesworth, 2005). It should be noted that language input is not the only trigger for noticing (Robinson, 1995; Swain, 1985; Swain & Lapkin, 1995). The facilitative role of language output for potential noticing cannot be overlooked (Hanaoka & Izumi, 2012; Sachs & Polio, 2007; Swain, 1985). Output can be a conversational turn during negotiations or a piece of writing (Hanaoka & Izumi, 2012; Swain, 1985). The interactive nature of collaboration offers opportunities for pushed

language output from learners in both form and meaning (e.g., Hanaoka & Izumi, 2012). According to Swain's (1985) Output Hypothesis, pushed output leads to potential noticing through output hypothesis-testing (Swain, 1985, 1998), as learners hypothesize a way of using the target language and test their assumptions through producing the language. A number of studies on peer interaction and collaborative writing have yielded evidence suggesting that language learners do notice the interactional feedback from their peers during interactions (Lai & Zhao, 2006; Qi & Lapkin, 2001; Swain & Lapkin, 1995). However, whether learners' own problematic language output can be noticed by learners has not yet been adequately addressed (Lai & Zhao, 2006), especially in the domain of collaborative writing. Nevertheless, considering that both input and output can trigger noticing in collaborative writing, it is important to investigate how tasks can be designed to foster more interaction and help language learners notice the interactional feedback given by their peers and their own problematic language output (Lai & Zhao, 2006).

Although noticing is viewed as a crucial cognitive mechanism for SLA, it is not still clear how to identify potential instances for noticing (e.g., Malaz, Rabiee & Ketabi, 2011). Decades of research on noticing have developed a variety of methods to capture different forms of noticing evidence during language learning process (Loewen, 2004; Qi & Lapkin, 2001; Wigglesworth, 2005). Wigglesworth (2005) synthesized the methods into two macro categories: think-aloud approach and talk-aloud approach. Think-aloud approach examines learners' cognitive thinking process during learning by learners' verbalization of thoughts during performance for researchers to analyze instances of noticing. However, this approach is criticized for lack of validity depending on learners' language proficiency, task types, and audience of the think-aloud, because learners are required to perform tasks and articulate their thoughts at the same time

(Wigglesworth, 2005; Ellis, 2004). Talk-aloud approach, on the other hand, measures potential noticing in an interactive context (Swain, 1985; Wigglesworth, 2005). The talk-aloud dialogues between learners are commonly referred as language-related episodes (LREs) (Swain & Lapkin, 1998).

The value of LREs in measuring learning and potential noticing in collaborative contexts has been substantiated by previous research (Dobao, 2012; Kim, 2008; Nassaji & Tian, 2010; Storch & Wigglesworth, 2010; Swain, 2001; Swain & Lapkin, 1995). As part of a dialogue in which learners discuss language use and make corrections on their own or others' language use (Swain & Lapkin, 1998), LRE consists of three parts: a trigger, feedback, and an optional uptake (Ellis & Shintani, 2015). An uptake is a response following the feedback by the learners (Lyster & Ranta, 1997). Uptake can be made immediately after the feedback during interactions or occur as a revision in later language productions (e.g., Loewen & Philp, 2006; Storch & Wigglesworth, 2010). Previous research has used both immediate and delayed uptakes as means to measure potential noticing and language learning, especially in writing (e.g., Ellis & Sheen, 2004; Shintani, 2015; Wigglesworth & Storch, 2012). Moreover, LRE is suggested as a reliable unit to measure potential noticing when feedback is part of the learning process (Qi & Lapkin, 2001; Wigglesworth, 2005). One concern raised from these studies is how well LREs can predict noticing and language learning in different forms of conversation (i.e., oral conversation or text-based chatting). Lai and Zhao (2006) underscored the benefit of text-chat in computer-mediated interactions and claimed that "written oral-like conversation" (Lai & Zhao, 2006, p. 102) allows learners to engage in a slow-pace conversation and gives learners more time to process input and produce output. Moreover, text-based conversation is more likely to help learners notice their problematic linguistic output compared to oral conversations (Mackey, Gass, & McDonough,

2000; Kim, 2014; Rassaei, 2017). Considering the abovementioned research findings and theoretical arguments on noticing, studying the potential for noticing in a computer-mediated collaborative writing setting through text-chat can yield to valuable insights and have important implications for teaching L2 writing.

Computer-mediated Collaborative Writing

Since Philp (1999) suggested studies on noticing should pay close attention to contextual factors, the focus of SLA research shifted away from evidential studies in a laboratory setting and advanced to examining how task design, study setting and individual differences could affect noticing in a classroom setting (Robison, 2001). As collaborative writing has shown to facilitate noticing (Chen, 2016) and with emerging importance of ISLA, knowledge of how to design effective collaborative writing tasks that are ecologically valid is highly valuable (Polio, 2017; Bensen, 2017). In what follows, we discuss how certain factors in computer-mediated collaborative writing (i.e., peer interactional feedback and individual differences) affect its potential for noticing.

In ESL/EFL writing, research on computer-mediated collaborative writing shows that collaboration can provide additional learning opportunities (e.g., Li & Zhu, 2013; Strobl, 2014), promote noticing of linguistics gaps through interactions (e.g., Arnold, Ducate, & Kost, 2012; Dobao, 2012), and facilitate language learning and development of writing skills (e.g., Bikowski & Vithanage, 2016; Kessler et al., 2012). Although these research findings shed light on the benefits of computer-mediated collaborative writing, limited studies have explored how collaborative writing facilitates learners' noticing during the writing process (Alwaleedi, 2017). Findings from empirical research can help teachers make informed classroom instructional decisions (Mei et al., 2017). Therefore, investigating the link between different contextual factors

and computer-mediated collaborative writing effectiveness can provide educators with ecologically valid findings.

Peer Interactional Feedback. In peer feedback, the "learners assume roles and responsibilities... in commenting on and critiquing each other's drafts" during the process of writing (Liu & Hansen, 2002, p.1). Nassaji (2016) defined any feedback exchanged in an open or communicative context as interactional feedback. Similar to traditional written feedback, interactional feedback can be implicit or explicit and related to both linguistic and communication issues. Previous research has shown promising benefits of peer interactional feedback during language learning process as it raises the opportunity for noticing linguistic gaps (e.g., Bradley, 2014) and facilitates self-reflection and collaboration (e.g., Drexler et al., 2007). Moreover, CMC technology can enhance the effect of peer interactional feedback by promoting learners' motivation and engagement (e.g., Wang, 2015), and increasing the quantity and quality of revisions (e.g., Liu & Sadler, 2003). Specifically in collaborative writing contexts, peer interactional feedback encourages learners to actively engage in discussions as opposed to passively accepting other's feedback (Yang, Badger, & Zhen, 2006).

However, the effectiveness of peer interactional feedback compared to teacher feedback, has been questioned by some researchers (e.g., Cho & MacArthur, 2010; Hyland & Hyland, 2006). Scholars argue that a potential challenge with peer interactional feedback could be due to the quality of peer feedback and learners' lack of trust of peer feedback (e.g., Kormos, 2012; Motallebzadeh & Amirabadi, 2011). Teachers are perceived as an authority and expert of the target language and learners tend to favor teacher feedback more than peer feedback, when both peer and teacher feedback coexist (e.g., Cho & MacArthur, 2010; Yang et al., 2006). Learner's limited language proficiency can affect their ability to provide high quality feedback (e.g.,

Watanabe, 2008). It also appears that learners' confidence in writing can enhance through providing feedback to others (e.g., Wu, 2006). In addition, negotiation process provides opportunities for pushed output, which allows noticing of both feedback and their problematic output (e.g., AbuSeileek & Abualsha'r, 2014; Lai & Zhao, 2006). Evidently, more opportunities for negotiation and interactional feedback could potentially lead to more opportunities for noticing and language learning. Computer-mediated collaborative writing tasks aligned with teaching practice in writing classrooms which is culturally and contextually responsive to learners' needs, can maximize opportunities for interactions and noticing (Bikowski & Vithanage, 2016; Elola & Oskoz, 2010, 2017). Therefore, designing an effective and ecologically valid task needs further consideration of other contextual factors, such as individual differences.

Individual Differences. According to Kellogg (1996), individual differences include cognitive factors, such as aptitude and language proficiency, and motivational factors like learning motivation, self-efficacy, and learning attitude. Kellogg indicated that individual differences could affect second language writing from the planning stage to the final stage of writing. Moreover, Li and Zhu (2017) examined how ESL learners interact during collaborative tasks and confirmed that individual differences had a great impact on the interactive patterns. Similarly, Cho (2017) concluded that one must consider the mediating role of individual differences in computer-mediated collaborative writing.

Moreover, as stated previously, ISLA research has entered in a "person-centered" era (Benson, 2017), in which the connection between individual differences and SLA have become a primary focus (Polio, 2017). Knowing that the number of non-native English speakers (NNES)

surpasses the number of NES in today's world, understanding what NNES can offer each other through collaboration has caught researchers' attention (Aslan, 2017; Cook, 1999).

Previous research has already attempted to investigate the difference between NNES-NNES and NNES-NES interactions and how it affects second language learning (Kung & Eslami, 2015; Sotillo, 2005). For example, during language learning tasks (e.g., jigsaw), Kung and Eslami (2015) and Sotillo (2005) found that the levels of engagement and the quality of interactions differed in NNES-NES dyads and NNES-NNES dyads. Kung and Eslami found that NNES-NES dyads produced more LREs compared to NNES-NNES dyad. Differently, through an exploratory analysis, Sotillo found that the NNES-NNES dyads produced more negotiation episodes than the NNES-NES dyads. Although the findings of these two studies contradict each other, there was observed evidence of successful learning in both studies.

Taking a closer look into the NNES-NNES dyads only, Kung and Eslami found that intermediate learners initiated more LREs during NNES-NNES interaction than advanced learners; whereas, the advanced learners in Sotillo's study were more engaged in interactions and provided more error corrections. Moreover, Watanabe and Swain (2007) noticed that language proficiency did not influence the frequency of LREs. The research findings from the above studies imply that dyadic type could have an influence on language learning during interactions. Furthermore, the findings related to the role of language proficiency in interaction and the frequency of LREs, are not consistent and more research needs to be conducted to shed light on this issue.

Language proficiency, as one of the individual variables, is shown to influence second language learning during interactions in several empirical studies (e.g., Nguyen, 2012; Qi & Lapkin, 2001; Watanabe, 2008; Wu et al., 2015). Some studies have indicated that advanced

learners were more engaged in interactions (Nguyen, 2012; Qi & Lapkin, 2001; Watanabe, 2008; Wu et al., 2015). These studies focused either on interactive language learning tasks or on individual writing. In collaborative writing context, on the other hand, studies have not directly examined the influence of language proficiency on learners' interaction and how it impacts their writing performance.

Research Questions

To address the relation among dyadic type, language proficiency and learners' noticing during computer-mediated collaborative writing task, this study aims to investigate how EFL learners with different language proficiency levels perform during computer-mediated collaborative writing in different dyadic types. Learners' attitudes toward the collaborative writing experience is also examined. Adapting a quasi-experimental design, we recruited EFL NNESs from China and NESs in the United States and asked them to complete two collaborative writing tasks in an online setting. Analyses of the text-chat logs, collaborative writing texts and a perception survey answered the following research questions:

1. What are the features and frequency of lexical, grammatical and mechanical LREs?
2. What are the features and frequency of NLREs?
3. What are the features and frequency of immediate and delayed uptakes?
4. How do language proficiency and dyadic type affect the learners' performance in terms of features and frequency of LREs, immediate and delayed uptakes?
5. What is the EFL learners' perception of computer-mediated collaborative writing using chats and *Microsoft Word*?

Method

Participants

To conduct this study, 90 NNES from China and 45 NES from the United States were recruited. Convenience sampling was used for recruiting the participants. The NES participants, who were enrolled in an ESL methods course at a major research university in the United States, completed this study as a course requirement. The NES participants were asked to voluntarily provide their consent so the researcher could use their assignments as data for this study. The NNES participants were first-year college students from the College of Foreign Languages and the College of Materials Engineering at a research university in northeastern China and they were enrolled in first-year English writing class.

Two hundred and three NNESs were in the initial pool. Ninety of them fit in the proficiency requirements based on the National College Entrance Exam (NCEE) English part. The NCEE is a national standardized test that senior high school students must take to enter universities in China, which measures students' English reading, writing and listening skills. Based on the scores of the first year students enrolled in 2016 at the university ($M = 121$, $SD = 2.96$), participants were classified into two proficiency groups: advanced proficiency (A-NNES) and intermediate proficiency (I-NNES) (see Figure 4.1). The top 25% participants (≥ 127 out of 150, $M = 130.45$, $SD = 3.53$) were labeled as the A-NNES group and the bottom 25% (≤ 116 out of 150, $M = 108.61$, $SD = 9.26$) were in the I-NNES group. The proficiency levels of the A-NNES and I-NNES groups were statistically significantly different according to a pairwise t-test analysis, $t(66) = 17.72$, $p < .001$. The result of a background survey on language learning experience, teaching experience and self-perceived computer literacy indicated that none of the NNES participants had participated in any computer-mediated collaborative writing activities

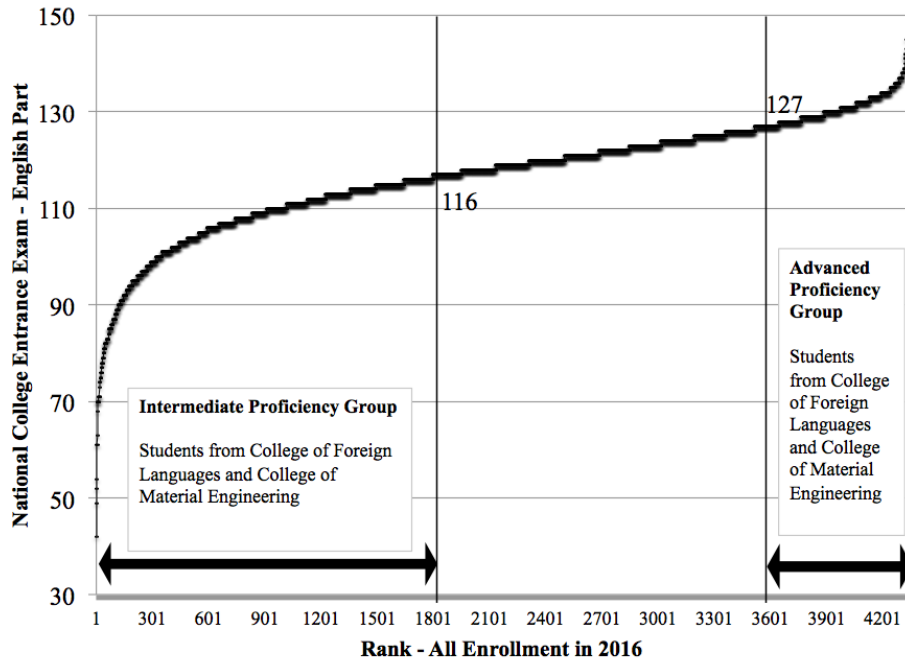


Figure 4.1. National College Entrance Exam English Part - School Distribution and Proficiency Groups

prior to this study. Both NNES and NES participants' ability to type in English using computers and sufficient experience of using the chosen technology.

Using a quasi-experimental multi-group design, each NNES participant was randomly paired with a NES participant or a NNES participant with a different level of language proficiency. The three collaborative writing groups were labeled with dyadic type and language proficiency: A-NNES and I-NNES ($n_{\text{participant}} = 44$; $n_{\text{dyad}} = 22$), I-NNES and NES ($n_{\text{participant}} = 46$; $n_{\text{dyad}} = 23$), A-NNES and NES ($n_{\text{participant}} = 44$; $n_{\text{dyad}} = 22$). After the study, the dyads that completed all the tasks and submitted all the required materials remained in the pool for data analysis. The final sample size for each group was: A-NNES and I-NNES ($n_{\text{participant}} = 32$; $n_{\text{dyad}} = 16$), I-NNES and NES ($n_{\text{participant}} = 34$; $n_{\text{dyad}} = 17$), A-NNES and NES ($n_{\text{participant}} = 42$; $n_{\text{dyad}} = 21$). One professor in the English department and two administrators in the two selected colleges at

the Chinese university acted as coordinators overseas. The researcher trained the three coordinators on the study procedure and provided them with weekly instructions. The researcher and the coordinators maintained contact and exchanged information about participants' performance and the step-by-step procedure throughout the whole study period.

Writing Tasks

The academic writing tasks were designed, taking students' interest, language learning context and writing competency into consideration. As an extra-curriculum activity for the English writing class, the task objectives for the NNES participants were to enhance their learning of English form and meaning (i.e., grammar, vocabulary, sentence structures) and writing skills (i.e., content, coherence, cohesion and text structure). The task topic was selected based on the survey result from a pilot study. Thirty-six NNESs and 18 NESs similar to the actual participants of this study and from the same populations of this study participated in the pilot study one semester before this study. The pilot study lasted for four weeks, during which students completed one computer-mediated collaborative writing task and filled out an evaluation survey of the task. The survey results showed that the students were interested in the following topics: education in different cultures, movies and music, sports, and current events in the society. The topics were further checked and confirmed by an English writing teacher in the Chinese university for cultural and educational appropriateness. Considering the English writing teacher's suggestion, *education in different cultures* was selected as an appropriate topic for the learners in this study. Guidelines and resources for the collaborative writing tasks were provided to the participants (see Appendix A for an example). The guidelines included a selection of sub-topics related to *education in different cultures*, resources that participants can refer to and

criteria for academic writing. To avoid misunderstanding of the study procedure, the instruction was written in both English and Chinese.

Guidelines for Peer Interactional Feedback

As suggested by previous studies on peer interactional feedback, adequate training and guidance are needed for providing effective feedback (Watanabe, 2008; Jiang & Ribeiro, 2017). Therefore, the participants received guidelines on how to provide peer interactional feedback (see Appendix D) and were instructed to use the guideline as a reference during the study. The guidelines were provided in both Chinese and English to ensure EFL learners' understanding about the procedure of providing feedback. The principles and examples of how to exchange feedback in synchronous text-chats were made clear to the participants through a detailed explanation of the guidelines during the study orientation.

Perception Survey

A perception survey was designed to investigate the NNEs' perceptions of the computer-mediated collaborative writing task, including the following six items in Table 4.1. The survey asked the NNEs to rate their feelings about each item on a 5 point Likert scale from 1 (= Strongly agree) to 5 (= Strongly disagree). The first four items in the survey were focused on the NNEs perceptions of exchanging peer interactional feedback during synchronous text-chat (items 1 and 2) and whether using technology for collaborative writing affects their confidence and motivation in English language use and writing (items 3 and 4). Item 5 looked at whether the NNEs perceived improvement in English writing after the collaboration and item 6 was on whether they would recommend this task as a classroom activity to their English writing teacher. Because we aim to explore how the collaborative writing tasks benefit NNEs on their

learning of English form and meaning as well as development of writing skills, only the NNEs were surveyed by the end of the study.

Table 4.1

Perception Survey Items

Item Number	Item Content
Item 1	Using online text-chat to exchange and discuss feedback is very effective for me to notice the areas for improvement.
Item 2	Discussion through online text-chat makes me concentrate more on the tasks.
Item 3	Using technology makes me more confident in expressing myself in English.
Item 4	This online collaborative writing experience motivated me to write more in English.
Item 5	I feel my English writing ability has improved through this collaboration.
Item 6	I would recommend online collaboration projects like this to be used by my English teachers.

CMC Technology

During the study, the dyads completed two collaborative writing tasks using QQ for interactions and *Microsoft Word* for writing. These tools were selected since both were accessible in the study contexts and participants were either familiar or made familiar of the tools through training. QQ is a multifunctional online chatting software developed by Tencent Technology Co Ltd. This social media software has recently been adapted as a reliable and effective tool for English language learning in China (Zeng, 2017). This tool enables synchronous and asynchronous communication for distant collaboration, featured with text-, voice- and video-chats, English and Chinese mutual translation, and online and offline file transfer. Participants in this study used QQ for synchronous text-based interaction and transfer of files.

Procedure

Table 4.2 shows the procedure of the current study. In Week 1, both the NNES and NES participants attended an orientation about the study and participated in a training session on the use of technology hosted by the researcher and the coordinators. The instruction and guideline for feedback were distributed and described during the orientation. At the end of the training session, both NNES and NES participants completed the background survey. From Week 2 to Week 7, participants completed two computer-mediated collaborative writing tasks. By the end of Week 7, the NNES participants were asked to fill out a perception survey on their attitudes toward the task.

Table 4.2

Study Procedure

Time	Activities
Week 1	Orientation Training on technology Background Survey
Week 2	Planning and writing Task 1 first draft
Week 3	Practice activity on providing peer interactional feedback Exchanging peer interactional feedback on Task 1 first draft
Week 4	Editing and finalizing Task 1
Week 5	Planning and writing Task 2 first draft
Week 6	Exchanging peer interactional feedback on Task 2 first draft
Week 7	Editing and finalizing Task 2 Perception Survey

To complete each task, the dyads followed the steps of planning, writing, and editing. From Week 2 to Week 4, each dyad collaboratively completed the Task 1. In Week 2, the dyads

discussed the content and structure, as well as labor division, and then wrote the first draft. The participants were instructed to do planning and writing jointly. In Week 3, a training session on how to exchange peer interactional feedback online through synchronous text-chats were provided prior to the dyads exchanging interactional feedback on their essay. During Week 4, the dyad edited and finalized the essay for Task 1 through negotiations. Following the same procedure, the dyads completed Task 2 from Week 5 to Week 7. By the end of Week 7, the NNES participants were asked to fill out a survey on their perceptions toward the tasks.

Data Analysis

LRE and NLRE Coding. The text-chat logs and the drafts of the two collaborative texts were collected weekly. The LREs and NLREs in the chat logs were coded and counted for their frequency using the coding criteria in Table 4.3, which was designed based on Storch and Wigglesworth (2007, 2010) and Swain (1998) studies. LREs were categorized into three types: lexis-based LREs focusing on vocabulary use, form-based LREs focusing on morphosyntax, and mechanical LREs focusing on spelling and punctuation. Any negotiation episodes on the overall structure and content of the writing were coded as NLREs. The examples selected from the data are verbatim, with their grammatical or spelling errors left intact.

Besides the frequency of LREs and NLREs, the characteristics of LREs and NLREs were coded for further analysis. The coding criteria shown in Table 4.4 was a modified version of Loewen's (2004) criteria. The initiator of episodes represented the person who started the first turn of an episode, which identified an error or a possible revision directly or indirectly. The length of episode was labeled as complexity. If only one response move followed after the first turn initiated, the episode was considered as a simple LRE or NLRE. An episode with more than one response move following the initial turn was identified as a complex episode. Only initiator

Table 4.3

Coding Criteria for LREs and NLREs

Categories	Description	Examples
Lexis-based LRE	<i>Vocabulary:</i> on the choice of vocabulary when the text is grammatically correct	<i>NNES:</i> Also, instead of saying "so" it is better to choose stronger word choice and say "As a result." <i>NES:</i> Yes. Can emphasize!
Form-based LRE	<i>Morphosyntax:</i> on the errors or appropriateness of sentence structures and forms of vocabulary, such as tense, pluralization and others	<i>NES:</i> The last sentence in yours has three complete thoughts: "In a word, every school system has its pros and cons, but as long as we study hard and try to improve ourselves, everything will be deserved." <i>NNES:</i> add an "and" between the first two thoughts, orAs long as Is that right? Oh,yes ,use"but"! <i>NES:</i> Yeah!
Mechanical LRE	<i>Spelling:</i> on the general spelling errors	<i>NES:</i> There are 3 of them, kindergarten, basical, and dayly. May I help you with the corrections? <i>NNES:</i> Yes. kindergarten? <i>NES:</i> Yes that's correct!!!
	<i>Punctuation:</i> on the general punctuation errors	<i>NES:</i> The sentence "some students in order to get better grades they copy others" this is a great sentence, but we need to add a few commas! So it would say: some students, in order to get better grades, copy others" <i>NNES:</i> Awesome! <i>NES:</i> We add these commas because it is extra information! Usually, but not completely necessary! Does that make sense? <i>NNES:</i> Yes!
NLRE	<i>Overall structure:</i> on the overall structure of the written texts	<i>NES:</i> We can divide the whole article into two parts. <i>NNES:</i> The next? <i>NES:</i> The first part is about the opportunity and second part is about the challenge. <i>NNES:</i> The idea is quite good.
	<i>Content:</i> on the selection, addition, and deletion of the text content	<i>NES:</i> Do you have any questions or any suggestions on how it could be changed? <i>NNES:</i> I think you can write more about your community, or group activities <i>NES:</i> okay! I will definitely add things like that.

and complexity characteristics were chosen since as Loewen stated, these two features mainly affect the quality and quantity of the language input received.

Table 4.4

Characteristics of LREs and NLREs

Characteristic	Description	Categories
Initiator	The person who initiated the first turn in a LRE or a NLRE	<i>Advanced NNES (A-NNES)</i> <i>Intermediate NNES (I-NNES)</i> <i>NES</i>
Complexity	Length of a LRE or a NLRE	<i>Simple</i> : one more response move (e.g., acknowledgement) <i>Complex</i> : more than one response moves (e.g., multiple turns to explain the error and solutions)

Uptake. The criteria for coding immediate and the delayed uptakes (see Table 4.5) were taken from Nassaji (2009) and Storch and Wigglesworth (2010). The immediate uptakes were located in the chat logs. Based on the response features given after feedback, we categorized immediate uptakes into acknowledgement, immediate correction and no uptake. The delayed uptakes were identified by comparing the first and the last draft of the texts based on the feedbacks given during the interaction. Only uptakes associated with LREs were coded for investigating noticing and learning of linguistics forms and meaning.

One of the coordinators in China double-coded 10% of the chat logs and collaborative texts. The inter-coder reliability was 0.91 for coding LREs and NLREs and 1 for coding complexity and initiator of feedback. The disagreements were further discussed and agreements reached.

Table 4.5

Coding Criteria for Immediate and Delayed Uptake

Categories	Sub-Categories	Descriptions
Immediate Uptake	Acknowledgement (A)	The response move only consists of a simple acknowledgment, such as "Okay" "Yes, I agree".
	Immediate Correction (IC)	The response move(s) consists of a correction of the error
	No immediate uptake (None)	No response move followed the trigger.
Delayed Uptake	Correct resolution (✓)	The later version of the texts consist of correct revisions based on the LREs.
	Incorrect resolution (✗)	The later version of the texts consist of incorrect revisions based on the LREs.
	Unresolved (?)	The later version of the texts does not have revisions related to LREs.

Quantitative Analysis. The number of LREs, NLREs, and immediate and delayed uptake were counted for frequency. The percentage of the number of episodes in each category over the overall number of the episodes in the group was calculated, as well as the percentage of uptakes. The descriptive statistics was performed on the frequency of LREs and NLREs to understand the individual dyadic differences among participants' performance. The results of the perception survey were also quantified. In order to understand the participants' attitudes toward the computer-mediated collaborative writing tasks, the answers were clustered into three categories: positive attitude (i.e., 1 = Strongly agreed or 2 = Agreed), neutral attitude (i.e., 3 = Neutral), and negative attitude (i.e., 4 = Disagreed or 5 = Strongly disagreed). Therefore, the percentages of positive, neutral, and negative responses were calculated on a cluster basis.

Qualitative Analysis. To further analyze the impact of language proficiency and dyadic type on learners' performance during interactions, a qualitative analysis of the chatting logs from

nine randomly selected dyads was conducted. The purpose of the qualitative analysis was to locate potential *noticing* evidence through LREs and uptakes and identify the connections between the two variables (i.e., language proficiency and dyadic type) and EFL learners' language learning during collaboration. We also conducted a macrogenetic analysis (Nassaji & Swain, 2000) on the nine dyads to investigate the cross-session growth. In this analysis, the development of interaction strategies and the process of learning were examined by the LREs related to the same language feature produced over time.

Results

Quantitative Analysis

The quantitative analysis of the participants' interactions answered research questions one through three about the frequency and features of LREs, NLREs and uptakes. Table 4.6 through Table 4.10 summarize the descriptive statistical information on the frequency and features of LREs, NLRE and uptakes in the data from 16 A-NNES & I-NNES dyads, 17 I-NNES & NES dyads and 21 A-NNES & NES dyads.

Table 4.6 shows the frequency of LREs and NLREs generated from each group. The results show that the frequency of LREs and NLREs had a noticeable difference among the three dyadic groups: A-NNES & NES (870) > I-NNES & NES (457) > A-NNES & I-NNES (371). A-NNES and NES dyads generated significantly more episodes than the other two dyadic types. Moreover, although mechanical areas received more attention during interactions when NNESs collaborated with NESs, the three groups showed similar distribution of different types of LREs and NLREs. Among the three types of LREs, form-based episodes accounted for the highest percentage across the three dyadic groups. Furthermore, NLREs related to content areas had higher frequency than NLREs related to text structure.

Table 4.6

Frequency and Percentage of LREs and NLREs by Categories and Dyadic Type

Dyadic Type	Overall	LRE			NLRE			
		Total	Lexis	Form	Mechanical	Total	Structure	Content
A-NNES & I-NNES	371	209 (56%)	42 (11%)	149 (40%)	18 (5%)	162 (44%)	66 (18%)	96 (26%)
I-NNES & NES	457	264 (58%)	42 (9%)	178 (39%)	44 (10%)	193 (42%)	53 (11%)	140 (31%)
A-NNES & NES	870	496 (57%)	78 (9%)	351 (40%)	68 (8%)	374 (43%)	107 (12%)	266 (31%)

As shown in Table 4.7, although A-NNES & NES dyads had the highest frequency of LREs and NLREs, the difference may not be significant because of the large variation in each group. As shown in Table 4.6 and Table 4.7, A-NNES and NES dyads were more engaged in interactions compared to the other two groups. However, this dyadic type also had the highest variation of the frequency of LREs and NLREs among the three groups.

Table 4.7

Descriptive Statistical Information for Frequency of LREs and NLREs

Dyadic Type	Variable	Mean	SD
A-NNES & I-NNES	Overall	23.25	13.18
	LRE	13.13	12.11
	NLRE	10.13	4.81
I-NNES & NES	Overall	26.89	29.48
	LRE	15.53	20.83
	NLRE	11.35	9.66
A-NNES & NES	Overall	41.62	40.94
	LRE	23.81	27.30
	NLRE	17.81	16.28

In terms of features of LREs, the results showed large differences among groups (see Table 4.8). First, when NNESs collaborated with other NNESs, both interlocutors initiated similar amount of LREs during interactions (A-NNES – 50%, I-NNES – 50%). However, when NNESs collaborated with NESs, NESs tended to be the main facilitator for LREs. Regarding language proficiency, advanced learners initiated more LREs in NNES-NES dyads (A-NNES – 33%, I-NNES – 18%). Second, regarding the complexity of LREs, similar results were found in A-NNES & I-NNES and I-NNES & NES dyads, as the majority of LREs were simple in nature (i.e., with one response move) (A-NNES & I-NNES – 66%, I-NNES & NES – 63%). On the other hand, in A-NNES and NES group, simple LREs only accounted for 38% of the overall episodes, with 62% of the episodes being complex. This finding reflects that more negotiations related to LREs and feedback were made during interactions between advanced learners and NESs.

Table 4.8

Numbers and Percentages of LREs by Features and Dyadic Type

Dyadic Type	Initiators			Complexity	
	A-NNES	I-NNES	NES	Simple	Complex
A-NNES & I-NNES	105 (50%)	104 (50%)	-	139 (66%)	70 (34%)
I-NNES & NES	-	48 (18%)	216 (82%)	165 (63%)	99 (37%)
A-NNES & NES	162 (33%)	-	334 (67%)	190 (38%)	306 (62%)

Comparing of the initiator and complexity level of LREs with those of NLREs (see Table 4.9), similar patterns were found, yet with one major difference: NLREs in A-NNES & I-NNES

dyads (80%) as well as I-NNES & NES dyads (82%) had higher percent of complex episodes than LREs in the same dyads (A-NNES & I-NNES – 34%, I-NNES & NES – 37%). Moreover, intermediate learners initiated a slightly higher percentage of NLREs on structure (50%) and content (55%) when they collaborate with NESs than LREs on language issues (18%)

Table 4.9

Numbers and Percentages of NLREs by Features and Dyadic Type

Dyadic Type	Category	Initiators			Complexity	
		A-NNES	I-NNES	NES	Simple	Complex
A-NNES & I-NNES	Overall	78 (48%)	84 (52%)	-	33 (20%)	129 (80%)
	Content	30 (45%)	36 (55%)	-	9 (14%)	57 (86%)
	Structure	48 (50%)	48 (50%)	-	24 (25%)	72 (75%)
I-NNES & NES	Overall	-	57 (29%)	136 (71%)	34 (18%)	158 (82%)
	Content	-	12 (23%)	41 (77%)	13 (25%)	40 (75%)
	Structure	-	45 (32%)	95 (68%)	22 (16%)	118 (84%)
A-NNES & NES	Overall	130 (35%)	-	244 (65%)	81 (22%)	293 (78%)
	Content	31 (29%)	-	76 (71%)	25 (23%)	83 (77%)
	Structure	99 (37%)	-	168 (63%)	56 (21%)	210 (79%)

The frequency and percentage of immediate and delayed uptakes followed after LREs are shown in Table 4.10 and 4.11. This result indicates the potential opportunities for noticing and possible evidence of learning from the collaborative writing process. The immediate uptakes were extracted from the chat logs. The delayed uptakes were identified in the collaborative

written texts by matching the revised text with the associated LREs. As indicated in Table 4.10, each group had some LREs that did not receive any response move after the initiator identified an error directly or indirectly, especially in the A-NNES & I-NNES dyad (30%). Moreover, when intermediate learners collaborated with advanced learners or NESs, half of the response moves to the feedback was a simple acknowledgement (A-NNES & I-NNES – 46%, I-NNES & NES – 52%), which also explains why more simple LREs were found in these two groups (see Table 4.8). However, 56% of the LREs between A-NNES and NES consisted of immediate correction.

Table 4.10

Numbers and Percentages of Immediate Uptakes by Sub-categories and Dyadic Type

Dyadic Type	Acknowledgement	Immediate Correction	No Uptake
A-NNES & I-NNES	97 (46%)	50 (24%)	62 (30%)
I-NNES & NES	136 (52%)	74 (28%)	54 (20%)
A-NNES & NES	153 (31%)	277 (56%)	76 (15%)

There were several differences between the groups with regards to delayed uptakes. First, less correct resolutions were made in the delayed uptakes in the A-NNES & I-NNES dyads (64%) and I-NNES & NES dyads (74%) than in the A-NNES & NES dyads (81%). Second, less incorrect resolutions were found in dyads with NESs: 5% in I-NNES & NES, 6% in A-NNES & NES compared to 18% in A-NNES & I-NNES. Third, a considerable amount of LREs were not addressed in later revisions, with the A-NNES and NES group having the lowest percent (13%).

Table 4.11

Numbers and Percentages of Delayed Uptakes by Sub-categories and Dyadic Type

Dyadic Type	Correct Resolution	Incorrect Resolution	No Resolution
A-NNES & I-NNES	135 (64%)	37 (18%)	37 (18%)
I-NNES & NES	195 (74%)	13 (5%)	56 (21%)
A-NNES & NES	404 (81%)	29 (6%)	63 (13%)

To answer research question five, the results of the attitude survey were summarized (Table 4.12). The results shows that advanced learners who collaborated with NESs had positive attitude towards all the items, whereas the other two groups revealed negative response to several items. First, on item 2 "*Discussion through online text-chat makes me concentrate more on the tasks*", 14% of the learners in the A-NNES & I-NNES group and 20% in the I-NNES & NES group showed a negative feeling. Second, though the majority of the participants in the A-NNES & I-NNES group (70%) and the I-NNES & NES group (66%) thought this experience motivated them to write more in English, only about half of the participants felt more confident in using and writing English and reported improvement. On the other hand, participants in the A-NNES & NES group presented a more positive attitude: 95% reported enhancement in confidence, 96% thought it promoted their motivation, and 100% reported improvement. Third, it is necessary to highlight that the majority of the participants recommended this computer-mediated collaborative writing task to be implemented in their college English writing classes (i.e., A-NNES & I-NNES: 83%, I-NNES & NES: 85%, A-NNES & NES: 96%).

Table 4.12

Summary of the Perception Survey Results (n = 53)

Items	A-NNES & I-NNES			I-NNES & NES			A-NNES & NES		
	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative
Using online text-chat to exchange and discuss feedback is very effective for me to notice the areas for improvement.	85%	13%	2%	95%	5%	-	92%	8%	-
Discussion through online text-chat makes me concentrate more on the tasks.	50%	36%	14%	35%	45%	20%	70%	13%	17%
Using technology makes me more confident in expressing myself in English.	57%	36%	7%	58%	48%	4%	95%	5%	-
This online collaborative writing experience motivated me to write more in English.	70%	28%	2%	66%	29%	5%	96%	4%	-
I feel my English writing ability has improved through this collaboration.	57%	16%	27%	48%	35%	17%	100%	-	-
I would recommend online collaboration projects like this to be used by my English teachers.	83%	12%	5%	85%	10%	5%	96%	4%	-

Qualitative Analysis

To go deeper in answering research question four on how dyadic type and language proficiency affect learners' noticing during the writing process, an in-depth qualitative analysis of nine randomly selected dyads was conducted. The nine dyads included: Dyads 6, 9 and 15 from the A-NNES & I-NNES group, Dyads 18, 14 and 31 from the I-NNES & NES group, and Dyads 43, 48 and 54 from the A-NNES & NES group. First, the interactional feedback strategies and participants' responses to feedback were analyzed, using Nassaji's (2015) categorization of interactional feedback (see Figure 4.2). Second, the focus of interactional feedback was examined. Last, we examined LREs on the same errors produced over time to investigate the cross-session growth on certain linguistic aspects, aiming to locate potential evidence of noticing and language learning.

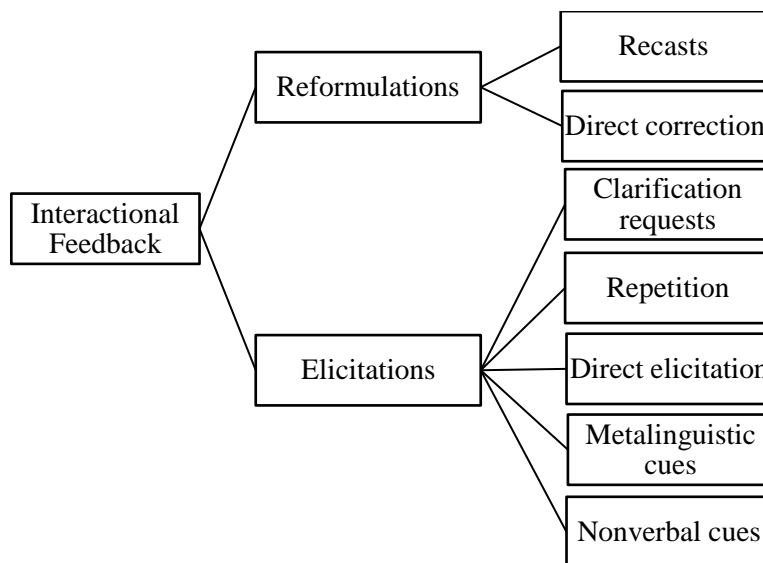


Figure 4.2. Categories of Interactional Feedback, reprinted from Nassaji (2015)

Overall, we found that NNESs used mainly direct correction to provide feedback, whereas NESs used more elicitation strategies along with direct feedback. Moreover, direct corrections usually followed with one response move, such as a simple acknowledgement, except when disagreements were in place or a further clarification was needed. As per our analysis, dyadic type and language proficiency had a significant impact on how NNESs initiated and responded to feedback during interactions, the focus of interactional feedback, and their growth over time. Below, the findings on participants' performance during the collaborative writing process are first presented, followed with analysis on the focus of interactional feedback and NNES's cross-session improvements on language learning.

Performance of I-NNES. Examples 1 through 5 represent how I-NNESs performed differently in various situations. In Examples 1 and 2, the collaborating partners of I-NNESs provided feedback using direct correction. To respond to the given feedback, the I-NNESs used different strategies. In Example 1, the I-NNES learner in the A-NNES & I-NNES dyad responded to the feedback with a metalinguistic explanation and challenged the correctness of the given feedback. However, in Example 2, the intermediate learner chose to accept the feedback from the NES with a simple acknowledgement "OK" without further questioning, even when the NES specifically asked for the I-NNES partner's opinion.

Example 1 (Dyad 15, A-NNES & I-NNES)

A-NNES: and appear is not right

 appearing

 it is active

I-NNES: but if we use appearing, what about the verb

A-NNES: yeah yeah yeah

my brain break down tonight I think

Example 2 (Dyad 24, I-NNES & NES)

NES: I think there are some grammar things we could change in the first paragraph!

Instead of "But Chinese and America class makes the difference more obvious" we could say "However, Chinese and American class schedules make the difference more obvious." Do you have any ideas also?

I-NNES: OK

Besides differences in response moves, dyadic type also had an influence on I-NNESs' initiation of feedback. Extracted from the same two dyads above, Example 3 and 4 are interaction episodes with the I-NNESs being the initiator of the feedback. Strategies used to provide feedback were different in terms of explicitness. In Example 3, the intermediate learner not only identified the errors and offered a correction, but also provided a further explanation when his partner did not accept the correction immediately. However, in Example 4, I-NNES wanted to offer a mechanical correction but hesitated to bring up the error. Instead, she first checked with her NES partner whether the rule is correct or not by "*Can we use a ',' before and?*" After receiving the NES's positive response, she identified the error in the next turn. In many other cases, the I-NNESs would provide a direct correction followed with a confirmation question, such as "*What do you think?*" "*How about this?*" "*Is this correct?*" when interacting with NESs.

Example 3 (Dyad 15, A-NNES & I-NNES)

I-NNES: "There are some details as follows"

some details are as follows

A-NNES: i don't know whether that sentence is right

i just write it by my feeling

I-NNES: which sentence?

A-NNES: as follows

I-NNES: ohohoh, we usually use XX are as follows

Example 4 (Dyad 24, I-NNES & NES)

I-NNES: Can we use a "," before and?

NES: usually yes- where are you talking about?

I-NNES: I think the best education is let the student to find the beauty of life !!!(here)

and maintain the curiosity.

NES: Yeah you could put one there

I-NNES: Haha, ok

The above four examples represented how I-NNESs responded to a given feedback and how they provided feedback in different dyadic groups. Based on how I-NNESs responded to their partners' feedback and the complexity of the episodes, it appears that the I-NNES learners were more confident and willing to provide input when interacting with A-NNESs; whereas less confident and active in the conversations with NESs.

Performance of A-NNES. A-NNES initiated feedback similar to I-NNES in NNES-NNES dyads, indicating that the NNES of both proficiency levels took equal responsibility for initiating interactional feedback based on the quantitative results. However, in general the A-NNES responded to feedback from I-NNES differently compared to when they responded to feedback from NESs.

First of all, the episode in Example 5 between an A-NNES and a NES is more complex than the ones generated by I-NNES & NES dyads (see Examples 2 and 4). In this episode, a considerable amount of turns was taken for metalinguistic explanations (turns three, five, and nine). Second, the A-NNES constantly asked for clarification (turn two) and informed her partner of the level of understanding (turns four and eight). Clarification requests then facilitated the response to feedback negotiations. From the input of the A-NNES about how well she understood the grammatical rule and her partner's feedback, the NES was able to provide explanations that catered to the partner's ability. In the same turn where the A-NNES acknowledged that she received the feedback (turn two), she also asked for clarification, "*Past tense?*", because she could not comprehend the grammatical rule for responding to feedback. She asked her NES partner to provide additional metalinguistic explanations in the following turns (clarification request). During the process, the A-NNES learner explicitly informed her partner of her knowledge of English tense, which gave the NES partner further information to facilitate deeper understanding. Such active engagement in feedback related negotiations was rarely found in the three I-NNES & NES dyads. Although metalinguistic explanations were also provided among the A-NNES & I-NNES dyads and the I-NNES & NES dyads, the explanations were less complex than the ones in the A-NNES & NES dyads.

Example 5 (Dyad 43, A-NNES & NES)

1 NES: And that's as same as American government do. Though students in China
and America have different lifestyles and values, they do have something
in common the beginning of the sentence can be changed to "That's the
same as what the American government does" to make it past tense

2 A-NNES: Yes.

Past tense?

3 NES: So using "does" makes it present tense and past tense. If you use "do" it's
just present tense

4 A-NNES: I don't think "does" refers past tense.

5 NES: Sooo in the sentence it says "That's the same as American government do".
When you make the comparison you are saying the American government
already does it

6 A-NNES: Yeah.

7 NES: or already did it

8 A-NNES: I know "did it", but I seldom heard about "does it".

9 NES: So "did it" makes it past tense

"does it" means they already did it and continue to do it

10 A-NNES: Yes.

Oh. I see.

11 NES: Does it make sense? Sorry, I am not that good at explaining eitherrrrr

12 A-NNES: Yes. I understand what you mean.

Performance of NES. Although the improvement of NESs' ability through collaborative writing is not the focus of this study, their role and engagement in providing feedback and discussing it during collaborations are important to consider. The strategies NES participants adapted had a great impact on the overall interaction patterns. First, NESs used elicitation to provide feedback to the learners, which NNESs in this study did not use. Through elicitation, NESs encouraged and facilitated the NNES partners to figure out a correct solution step by step, instead of directly providing the answer to their partners. As shown in Example 6, the NES partner first identified the location of the error. Rather than provide a direct correction, she then asked her partner "*Why do we think this needs to be revised?*" To respond, the NNES provided a solution but it was inappropriate. With the NNES failing the attempt, the NES first acknowledged her partner's effort by saying "*okay*" and then provided the correct solution. Although no metalinguistic explanation was provided, A-NNES paid attention to the erroneous sentence through responding to her partner's question in the first turn.

Example 6 (Dyad 31, A-NNES & NES)

NES: So the sentence "The Chinese teaching is a kind of passing on knowledge, the teacher just teach you know but how teach you know why, maybe the teacher himself doesn't know why." *Why do we think this needs to be revised?*

A-NNES: "but teach you know why" does not make any sense

Here should be another conjunction i think.

How about "rather than"?

NES: okay, so. I think " the teacher just teach you know how" also doesn't make sense, So I think this can be revised to "The teacher just teaches you the "how"

in class, but no the "why."

but not the why*

A-NNES: Okay. That sounds great!

Another strategy NESs used to prompt feedback from the NNESs was the use of a more general/open-ended elicitation. In Example 7, the dyad was focusing on grammatical errors during the interaction. Without directly providing feedback on errors, the NES partner asked a general question "*Are there any grammatical errors?*" to encourage the NNES learner to find the errors herself. However, the NNES did not provide a response to the feedback in the next turn. Then the NES partner further asked the NNES learner to specify the grammatical errors she found. Followed with the NES partner's questions, the NNES learner eventually pointed out the error and provided a corresponding correction in the later turns.

Example 7 (Dyad 48, A-NNES & NES)

NES: Alright you ready? Are there any grammatical errors?

A-NNES: ok

NES: Do you see any?

A-NNES: yeah.

NES: What?

A-NNES: students have two final examinations, which mean they will have long vocations.

It should be means

NES: Great.

Second, besides elicitations, clarification requests were also commonly used by NESs to ensure mutual understanding during interactions. Compared with the A-NNES & I-NNES dyads, the NNES-NES interactions contained more clarification episodes. In Example 8, the NNES partner identified an error but the expression was not clear. Instead accepting and moving on, the NES asked for clarification so that he could provide a proper response. In addition to the clarification request, the NES partner also restated the correct response after the NNES partner specified the error. As per our analysis of the chat logs and the collaborative texts of Dyad 54, such emphasis on feedback response and its correctness led to more correct revisions in the later draft. However, when the feedback response was not restated in the chats, we found incorrect or no revisions in their collaborative texts.

Example 8 (Dyad 54, A-NNES & NES)

A-NNES: And the match is also wrong.

NES: What do you mean?

A-NNES: There is "kinds of" to express the different types or sth else, does that make sense?

And can you get what I mean?

NES: Yes! That is hard for me to explain but you are right

So far we have: "Some agree that these two kinds of..."

Third, as a non-feedback related move, complimenting was another strategy that NESs often used during interactions to encourage their partner to engage in the collaboration process. Example 9 and Example 10 illustrate how NESs and NNESs performed differently on the use of

compliments when they respond to other's feedback. Example 9 represents an A-NNES & I-NNES dyad, in which the A-NNES directly addressed that they needed to add more personal experience to the text and said that she would take the responsibility and make the revision. However, the I-NNES only responded with a simple acknowledgement and moved on to locate other areas for revisions by saying "*Yes. Anything else?*" The NES in Example 10, on the other hand, complimented the A-NNES partner by saying "*You are doing great!*" From the response of the A-NNES "*Yeah, we have finished another sentence!*" it seems that the acknowledgement and compliment from her NES partner gave her a sense of achievement, which motivated her to be more engaged in the writing process. The survey results reflected this finding that the NNESs who collaborated with NESs reported more confidence and improvement in their writing and English proficiency.

Example 9 (Dyad 6, A-NNES & I-NNES)

A-NNES: We are supposed to add more personal experience

I-NNES: Ok, where?

A-NNES: The second section. I can accomplish it, don't worry. From the "sometimes" in the first line, before "the"

I-NNES: Yes. Anything else?

Example 10 (Dyad 45, A-NNES & NES)

A-NNES: the "could"

NES: Yup. It should be "can."

That's it for that sentence! *You are doing great!*

A-NNES: Yeah, we have finished another sentence!

Focus of Interactional Feedback. As Table 4.5 above shows, language proficiency and dyadic type affected the focus of interactional feedback, in which the major difference among the dyadic groups was on mechanical errors. The qualitative analysis not only confirmed this result but also revealed the following findings:

- 1) I-NNESs focused more on overall structure, content selection, and mechanical errors (i.e., capitalization and spelling);
- 2) A-NNESs attended mostly to tense and pluralization;
- 3) NESs emphasized the use of vocabulary, sentence structure, and mechanical errors (i.e., punctuation).

The following episodes extracted from interactions among the nine dyads exemplified the above findings.

Examples of I-NNES. Taking Dyad 6 as an example of A-NNES & I-NNES dyads, the I-NNES partner initiated 13 LREs and NLREs out of 33 during the collaboration, among which nine of the episodes were focused on content selection and overall text structure. Example 11 shows that the I-NNES learner thought that the biggest issue in their writing was the lack of personal experience. Then she pointed out this problem during interaction and implicitly indicated a potential revision. Later in the same week, when the episode in Example 12 occurred, the I-NNES noticed that her previous indication did not lead to revision. Then she explicitly addressed the same content-related issue and received an acknowledgement from her partner. Similar episodes appeared multiple times in this dyad's interactions during the task period and in other dyads where I-NNES was one of the interlocutors.

Example 11 (Dyad 6, A-NNES & I-NNES)

I-NNES: However, I think the biggest shortage is that the composition is not combined with personal experience.

A-NNES: Yes, this is very important.

Example 12 (Dyad 6, A-NNES & I-NNES)

I-NNES: We can add some personal experiences to here.

A-NNES: Yes, you are right.

Examples of A-NNES. Different from the previous examples, the A-NNES learner in Dyad 43 attended more to morphosyntactic errors, as reflected by the frequency of LREs on morphosyntax. For example, in Example 13, the A-NNES identified a pluralization error in the text by saying "*It seems the plural problem again*" (turn two). Similar expressions that imply an emphasis on morphosyntactic errors, especially pluralization issues, were found across the other six dyads with A-NNESs, such as "*the 'week' should be 'weeks' too*" (Dyad 9, A-NNES), "*here is another plural mistake*" (Dyad 54, A-NNES). Moreover, pluralization-related verb agreement errors also received attention from the A-NNES participants. For instance, the A-NNES partner in Dyad 48 identified a verb-agreement error, "*the teacher and teach do not match*". The NES partner responded "*Right! You spotted another one. Teacher is singular*". The expression "*another one*" used in the response move implied that there could have been multiple occasions that feedback was provided on the same errors.

Example 13 (Dyad 43, A-NNES & NES)

1 NES: Okay, we will go to the next paragraph!

2 A-NNES: Okay.

It seems the plural problem again.

3 NES: ?

Like where?

4 A-NNES: Chinese education is singular form.

The first sentence of the second paragraph

5 NES: ah okay

Examples of NES. According to our analysis, NESs tended to emphasize punctuation more than the NNES participants. A considerable amount of interactional feedback on punctuation was found during interactions among the six dyads with NESs, especially on one particular spacing error (e.g., a space must be placed after a punctuation mark in English writing). Example 14 is an instance from an I-NNES & NES dyad. As shown in the example, when the I-NNES learner did not apply the spacing rule in the second collaborative writing tasks, the NES partner reminded her partner by saying "*Also, lets remember to always...*" Similar feedback was found repeatedly among other NNES-NES dyads on the same spacing rule, such as "*still, pay close attention to spaces needed after punctuation*" (Dyad 18, NES), "*remember what we talked about before. You want to make sure you add a space after periods and commas*" (Dyad 48, NES), "*always remember, last word, comma, space*" (Dyad 54, NES).

Example 14 (Dyad 31, I-NNES & NES)

NES: Also, lets remember to always put a space after a period or a comma.

Example: "People must memorize varieties of characters. But Chinese people"

Instead: "People must memorize varieties of characters. But Chinese people"

I-NNES: Oh, I see, sorry

NES: It's ok :)

You only did a few times.

Macrogenetic Analysis: Cross-session Growth. To further answer research question four and examine the process of learning and potentials for noticing related to language proficiency and dyadic type, we conducted a macrogenetic analysis of the LREs on the same errors and their associated uptakes. Because NLREs were only related to content and overall structure, only LREs were examined to investigate learners' growth in learning of linguistics form and meaning.

Guided by Nassaji and Swain (2000), we first summarized the change in frequency of LREs by comparing the LREs generated during Task 1 period and Task 2 period. Table 4.13 indicates that the number of LREs dropped dramatically among the nine dyads, except for Dyad 31, which had the lowest frequency of LREs overall. As mentioned by Nassaji and Swain, the decrease in LREs could imply a potential decrease of errors in Task 2 compared to Task 1. Then, to further obtain an understanding on learners' growth overtime, we analyzed LREs on the same errors initiated in the two task periods. However, due to limited numbers of LREs on the same errors in some dyads, we were only able to perform the analysis with Dyad 15 (A-NNES & I-NNES) on preposition errors and Dyad 48 (A-NNES & NES) on subject-verb agreement and punctuation errors. Detailed analysis is presented as follows.

Table 4.13

Numbers of LREs by Dyads and Task Periods

Dyad	Dyadic Type	Week 2-4 (Task 1) Number of LREs	Week 5-7 (Task 2) Number of LREs
6	A-NNES & I-NNES	12	6
9	A-NNES & I-NNES	28	16
15	A-NNES & I-NNES	19	11
18	I-NNES & NES	10	6
24	I-NNES & NES	13	7
31	I-NNES & NES	5	4
43	A-NNES & NES	40	17
48	A-NNES & NES	63	53
54	A-NNES & NES	47	20

Dyad 15: A-NNES & I-NNES. From their interactions, we observed the potential for noticing and learning on the use of preposition "in" by the advanced learner, which was reflected through the A-NNES learner's responses to feedback. During the period of Task 1, the I-NNES learner identified a proposition error in the A-NNES's writing (see Example 15). Then the I-NNES provided a correction, followed with an acknowledgment from the A-NNES partner. However, while working on Task 2, the A-NNES addressed the feedback on the same error in a different way. Example 16 illustrated that the I-NNES learner noticed a potential proposition error regarding "in" but provided a false correction. Instead of accepting the correction as in the first period, the A-NNES learner disagreed and provided a correct solution. The difference in responses could be an indicator that the A-NNES had noticed the error during the first period so that she was able to notice her partner's erroneous feedback in the second period.

Example 15 (Dyad 15, A-NNES & I-NNES)

I-NNES: the fourth one on your future is not true

we often say in the future

A-NNES: yeah

Example 16 (Dyad 15, A-NNES & I-NNES)

I-NNES: the next, maybe in last summer vacation

add in

A-NNES: last summer vacation don't need to add "in"

I-NNES: yeah maybe it is right

To examine whether the A-NNES learned about the use of "*in*" in writing, we also located the A-NNES's writing in the two collaborative texts and analyzed all sentences in which "*in*" was used. In the first draft of Task 1, seven sentences written by the A-NNES consisted the proposition "*in*", among which, three were erroneous and the I-NNES identified one of the errors in Example 15. However, in the first draft of Task 2, the A-NNES had nine sentences that contained "*in*" without any error. The difference can be taken as an indication that the A-NNES learner could have had prior knowledge about the use of this preposition since she used it correctly in Task 1 in some instances. Through interacting with her partner, she was able to pay closer attention to the correct use of the form and avoid mistakes in Task 2.

Dyad 48: A-NNES & NES. As for Dyad 48, we found LREs were frequently focused on the subject-verb agreement and punctuation errors over time. Analyzing the LREs in the interactions, we were able to figure out the developmental process of the A-NNES learner on the two forms (subject-verb agreement and punctuation), as illustrated in Figure 4.3 and Figure 4.4.

In terms of subject-verb agreement, when exchanging interactional feedback (Week 3), the A-NNES only responded to the provided feedback on subject-verb agreement errors with an acknowledgement. After one week of interaction and editing, the NNES was able to provide corrections guided by the NES's feedback in Week 4. Progressively, during the Week 6 and Week 7 of Task 2, the NNES seemed to be able to identify errors, provide corrections and metalinguistic explanations. The examples in Figure 4.3 represent how the learner performance on this particular grammatical issue gradually improved over time.

<p style="text-align: center;">Week 3</p> <ul style="list-style-type: none"> • NES identified errors • NES provided corrections and metalinguistic explanations • NNES acknowledge the corrections 	<p style="text-align: center;">Week 4</p> <ul style="list-style-type: none"> • NES identified errors • NNES provided corrections • NES provided metalinguistic explanations 	<p style="text-align: center;">Week 6 & 7</p> <ul style="list-style-type: none"> • NES prompt feedback • NNES identified errors and provided corrections • NES acknowledged the corrections • NNES offered metalinguistic explanations
<p style="text-align: center;">Example</p> <p>NES: In the same sentence since schedules is plural is should be are. A-NNES: OK</p>	<p style="text-align: center;">Example</p> <p>NES: The Chinese education pay attention to A-NNES: It should be pays NES: Yes because it is singular.</p>	<p style="text-align: center;">Example</p> <p>NES: Do you know what is wrong with the verb? A-NNES: use NES: Yep A-NNES: because teachers is plural, haha</p>

Figure 4.3. Developmental Process of A-NNES in Dyad 48 on Subject-Verb Agreement.

Similarly, as shown in Figure 4.4 learner's development in using space after punctuations is indicated.

<p style="text-align: center;">Week 3</p> <ul style="list-style-type: none"> • NES prompted feedback • NNES acknowledged lack of knowledge about the form • NES provided corrections and metalinguistic explanations 	<p style="text-align: center;">Week 4</p> <ul style="list-style-type: none"> • NES prompted feedback • NNES failed to locate errors • NES reminded the partner about the previous feedback • NNES recalled the feedback, provided feedback and immediate correction 	<p style="text-align: center;">Week 6</p> <ul style="list-style-type: none"> • NNES incorrectly revised the error in the later draft • NES provided feedback on the incorrect revision • NNES acknowledged the feedback, provided immediate correction in the following turn and revised the writing.
<p style="text-align: center;">Example</p> <p>NES: Are there errors in punctuations?</p> <p>A-NNES: I have no idea about punctuations.</p> <p>NES: Alright. The main thing is that you want to add a space after all periods and commas. Can you find places they did not do this?</p> <p>A-NNES: Let me see I can't find it Haha</p> <p>NES: In the first paragraph globalization. (space) Some</p> <p>A-NNES: <u>Yeah, I can understand it</u></p>	<p style="text-align: center;">Example</p> <p>1 NES: Ok so Are there any errors on punctuations?</p> <p>2 A-NNES: Let me see I don't find it</p> <p>3 NES: <u>Remember what we talked about.</u> You want to make sure you add a space after periods and commas.</p> <p>4 A-NNES: I remember it. Each place has its streams in from all over the world.(space) Different places have different cultures,</p> <p>5 NES: Oh perfect.</p> <p>6 A-NNES: haha, I remember what you said, it is helpful.</p> <p>7 NES: Glad you did!</p> <p>8 A-NNES: haha, thanks</p>	<p style="text-align: center;">Example</p> <p>1 NES: Ok there are some extra spaces added in some places. There is just too much space between the words in these spaces. Make sure to just put one space.</p> <p>2 A-NNES: Yeah. I am sorry. I'm deleting now.</p> <p>3 NES: No problem.</p>

Figure 4.4. Developmental Process of A-NNES in Dyad 48 on Punctuation Error

As shown in Figure 4.4, initially in Week 3, the NES used elicitation to provide feedback on use of punctuation and space. This indicates that the NES assumed her NNES partner should know the basic punctuation rules in English writing. The Week 3 example in Figure 4.4 was the

first episode that occurred during the study on the punctuation error. As we can see, the A-NNES responded to her partner's question and metalinguistic explanations informing the NES that she was not aware of what was wrong with the punctuation. Even when the NES partner explicitly pointed out the punctuation issue, the NNES was not able to figure out the response to the provided feedback. Moreover, although the NES finally provided the correction and the learner claimed that she understood the answer, she did not use space after period in her response "Yeah,I can understand it", which indicated that she did not provide an immediate uptake followed with her partner's feedback.

In Week 4, after the dyad finished revising the draft, the NES noticed that her partner did not revise the punctuation issue. So the NES again tried to have her partner locate the same issue (use of space after punctuation). It is necessary to note that sometimes the NNES would use the *Microsoft Office* phone app for writing and editing, when she could not use her computer for synchronous interactions. The phone app does not highlight errors, such as the punctuation issue, in the text, therefore makes errors less noticeable than the *Microsoft Word* desktop version. or Microsoft Word. Knowing that the NNES had issues with the use of punctuation and space, the NES restated the previous feedback and reminded her partner what the error was by saying “*Remember what we talked about.*” in turn 3 of the Week Example in Figure 4.4. This time the prompt and reminding appeared to be effective and the NNES provided the correct revision immediately in the following turn (turn 6). However, in Task 2 (Week 6), the NNES applied the rule in the writing but incorrectly added extra spaces in the text. The NES then provided direct correction to address this issue. The NNES not only corrected the error immediately during interactions (see Figure 4.4 for Week 6 Example, turn 2) but also used the punctuation and space correctly in the final draft.

Although the findings from these two dyads do not represent the process of language learning of all the participants, we were able to identify that the developmental process of learners' writing ability and linguistic form and meaning can potentially be influenced by learners' language proficiency and interactional patterns. In general, higher language proficiency learners were more actively engaged in interactions, providing more potential for noticing and learning of language form and meaning.

Discussion and Conclusion

The current study explored the relations among dyadic type, learner language proficiency and learners' noticing in computer-mediated collaborative writing tasks. Adapting a quasi-experimental multi-group design, this study analyzed the chat logs, collaborative writing texts and perception surveys generated from a total of 54 dyads with mixed language proficiency labeled in three dyadic types. The findings suggest that computer-mediated collaborative writing tasks facilitate learners' noticing and language learning when properly designed for learners' needs and proficiency levels. The survey data also showed that, in general, the Chinese EFL learners had positive attitudes towards using computer-mediated collaborative writing tasks. Additionally, the more engaged learners found the tasks being more beneficial. Our analysis shows that language proficiency and dyadic type influence the level of engagement and performance during interactions and the intensity of interactions and level of engagement is associated with the level of noticing and learning in writing. More detailed discussion on different aspects of this study is provided as follows.

The Role of NES and NNES in Collaborative Writing

Knowing that English language learners have outnumbered NESs in today's world (Cook, 1999), the investigation of what NNESs can offer each other through collaborative language

learning has become one of the primary topics in ISLA research (Reichert & Liebscher, 2012; Storch, 2002; Watanabe, 2008). One of the purposes of this study was to examine how dyadic type affects language learning and development of writing skills during the collaboration process. The findings indicated that although higher frequency of LREs and NLREs were generated in NNES-NES dyads than in NNES-NNES dyads, collaborating with NNESs and NESs can both benefit Chinese EFL learners' learning of English form and meaning and their development of English writing skills in different aspects. The findings on frequency of LREs and NLREs resonate with earlier studies on peer interactions (Kung & Eslami, 2015; Sotillo, 2005) that though interacting with NESs produced a higher number of episodes, both NNES-NES and NNES-NNES interactions have potential for noticing and subsequent language learning. Supported by previous research (Kung & Eslami, 2015; Sotillo, 2005), the findings of this study confirmed the facilitative roles of both NNESs and NESs in collaborative writing context. In what follows, we will first discuss how collaborating with A-NNESs and NESs affected I-NNESs' language learning process during collaboration, and then center the discussion on how dyadic type mediated A-NNESs' learning and development of writing skills.

Performance of I-NNESs. Specifically, this study showed that I-NNESs were able to benefit equally from collaborating with A-NNESs and NESs, as the frequency of LREs and NLREs indicating similar intensity of negotiations in NNES-NNES and NNES-NES dyads. Moreover, the results of uptakes and correct revisions indicated that collaborating with A-NNESs and NESs provided similar potential for noticing for I-NNES learners. Focused on peer interactions, Kung and Eslami (2015) found that I-NNESs were more active in NNES-NES interactions and demonstrated more instances of LREs when interacting with NESs compared to NNES-NNES dyads. However, Kung and Eslami drew the above finding only from the results of

frequency of LREs and did not examine other features of LREs. Unlike Kung and Eslami, this study also included analyses of the initiator and complexity of LREs and NLREs, as suggested by Loewen (2004). The addition of the feature-related analysis provided sufficient evidence to indicate that though the number of LREs and NLREs in A-NNES & I-NNES dyads was less than in I-NNES & NES dyads, the numbers of LREs and NLREs initiated by I-NNESs in NNES-NNES dyads were higher than in NNES-NES dyads (see Table 4.8 and Table 4.9). Furthermore, the qualitative findings reflected that the I-NNESs were more confident of providing input in NNES-NNES dyads than in NNES-NES dyads. These results suggested that, in the same learning context with the same collaborative writing tasks, the intermediate learners were more engaged in interactions with their A-NNES peers than with NESs, which further affects the potential for noticing and language learning.

As indicated by Watanabe (2008), the patterns of interaction could have a greater impact on learner performance during collaborative writing than the partner's proficiency level. She further stated that learners value the input from their partners and prefer collaborating with someone who is engaged in interactions. Likewise, given that the I-NNESs initiated more LREs and NLREs in the NNES-NNES dyads than in the NNES-NES dyads, it is presumed that I-NNESs were more willing to offer input while collaborating with their NNES peers. Moreover, the qualitative findings revealed how the patterns of interaction differed between NNES-NNES and NNES-NES dyads with I-NNESs. In terms of strategies used to respond to feedback, more metalinguistic explanations on form-based issues were provided by I-NNESs in A-NNES & I-NNES dyads than in I-NNES & NES dyads. On the other hand, I-NNES only acknowledged the feedback from NESs and did not proceed to further negotiations in most episodes. The interactive pattern of A-NNES & I-NNES dyads is viewed as “mutually supportive”, while the

pattern of interactions of I-NNES & NES dyads can be identified as “authoritative/responsive” (Li & Zhu, 2013). As informed by previous research on patterns of peer interaction and its relation with noticing and language learning (Li & Zhu, 2013; Storch, 2002; Watanabe, 2008), the mutually supportive interactions, as shown in the A-NNES & I-NNES dyads, has more potential for noticing and subsequent language learning, which suggests that I-NNESs were able to benefit more from interacting with NNES peers using computer-mediated collaborative writing tasks.

In terms of what aspects had I-NNESs benefited from collaborating with partners on writing, we found that I-NNESs acquired mainly writing techniques from the NESs, such as how to structure an argumentative essay and punctuations. Diab (2005) investigated how NES EFL teachers and NNES EFL teachers perceived as of importance in EFL writing and found that the NES teachers viewed the structure and content of the writing as the primary criterion for evaluating writing quality; whereas NNES teachers emphasized more on grammar and sentence-level issues. Additionally, the I-NNES may consider NES as a more reliable source for feedback than A-NNES (Díez-Bedmar & Pérez-Paredes, 2012). Therefore, the data showed that more feedback on content and structure was given by NESs than by A-NNESs, thus the I-NNES had more opportunities to receive and negotiate feedback on non-language-related aspects in NNES-NES dyads, which led to development of writing skills.

Performance of A-NNESs. The findings of this study indicated that the A-NNESs were able to benefit more from collaborating with NESs than with I-NNESs. Yu and Hu (2017) found that advanced learners’ perception of the quality of peer feedback and goals for peer feedback have a great impact on how advanced learners benefit from peer interactions. From the qualitative findings, we noticed that A-NNESs were more active in interactions with NESs and

the provision of feedback given by NESs was higher than in A-NNES & I-NNES dyads. Likewise, Yu and Hu reported that the higher proficiency learners felt less motivated to interact with lower proficiency learners because the interactions provided them with limited opportunities for language learning. Moreover, Hu and Lam (2010) stated that since advanced learners may have less confidence in the quality of feedback given by lower proficiency learners, they were less motivated to engage in peer feedback, which was also reflected in Yang and Meng's (2013) study. Evidently, it is possible that A-NNESs were demotivated by the potential low quality of peer feedback from I-NNES peers.

In relation to the role of NNES and NES in collaborative writing, the findings of this study resonate with previous research on peer interaction, in which intermediate learners can benefit from both collaboration with advanced learners and native speakers (Kung & Eslami, 2015; Sotillo, 2004; Watanabe, 2008); but advanced learners were more likely to gain more from interacting with peers with a similar or higher level of proficiency (Hu & Lam, 2010; Yu & Hu, 2017). From an ecological perspective, in collaborative writing context, in which learners typically have mixed proficiency, an effective task design should bring benefit to all levels of learners. Thus, informed by this study, teachers should take learners' language proficiency into consideration in task design to optimize the task effectiveness on learning of linguistic knowledge and development of writing skills.

Developmental Process of NNESs' Language Learning

The analysis of the LREs on the same errors revealed the developmental process of NNESs' language learning on certain forms. The findings showed that the NNESs in the two dyads were able to acquire gradually the target forms over time following their partner's feedback. For instance, the A-NNES learners in Dyad 48 developed from lack of knowledge on

the subject-verb agreements to being able to identify the issue, provide correct resolution and metalinguistic explanations. This development of the learning process acknowledged the role of peer interactional feedback in the collaborative writing process. Each negotiation episode on subject-verb agreements provided an opportunity for A-NNES to notice the correct form. It is necessary to note that these negotiations on the target forms consisted metalinguistic explanations or multiple turns. Loewen (2004) indicated the complexity of LREs has a significant predictability on the frequency and accuracy of uptakes. Ellis et al. (2001) also asserted that prolonged negotiations can lead to a better chance of noticing. Supported by Loewen and Ellis et al., we assume that engaging in complex negotiations on a target form repeatedly during the collaboration process can facilitate learners' noticing and language learning of the form, which also echoes Elola and Oskoz's (2010) finding. This finding suggested that in-depth analysis of chat logs over time can be used to demonstrate the developmental process of language learning, which can help teachers and researchers to obtain a more comprehensive understanding of the language learning process.

Individual differences and Contextual Factors

It is important to note that the finding of this study also addressed the potential influence of individual differences and contextual factors on the effectiveness of computer-mediated collaborative writing. As discussed above, dyadic type and language proficiency had an impact on learners' performance during collaboration. However, knowing that the participants were given the same instruction on the same tasks with same time limits to complete the tasks, the performance of each dyads largely varied, which is potentially influenced by individual differences, such as learning motivation, and contextual factors, such as learners' familiarity with computer-mediated language learning. This finding resembles Alwaleedi's (2017) and Díez-

Bedmar and Pérez-Paredes's (2012), in which the variation of the frequency of LREs generated by peer interactions was relatively large as a result of individual differences. Moreover, Spada (2005) suggested that contextual factors needed close attention to ensure ecological validity of empirical ISLA studies. Thus, supported by previous research, below we will discuss what individual traits and contextual factors may have affected the effectiveness of computer-mediated collaborative writing in terms of their performance during collaboration.

As Benson (2017) stated, the primary focus of today's ISLA research is the investigation of the complicated relations among individual learners, classroom instruction and the learning context. Situated in a Chinese EFL writing class, this study found that the participants' background and the EFL class setting in China may have impacted the findings. To understand what individual factors affected learners' motivation to engage in peer collaborations, we further identified the five most engaged dyads (two A-NNES & NES dyads, two I-NNES & NES dyads, and one A-NNES & I-NNES dyads; frequency of LREs and NLREs > 90) and the five least engaged dyads (one A-NNES & NES dyads, two I-NNES & NES dyads, and two A-NNES & I-NNES dyads; frequency of LREs and NLREs < 20). Based on the analysis of chat logs from these dyads and their background survey results, three factors caught our attention: academic major, previous experience of using computers for language learning and collaboration, as well as professional goals.

The NNESs who were most engaged in collaborations were either English major students or had future plan of studying abroad, becoming a teacher, or working in an international firm. On the other hand, the NNESs who were least engaged in the writing process were students of non-English majors, and reported no specific future plan at that time or hoping to work in a major-related profession. Linking with the results of LREs and NLREs, we noticed

that learners' motive to collaborate highly affected their major and profession choices. Therefore, these highly motivated learners can be more active and engaged in the computer-mediated collaborative writing and able to obtain more opportunities for noting and language learning (Bikowski & Vithanage, 2016; Loewen, 2004).

As far as the contextual factors are considered, it is important to know that computer-mediated language learning has not been popular in Chinese EFL class setting (Mei et al., 2017). However, some simple implications of computer technology have been incorporated for teaching practices, such as completing assignments using personal computers or creating online social media groups for after-class teacher-student communications (Paul & Liu, 2017; Zeng, 2017). Based on the NNES participants' self-reported computer competence, all participants had an adequate level of using computers for writing and communication. However, only a limited number of NNESs reported having experience of using technology for collaborative tasks (10 out of 53 NNESs). Therefore, it is presumed that NNESs' familiarity of computer-mediated collaborative learning may have impacted their motivation for collaborative writing. It is also valuable to conduct interviews with the individuals who had prior experience of computer-mediated collaborative learning to investigate how the experience affected their performance in this study.

Attitudes towards Computer-mediated Collaborative Writing

The perception survey results showed that participants in all dyadic groups overall had positive attitudes towards the computer-mediated collaborative writing task and thought the tasks helped their writing improve and enhanced their ability of English language use. However, it is important to note that when asked to rate their impression of the use of CMC technology, about half of the NNESs from the A-NNES & I-NNES and I-NNES & NES dyads reported that 1)

online text-chats did not direct their attention more to the task, compared to face-to-face or online oral-chats, and 2) using technology did not make them feel more confidence in expressing themselves in English. Although their perceptions showed that learners may have perceived using CMC technology for collaborative writing as distracting from collaboration and interaction, the findings of the chat logs showed otherwise. As indicated by the results of LREs and NLREs, a considerable amount negotiation episodes were produced over six weeks, this suggested that the learners were engaged in collaboration and interactions. Moreover, considering that this study was conducted in the Chinese EFL context, in which computer-mediated language learning is not commonly incorporated in English classrooms, the negative perception of the use of CMC technology may come from unfamiliarity of technology-enhance language learning. As shown from the NNEs' background survey, the learners rarely use computers for assignment or class activities. Mostly, technology was used for after-class communication between students and teachers, such as sending out announcement (Yang, Zhu, Jin, & Li, 2017; Zeng, 2017). A number of studies in other language learning contexts have provided supportive evidence that using technology for collaborative writing facilitates collaboration and facilitate interactions (Alvarez et al., 2011; Elola & Oskoz, 2010, 2017; Liu & Sadler, 2003). Therefore, for Chinese EFL learners to acknowledge the benefit of technology for language learning, especially in collaborative writing, and effectively utilize the technology, future study is needed to investigate different computer-mediated task designs situated in the Chinese EFL class setting.

Overall, the findings of this study showed that dyadic type and language proficiency had a great impact on how EFL learners interacted with other NNEs peers or NES in computer-mediated collaborative writing tasks. Moreover, NNEs-NES dyads and NNEs-NNEs dyads

were both beneficial to I-NNESs on potential for noticing and language learning in different aspects. More opportunities for noticing were observed in A-NNES & NES dyads, indicating that advanced learners were able to gain more from collaborating with NESs than with I-NNESs. Furthermore, this study also acknowledged the facilitative role of both NNES and NES in peer collaborative writing for enhancing opportunities for noticing and learning of linguistics form and meaning.

From an ecological point of view, effective design of computer-mediated collaborative writing should pay close attention to individual differences (e.g., learning needs, motivation, educational experience, and professional goals) and contextual factors (e.g., objectives of the classes and use of technology for teaching practices), as this study showed that these factors had great impacts on how learners can benefit from the tasks. Informed by the findings of this study, the computer-mediated collaborative writing task using QQ and *Microsoft Word* was shown to be an effective task for Chinese EFL learners to acquire linguistic knowledge and develop writing skills through peer interactions, which also endows this task with ecological value in the Chinese EFL context. Moreover, the majority of the NNES participants had a positive attitude towards the tasks and would recommend this task as a classroom activity as part of their English writing class.

Implications

Based on the findings and the research context of this study, a central question needed to be addressed is: how to motivate learners to be actively engaged in collaborative writing practice, considering their individual differences and the contextual factors in EFL classrooms. The following pedagogical implications fall under the preparation for computer-mediated

collaborative writing, including dyadic or group arrangement, task design, and considerations on ecological validity of tasks.

First, how learners facilitate each other during interactions plays a big part in learners' acquisition of linguistic knowledge in writing, which can be influenced by individual traits like language proficiency and learning motivations. Thus it is important for teachers to be aware of these individual differences before pairing them for collaborative writing. A well-designed collaborative writing task should provide learners with adequate opportunities for both receiving language input and producing output. Limited interactions may hinder learning during collaborations. Giving the fact that in EFL context, native speakers are not always accessible (Aslan, 2017), it is important to consider what type of NNES only dyads or groups can optimize the learning effect. As stated above, lower proficiency learners mostly benefited from collaborating with other higher proficiency learners and it is recommended to have higher proficiency learners collaborate with other peers with similar proficiency levels (Yu & Hu, 2016). Moreover, Allen and Mills (2016) also suggest avoiding mixed-proficiency groups for peer collaboration since it entails minimal learning for higher proficiency learners. Moreover, learners' educational background should also be considered for better learning effects, including previous educational experience, academic major and professional goals.

Second, the task should provide opportunities to both interlocutors for receiving input and producing output. This requires the task topics and materials to be carefully selected and designed. Informed by this study, it is important to survey the students which topics are of great interests and address their needs. Moreover, the teachers should provide adequate training, instruction, and monitoring during the tasks. It is necessary for teachers to be aware of how patterns of interaction can shape the learning outcome and the final writing performance (Yang

& Meng, 2013). Thus, monitoring of students' process not only gives students opportunities to receive timely feedback from teachers on their performance but also helps teachers to make sure every student has opportunities for learning. Last but not the least, informed by this study, the following questions need to be addressed by the teachers to design an ecological oriented task on computer-mediated collaborative writing: What technology is available and popular in the context? Which tools have been used in EFL teaching in this context? Are the learners and the teachers familiar with those tools? Which type of tasks can be designed using these tools?

Limitations and Future Directions

Although the current study showed that learners benefited from the computer-mediated collaborative writing tasks during the writing process, this study is not without limitations. First of all, the NESs' background may have an impact on the findings. The NES participants were students majored in education, who were taking ESL methods class at the time of this study. As part of their course assignments, this study provided them an opportunity to interact directly with EFL learners. Although this was beneficial to the NESs in terms of learning the course content, they could have practiced the learned strategies with their partners. Future research should consider the possible interfering factors and provide some level of control to these variables. Second, although the qualitative findings showed potential for noticing and subsequent learning during peer collaborations, the findings are not generalizable to all EFL population. However, researchers can use the chat logs from the learners to demonstrate the developmental process of language learning on a specific form, as supported by the macrogenetic analysis findings. Third, this study only involved mix-proficiency dyadic groups. Future research should include more variety of dyadic types, such as dyads with same proficiency levels combining with mixed-proficiency dyads to further investigate the role of NNEs in peer collaborative writing.

CHAPTER V

CONCLUSION

Summary

This dissertation study presented a short-term quasi-experimental study with pre- and post-test design. Using learner-familiar CMC technology, QQ and *Microsoft Word*, this study focused on Chinese EFL learners and how they can benefit from computer-mediated collaborative writing by examining both individual writing products and collaboration processes.

Chapter Three focused on the effectiveness of computer-mediated collaborative writing on individual performance and the potential influence from dyadic type and language proficiency. The analysis of gain scores showed that learners had a certain level of improvement on fluency and overall performance in the post-test; however limited improvements were found on complexity and accuracy. Through analysis of language complexity, accuracy and fluency (CAF), as well as overall performance on the pre- and post-tests in terms of group differences, this chapter indicated that collaborative writing led to higher improvement in overall performance compared to individual writing. Although some differences were observed between collaborative writing and individual writing groups on CAF, in general the results showed that similar impact from collaborative and individual writing on gains of CAF.

Chapter Four mainly explored the collaboration process and how language proficiency and dyadic type associated with learners' performance during interactions. Through quantitative and qualitative analysis of the text-chat logs and collaborative writing texts, this chapter revealed that computer-mediated collaborative writing provided opportunities for noticing and learning during interactions. Language proficiency and dyadic type had a great impact on learners' used

of feedback strategies and learning motivations. Moreover, the findings further indicated that other individual differences (i.e., academic major and professional goals) and contextual factors (i.e., the use of computers for language learning) also had an influence on learners' motivation and patterns of interactions. The detailed analysis of two selected dyads' chat logs showed the developmental process of how learners acquire certain forms in writing (i.e., subject-verb agreement, punctuation, proposition "in") guided by peer interactional feedback. In addition, the perception survey indicated that learners had positive attitudes towards the computer-mediated collaborative writing tasks. Moreover, the more engaged learners in collaboration reported more self-perceived improvements, enhanced confidence and motivation in English learning. Overall, the findings of this dissertation study provided an ecologically valid example for EFL teachers in China to incorporate computer-mediated collaborative writing in their future teaching practices.

Regarding the impact of dyadic type and language proficiency, both chapters confirmed the possible impact of dyadic type and language proficiency on language learning in writing products and collaboration process, which echoed the findings of earlier studies (e.g., Bikowski & Vitanage, 2016; Eslami & Kung, 2016; Kung & Eslami, 2015; Sotillo, 2005; Watanabe, 2008; Yoon, 2017). Both chapters showed that collaborating with NESs was more beneficial to A-NNESs in terms of improvement on overall writing performance, writing fluency and opportunities for noticing and learning in interactions. In addition, I-NNESs were able to benefit from both collaborations with A-NNESs and NESs. However, Chapter Four showed that when I-NNESs interacted with other NNES peers, the I-NNESs were more willing to provide input and had a higher motivation for learning, indicating more potential for noticing and learning. Informed by these findings, both NNESs and NESs were able to contribute to learning through

computer-mediated collaborative writing. However, it is suggested that higher proficiency learners could benefit more from collaborating with peers of similar or higher proficiency levels.

Pedagogical Implication

An important contribution of this dissertation study is the ecologically valid insight on incorporating computer-mediated collaborative writing into Chinese EFL classrooms. Although previous studies have stated several constraints of adapting technology in Chinese universities (Mei, Brown, & Teo, 2017; Paul & Liu, 2017; Zeng, 2017), this study overrules the previous remarks and highlights some practical implications that allow teachers to utilize computer-mediated collaborative writing tasks to help EFL students improve their individual writing. Having the majority of the participants recommending this activity to be part of their English writing classes, it is more valuable to adapt and further develop this type of task for future classroom implications. Situated in China, the following pedagogical implications will provide EFL teachers with information on how to design ecological and effective computer-mediated collaborative writing tasks that can benefit learners with various background and proficiency levels.

First, the EFL teacher should be familiar with students' needs and their language and computer competency. As writing task is a goal-oriented activity, being clear of what students' needs can help cater the task to their needs. Setting the objectives of the tasks directly to students' needs highly motivates students to be engaged in the tasks. Moreover, individual differences, such as language proficiency learners' educational background, also have an influence on how learners interact during collaborations. Teachers are suggested to pair students with a similar background and computer skills to ensure effective and engaging interactions.

Moreover, pairing higher proficiency learners with others of similar or higher levels of proficiency can be more beneficial.

Second, implementation of CMC technology in classrooms requires both teachers and learners to be familiar with the tools. Due to limited technological resources and support in Chinese universities (Mei et al., 2017), teachers must have a clear idea about what can be used as a stable technological tool. The benefits of using familiar tools are supported by this study and other empirical studies with Chinese EFL students (e.g., Zeng, 2017). For instance, not every student has a laptop and convenient access to Wi-Fi; but smartphones are popularized among Chinese university students. In this study, the two CMC technology, QQ and *Microsoft Word*, both have mobile versions. When computers were not available during the synchronous interaction time, the participants would use the mobile apps to maintain effective communications. Thus, as an alternative tool for computers, teachers can utilize mobile devices as a tool for language learning tasks.

Third, because computer-mediated collaborative writing tasks require intensive interactions in an online setting, teachers need to instruct and train students properly on how to provide effective peer feedback. Not knowing how to exchange effective peer feedback could lead to less motivation for collaboration, fewer negotiations and fewer opportunities for language learning. Therefore, it is important for teachers to provide effective and proper instructions and opportunities for practice prior to doing the task. During the task, monitoring students' collaboration process through observation in a timely fashion, checking the process in the online platform constantly can also promote effective interactions and more instances of learning.

Limitation and Future Directions

This dissertation study also has several limitations that offer opportunities for future research. First, the duration of this study is relatively short. Longer duration is recommended for better outcomes in writing for future studies. Second, due to convenience sampling, the background of the participants may have influenced the study results. For instance, some NNES participants were English major students who may have more opportunities of learning English writing outside of the writing class. Also, the NESs were pre-service teachers who have had training on teaching ESL students. Their education background could have influenced their performance during interactions. Thus further studies should pay close attentions to the possible intervening factors, like participants' relevant experiences.

Third, the measurement of writing product and collaborative process could have improved. For instance, it is recommended that to measure language gains through interactions, tailor-made tests may result in better outcomes (Loewen, 2004). However, due to the large sample size and limited time, creating tailor-made tests for each individual was not a practical choice for this dissertation. Moreover, using language-related episodes and uptakes to measure potential for noticing and language learning may overlook some other unobservable evidence. Thus for future studies, we recommend having a smaller sample, using tailor-made tests to measure language gains, and adding stimulated recall or other in-depth measures to understand how computer-mediated collaborative writing affects second language learning.

REFERENCES

- AbuSeileek, A., & Abualsha'r, A. (2014). Using peer computer-mediated corrective feedback to support EFL learners' writing. *Language Learning & Technology, 18*, 76-95.
- Ahmadian, M. J. (2011). The effect of 'massed' task repetitions on complexity, accuracy and fluency: does it transfer to a new task?. *The Language Learning Journal, 39*, 269-280.
- Alm, A. (2008). Integrating emerging technologies in the foreign language classroom: A case study. *International Journal of Pedagogies and Learning, 4*(4), 44-60.
- Alvarez, I., Espasa, A., & Guasch, T. (2012). The value of feedback in improving collaborative writing assignments in an online learning environment. *Studies in Higher Education, 37*, 387-400.
- Alwaleedi, M. A. (2017). Examining Language Related Episodes (LREs) of Arabic as a second language (ASL) learners during collaborative writing activities. *Theory and Practice in Language Studies, 7*, 256-263.
- Amir, Z., Ismail, K., & Hussin, S. (2011). Blogs in language learning: Maximizing students' collaborative writing. *Procedia-Social and Behavioral Sciences, 18*, 537-543.
- Armstrong, K., & Retterer, O. (2008). Blogging as L2 writing: A case study. *AACE Journal, 16*, 233-251.
- Arnold, N., Ducate, L., & Kost, C. (2012). Collaboration or cooperation? Analyzing group dynamics and revision processes in wikis. *CALICO Journal, 29*, 431-448.
- Arslan, R. Ş., & Şahin-Kızıl, A. (2010). How can the use of blog software facilitate the writing process of English language learners?. *Computer Assisted Language Learning, 23*, 183-197.

- Aslan, E. (2017). Doing away with the 'native speaker': a complex adaptive systems approach to L2 phonological attainment. *The Language Learning Journal*, 45, 447-465.
- Asu, L., & Perrotti, M. (2017). Implementing eLearning in a global organization: Pitfalls, successes, and considerations. In K. L. Milheim (Ed.), *Cultivating diverse online classrooms through effective instructional design* (pp. 178-198). Hershey, PA: IGI Global.
- Aydın, Z., & Yıldız, S. (2014). Using wikis to promote collaborative EFL writing. *Language Learning & Technology*, 18, 160-180.
- Baba, K., & Nitta, R. (2014). Phase transitions in development of writing fluency from a complex dynamic systems perspective. *Language Learning*, 64(1), 1-35.
- Bai, Y., Mo, D., Zhang, L., Boswell, M., & Rozelle, S. (2016). The impact of integrating ICT with teaching: Evidence from a randomized controlled trial in rural schools in China. *Computers & Education*, 96, 1-14.
- Benson, P. (2017). Ways of seeing: The individual and the social in applied linguistics research methodologies. *Language Teaching*, 1-11. Retrieved from doi:10.1017/S0261444817000234.
- Bikowski, D., & Vithanage, R. (2016). Effects of web-based collaborative writing on individual L2 writing development. *Language Learning & Technology*, 20, 79-99.
- Bloch, J. (2002). Student/teacher interaction via email: The social context of Internet discourse. *Journal of Second Language Writing*, 11, 117-134.
- Bower, J., & Kawaguchi, S. (2011). Negotiation of meaning and corrective feedback in Japanese/English eTandem. *Language Learning & Technology*, 15, 41-71.

- Bradley, L. (2014). Peer-reviewing in an intercultural wiki environment-student interaction and reflections. *Computers and Composition, 34*, 80-95.
- Brooks, L., & Swain, M. (2009). Languaging in collaborative writing: Creation of and response to expertise. In A. Mackey & C. Polio (Eds.), *Multiple perspectives on interaction: Second language research in honor of Susan M. Gass* (pp. 58-89). New York, NY: Routledge.
- Brown, D. (2012). The written corrective feedback debate: Next steps for classroom teachers and practitioners. *TESOL Quarterly, 46*, 861-867.
- Brown, D. (2016). Motivation and learning outcomes in reciprocal SCMC language-learning. *International Journal of Computer-Assisted Language Learning and Teaching, 6*(2), 19-34.
- Byrnes, H., & Manchón, R. M. (Eds.). (2014). *Task-based language learning—Insights from and for L2 writing* (Vol. 7). Amsterdam: John Benjamins.
- Chao, Y. C. J., & Lo, H. C. (2011). Students' perceptions of Wiki-based collaborative writing for learners of English as a foreign language. *Interactive Learning Environments, 19*, 395-411.
- Chen, T. (2016). Technology-supported peer feedback in ESL/EFL writing classes: a research synthesis. *Computer Assisted Language Learning, 29*, 365-397.
- Chen, W. C., & Eslami, Z. (2013). Focus on form in live chats. *Journal of Educational Technology & Society, 16*, 147-158.
- Chen, W. C., Shih, Y. C. D., & Liu, G. Z. (2015). Task design and its induced learning effects in a cross-institutional blog-mediated telecollaboration. *Computer Assisted Language Learning, 28*, 285-305.

- Cho, H. (2017). Synchronous web-based collaborative writing: Factors mediating interaction among second-language writers. *Journal of Second Language Writing, 36*, 37-51.
- Cho, K., & MacArthur, C. (2010). Student revision with peer and expert reviewing. *Learning and Instruction, 20*, 328-338.
- Colpaert, J. (2006). Toward an ontological approach in goal-oriented language courseware design and its implications for technology-independent content structuring. *Computer Assisted Language Learning, 19*, 109-127.
- Cook, V. (1999). Going beyond the native speaker in language teaching. *TESOL Quarterly, 33*, 185-209.
- Cumming, A. (1990). Expertise in evaluating second language compositions. *Language Testing, 7*(1), 31-51.
- December, J. (1996). What is Computer-mediated Communication? Retrieved from <http://www.december.com/john/study/cmc/what.html>
- Deng, L., & Yuen, A. H. (2011). Towards a framework for educational affordances of blogs. *Computers & Education, 56*, 441-451.
- Diab, R. L. (2005). Teachers' and students' beliefs about responding to ESL writing: A case study. *TESL Canada Journal, 23*(1), 28-43.
- Díez-Bedmar, M., & Pérez-Paredes, P. (2012). The types and effects of peer native speakers' feedback on CMC. *Language Learning & Technology, 16*, 62-90.
- Dobao, A. F. (2012). Collaborative writing tasks in the L2 classroom: Comparing group, pair, and individual work. *Journal of Second Language Writing, 21*, 40-58.

- Drexler, W., Dawson, K., & Ferdig, R. E. (2007). Collaborative blogging as a means to develop elementary expository writing skills. *Electronic Journal for the Integration of Technology in Education*, 6, 140-160.
- Educational Testing Service (2012). *Official guide to the TOEFL* (4th Edition). New York, NY: McGraw-Hill.
- Educational Testing Service (2016). *Official TOEFL iBT® tests volume 2* (1st Edition). New York, NY: McGraw-Hill
- Ellis, R. (2003). *Task-based language learning and teaching*. Oxford, UK: Oxford University Press.
- Ellis, R. (2004). Individual differences in second language learning. In A. Davies & C. Elder (Eds.), *The handbook of applied linguistics* (pp. 525-551). Malden, MA: Blackwell Publishing Ltd.
- Ellis, R. (2005). Principles of instructed language learning. *System*, 33, 209-224.
- Ellis, R., Basturkmen, H., & Loewen, S. (2001). Learner uptake in communicative ESL lessons. *Language Learning*, 51, 281-318.
- Ellis, R., & Sheen, Y. (2004). Reexamining the role of recasts in second language acquisition. *Studies in Second Language Acquisition*, 28, 575-600.
- Ellis, R., & Shintani, N. (2015). *Exploring language pedagogy through second language acquisition research*. New York, NY: Routledge.
- Elola, I., & Oskoz, A. (2010). Collaborative writing: Fostering foreign language and writing conventions development. *Language Learning & Technology*, 14(3), 51-71.

- Eslami, Z. R., & Kung, W. T. (2016). Focus-on-form and EFL learners' language development in synchronous computer-mediated communication: task-based interactions. *The Language Learning Journal*, 44, 401-417.
- Ferris, D. R. (2011). *Treatment of error in second language student writing* (2nd ed.). Ann Arbor, MI: University of Michigan Press.
- Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication*, 32, 365-387.
- Foster, P., & Skehan, P. (1999). The influence of source of planning and focus of planning on task-based performance. *Language Teaching Research*, 3, 215-247.
- Gass, S. (1997). *Input, interaction, and the development of second languages*. Mahwah, NJ: Erlbaum.
- Gebril, A. (2009). Score generalizability of academic writing tasks: Does one test method fit it all?. *Language Testing*, 26, 507-531.
- Gilabert, R., Manchón, R., & Vasylets, O. (2016). Mode in theoretical and empirical TBLT research: Advancing research agendas. *Annual Review of Applied Linguistics*, 36, 117-135.
- Glogoff, S. (2005). Instructional blogging: Promoting interactivity, student-centered learning, and peer input. *Innovate: Journal of Online Education*, 1(5), 1-5.
- González-Lloret, M., & Ortega, L. (Eds.). (2014). *Technology-mediated TBLT: Researching technology and tasks* (Vol. 6). Philadelphia, PA: John Benjamins Publishing Company.
- Grigornko, E. L., Sternberg, R. J., & Ehrman, M. E. (2000). A theory-based approach to the measurement of foreign language learning ability: The canal-F theory and test. *The Modern Language Journal*, 84, 390-405.

- Guardado, M., & Shi, L. (2007). ESL students' experiences of online peer feedback. *Computers and Composition, 24*, 443-461.
- Guasch, T., Espasa, A., Alvarez, I. M., & Kirschner, P. A. (2013). Effects of feedback on collaborative writing in an online learning environment. *Distance Education, 34*, 324-338.
- Guénette, D. (2007). Is feedback pedagogically correct? Research design issues in studies of feedback on writing. *Journal of Second Language Writing, 16*, 40-53.
- Guichon, N., Bétrancourt, M., & Prié, Y. (2012). Managing written and oral negative feedback in a synchronous online teaching situation. *Computer Assisted Language Learning, 25*, 181-197.
- Gutierrez, X. (2008). What does metalinguistic activity in learners' interaction during a collaborative L2 writing task look like?. *The Modern Language Journal, 92*, 519-537.
- Hanaoka, O., & Izumi, S. (2012). Noticing and uptake: Addressing pre-articulated covert problems in L2 writing. *Journal of Second Language Writing, 21*, 332-347.
- Haring-Smith, T. (1994). *Writing together: Collaborative learning in the writing classroom*. New York, NY: Harper Collins College.
- Hayes, J. R., & Flower, L. S. (1983). Uncovering cognitive processes in writing: An introduction to protocol analysis. In P. Mosenthal, L. Tamor, & S. A. Walmsley (Eds.), *Research on writing: Principles and methods* (pp. 207-220). New York, NY: Longman.
- Hismanoglu, M., & Hismanoglu, S. (2011). Task-based language teaching: What every EFL teacher should do. *Procedia-Social and Behavioral Sciences, 15*, 46-52.
- Ho, M. C., & Savignon, S. J. (2007). Face-to-face and computer-mediated peer review in EFL writing. *CALICO Journal, 24*, 269-290.

- Housen, A., & Kuiken, F. (2009). Complexity, accuracy, and fluency in second language acquisition. *Applied Linguistics*, 30, 461-473.
- Hsieh, Y. C. (2017). A case study of the dynamics of scaffolding among ESL learners and online resources in collaborative learning. *Computer Assisted Language Learning*, 30, 115-132.
- Hu, G. W., & Lam, S. T. E. (2010). Issues of cultural appropriateness and pedagogical efficacy: Exploring peer review in a second language writing class. *Instructional Science*, 38, 371–394.
- Hung, Y. W., & Higgins, S. (2016). Learners' use of communication strategies in text-based and video-based synchronous computer-mediated communication environments: opportunities for language learning. *Computer Assisted Language Learning*, 29, 901-924.
- Hunt, K. W. (1970). Do sentences in the second language grow like those in the first?. *TESOL Quarterly*, 4, 195-202.
- Hulstijn, J. H. (1997). Second language acquisition research in the laboratory: Possibilities and limitations. *Studies in Second Language Acquisition*, 19, 131-143.
- Hyland, K., & Hyland, F. (2006). Feedback on second language students' writing. *Language Teaching*, 39(2), 83-101.
- Iwashita, N., Brown, A., McNamara, T., & O'Hagan, S. (2008). Assessed levels of second language speaking proficiency: How distinct?. *Applied Linguistics*, 29(1), 24-49.
- Jafari, N., & Ansari, D. N. (2012). The effect of collaboration on Iranian EFL learners' writing accuracy. *International Education Studies*, 5, 125-131.
- Jalili, M. H., & Shahrokhi, M. (2017). Impact of collaborative writing on the complexity, accuracy, and fluency of Iranian EFL learners' L2 writing. *Journal of Applied Linguistics and Language Research*, 4(4), 13-28.

- Jiang, W., & Ribeiro, A. (2017). Effect of computer-mediated peer written feedback on ESL/EFL writing: A systematic literature review. *Electronic International Journal of Education, Arts, and Science (EIJEAS)*, 3(6), 57-79.
- Kellogg, R. T. (1996). A model of working memory in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 57–71). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Kessler, G., Bikowski, D., & Boggs, J. (2012). Collaborative writing among second language learners in academic web-based projects. *Language Learning & Technology*, 16(1), 91-109.
- Kim, H. N. (2008). The phenomenon of blogs and theoretical model of blog use in educational contexts. *Computers & Education*, 51, 1342-1352.
- Kim, H. Y. (2014). Learning opportunities in synchronous computer-mediated communication and face-to-face interaction. *Computer Assisted Language Learning*, 27, 26-43.
- Kitao, S. K., & Saeki, N. (1992). Process and social aspects of writing: Theory and classroom application. *Annual Reports of Studies*, 33, 86-102.
- Kittle, P., & Hicks, T. (2009). Transforming the group paper with collaborative online writing. *Pedagogy*, 9, 525-538.
- Kormos, J. (2012). The role of individual differences in L2 writing. *Journal of Second Language Writing*, 21, 390-403.
- Korte, M. (2008). *Corpus methods in interlanguage analysis* (Doctoral dissertation). Retrieved from OhioLINK (http://rave.ohiolink.edu/etdc/view?acc_num=ucin1218835515).
- Krajka, J. (2012). Web 2.0 online collaboration tools as environments for task-based writing instruction. *Journal of Faculty of Educational Sciences*, 45(2), 97-117.

- Kung, W. T., & Eslami, Z. R. (2015). Learners of different language proficiency levels and incidental focus on form in synchronous text-based discussion. *International Journal of Computer-Assisted Language Learning and Teaching*, 5(3), 42-59.
- Lai, C., Lei, C., & Liu, Y. (2016). The nature of collaboration and perceived learning in wiki-based collaborative writing. *Australasian Journal of Educational Technology*, 32(3), 80-95.
- Lai, C., & Zhao, Y. (2006). Noticing and text-based chat. *Language Learning & Technology*, 10(3), 102-120.
- Lam, W.S.E., & Kramersch, C. (2002). The ecology of an SLA community in a computer-mediated environment. In J. Leather & J. van Dam (Eds), *Ecology of language acquisition educational linguistics*, vol 1 (pp. 141-158). Dordrecht, Netherlands: Springer.
- Lantolf, J. & Thorne, S. L. (2007). Sociocultural theory and second language learning. In B. van Patten & J. Williams (eds.), *Theories in second language acquisition* (pp. 201-224). Mahwah, NJ: Lawrence Erlbaum.
- Larsen-Freeman, D. (2018). Looking ahead: Future directions in, and future research into, second language acquisition. *Foreign Language Annals*, 51(1). Retrieved from <https://doi.org/10.1111/flan.12314>
- Laufer, B., & Nation, P. (1995). Vocabulary size and use: Lexical richness in L2 written production. *Applied Linguistics*, 16, 307-322.
- Lee, L. (2010). Fostering reflective writing and interactive exchange through blogging in an advanced language course. *ReCALL*, 22, 212-227.

- Lee, J. F. (2000). *Tasks and communicating in language classrooms*. Mahwah, NJ: McGraw-Hill.
- Lee, S. Y. (2005). Facilitating and inhibiting factors in English as a foreign language writing performance: A model testing with structural equation modeling. *Language Learning, 55*, 335-374.
- Lee, C., Cheung, W. K. W., Wong, K. C. K., & Lee, F. S. L. (2013). Immediate web-based essay critiquing system feedback and teacher follow-up feedback on young second language learners' writings: an experimental study in a Hong Kong secondary school. *Computer Assisted Language Learning, 26*, 39-60.
- Li, M., & Storch, N. (2017). Second language writing in the age of CMC: Affordances, multimodality, and collaboration. *Journal of Second Language Writing, 36*, 1-5.
- Li, M., & Zhu, W. (2013). Patterns of computer-mediated interaction in small writing groups using wikis. *Computer Assisted Language Learning, 26*, 61-82.
- Li, M., & Zhu, W. (2017). Good or bad collaborative wiki writing: Exploring links between group interactions and writing products. *Journal of Second Language Writing, 35*, 38-53.
- Liaw, M. L. (1998). Using electronic mail for English as a foreign language instruction. *System, 26*, 335-351.
- Lim, W. L., & Jacobs, G. M. (2001). An analysis of students' dyadic interaction on a dictogloss task. ERIC Document Reproduction Service No. ED 456 649.
- Liou, H. C., & Lee, S. L. (2011). How wiki-based writing influences college students' collaborative and individual composing products, processes, and learners' perceptions. *International Journal of Computer-Assisted Language Learning and Teaching, 1*(1), 45-61.

- Liu, Q., & Brown, D. (2015). Methodological synthesis of research on the effectiveness of corrective feedback in L2 writing. *Journal of Second Language Writing, 30*, 66-81.
- Liu, H., Lin, C. H., Zhang, D., & Zheng, B. (2017). Chinese language teachers' perceptions of technology and instructional use of technology: A path analysis. *Journal of Educational Computing Research*. Retrieved from <https://doi.org/10.1177/0735633117708313>.
- Liu, J., & Sadler, R. W. (2003). The effect and affect of peer review in electronic versus traditional modes on L2 writing. *Journal of English for Academic Purposes, 2*, 193-227.
- Loewen, S. (2004). 'The occurrence and characteristics of student-initiated Focus on Form'. In H. Reinders, H. Anderson, M. Hobbs, & J. Johnes-Parry (Eds.), *Supporting independent learning in the 21st century. Proceedings of the inaugural conference of the Independent Learning Association* (pp. 86-93). Auckland: Independent Learning Association Oceania. Retrieved from http://www.independentlearning.org/ila03/ila03_loewen%20.pdf
- Loewen, S. (2014). *Introduction to instructed second language acquisition*. New York, NY: Routledge.
- Loewen, S., & Erlam, R. (2006). Corrective feedback in the chatroom: An experimental study. *Computer Assisted Language Learning, 19*, 1-14.
- Loewen, S., & Philp, J. (2006). Recasts in the adult English L2 classroom: Characteristics, explicitness, and effectiveness. *The Modern Language Journal, 90*, 536-556.
- Long, M. H. (1981). Input, interaction, and second-language acquisition. *Annals of the New York Academy of Sciences, 379*(1), 259-278.
- Long, M. H. (1985). Input and second language acquisition theory. In S. M. Gass & C. G. Madden (Eds.), *Input in second language acquisition* (pp. 377-393). Cambridge, MA: Newbury House.

- Louth, R., McAllister, C., & McAllister, H. A. (1993). The effects of collaborative writing techniques on freshman writing and attitudes. *The Journal of Experimental Education*, *61*, 215-224.
- Lyster, R. (2001). Negotiation of form, recasts, and explicit correction in relation to error types and learner repair in immersion classrooms. *Language Learning*, *51*, 265-301.
- Lyster, R., & Ranta, L. (1997). Corrective feedback and learner uptake. *Studies in Second Language Acquisition*, *19*, 37-66.
- Malaz, I., Rabiee, M., & Ketabi, S. (2011). The pragmatic instruction effects on Persian EFL learners' noticing and learning outcomes in request forms. *Journal of Technology & Education*, *5*, 187-193.
- Matsuda, A. (2018). World Englishes and NNESTs. *The TESOL Encyclopedia of English Language Teaching*. Retrieved from <https://doi.org/10.1002/9781118784235.eelt0041>.
- Mei, B., Brown, G. T., & Teo, T. (2017). Toward an understanding of preservice English as a foreign language teachers' acceptance of computer-assisted language learning 2.0 in the People's Republic of China. *Journal of Educational Computing Research*, *26*, 74-104.
- Mirzaei, A., & Eslami, Z. R. (2015). ZPD-activated languaging and collaborative L2 writing. *Educational Psychology*, *35*(1), 5-25.
- Motallebzadeh, K., & Amirabadi, S. (2011). Online interactional feedback in second language writing: Through peer or tutor. *Theory and Practice in Language Studies*, *1*, 534-540.
- Nassaji, H. (2009). Effects of recasts and elicitations in dyadic interaction and the role of feedback explicitness. *Language Learning*, *59*, 411-452.
- Nassaji, H. (2015). *The interactional feedback dimension in instructed second language learning: Linking theory, research, and practice*. London, UK: Bloomsbury Publishing.

- Nassaji, H. (2016). Anniversary article Interactional feedback in second language teaching and learning: A synthesis and analysis of current research. *Language Teaching Research*, 20, 535–562.
- Nassaji, H., & Swain, M. (2000). A Vygotskian perspective on corrective feedback in L2: The effect of random versus negotiated help on the learning of English articles. *Language Awareness*, 9(1), 34-51.
- Nassaji, H., & Tian, J. (2010). Collaborative and individual output tasks and their effects on learning English phrasal verbs. *Language Teaching Research*, 14, 397-419.
- Nguyen, P. T. T. (2012). Peer feedback on second language writing through blogs: The case of a Vietnamese EFL classroom. *Computer-Assisted Language Learning and Teaching*, 2(1), 13-23.
- Noël, S., & Robert, J. M. (2004). Empirical study on collaborative writing: What do co-authors do, use, and like?. *Computer Supported Cooperative Work*, 13(1), 63-89.
- Novakovich, J. (2016). Fostering critical thinking and reflection through blog-mediated peer feedback. *Journal of Computer Assisted Learning*, 32(1), 16-30.
- Oliver, R., Grote, E., & Nguyen, B. (2014). Australian Indigenous students developing literacy and code-switching skills through online communication: A study of Facebook as an education tool. In Cree, A.C. (Ed.), *Literacies: The power to change, volume 2 – Literacy in a changing world* (pp. 88-104). Oxford, UK: World Literacy Summit.
- Ortega, L. (2003). Syntactic complexity measures and their relationship to L2 proficiency: A research synthesis of college-level L2 writing. *Applied Linguistics*, 24, 492-518.
- Ortega, L. (2005). Methodology, epistemology, and ethics in instructed SLA research: An introduction. *The Modern Language Journal*, 89, 317-327.

- Ortega, L. (2012). Epilogue: Exploring L2 writing-SLA interfaces. *Journal of Second Language Writing, 21*, 404-415.
- Park, S. (2008). *An exploration of examinee abilities, rater performance, and task differences using diverse analytic techniques* (Doctoral dissertation). Retrieved from DSpace (<http://hdl.handle.net/10125/20885>).
- Paul, C. M., & Liu, H. J. (2017). Technology and Innovation in China's English as a Foreign Language (EFL) Classrooms. In H. A. Spires (Ed.), *Digital transformation and innovation in Chinese education* (pp. 163-177). Hershey, PA: IGI Global.
- Philp, J. (1999, March). Constraints on "noticing the gap": A study of NNS' apperception of recasts in NS-NNS interaction. Paper presented at the 1999 *Annual Conference of the American Association for Applied Linguistics, Stamford, CT*.
- Plakans, L., Gebril, A., & Bilki, Z. (2016). Shaping a score: Complexity, accuracy, and fluency in integrated writing performances. *Language Testing, 1-19*. Retrieved from <http://dx.doi.org/10.1177/0265532216669537>.
- Polio, C. (2012). The relevance of second language acquisition theory to the written error correction debate. *Journal of Second Language Writing, 21*, 375-389.
- Polio, C. (2017). Second language writing development: A research agenda. *Language Teaching, 50*, 261-275.
- Polio, C. & J. H. Park (2016). Language development in second language writing. In R. M. Manchón & P. Matsuda (Eds.), *Handbook of second and foreign language writing* (pp. 287-306). New York, NY: Routledge.

- Qi, D. S. (2014). *Syntactic complexity of EFL, ESL and ENL: Evidence from the international corpus network of Asian learners of English* (Master's thesis). Retrieved from Scholarbank (<http://scholarbank.nus.edu.sg/handle/10635/79491>).
- Qi, D. S., & Lapkin, S. (2010). Exploring the role of noticing in a three-stage second language writing task. *Journal of Second Language Writing, 10*, 277-303.
- Raizi, A. M. (2016). Comparing writing performance in TOEFL-iBT and academic assignments: An exploration of textual features. *Assessing Writing, 28*, 15-27.
- Rao, Z., & Lei, C. H. (2014). Teaching English as a foreign language in Chinese universities: The present and future. *English Today, 30*(4), 40-45.
- Rassaei, E. (2014). Scaffolded feedback, recasts, and L2 development: A sociocultural perspective. *The Modern Language Journal, 98*, 417-431.
- Reichert, T., & Liebscher, G. (2012). Positioning the expert: Word searches, expertise, and learning opportunities in peer interaction. *The Modern Language Journal, 96*, 599-609.
- Robinson, P. (1995). Attention, memory, and the “noticing” hypothesis. *Language Learning, 45*, 283-331.
- Robinson, P. (2001). *Cognition and second language instruction*. New York, NY: Cambridge University Press.
- Rodgers, K. J., Horvath, A. K., Jung, H., Fry, A. S., Diefes-Dux, H., & Cardella, M. E. (2014). Students' perceptions of and responses to teaching assistant and peer feedback. *Interdisciplinary Journal of Problem-based Learning, 9*(2), 36-56.
- Romiszowski, A., & Mason, R. (1996). Computer-mediated communication. *Handbook of Research for Educational Communications and Technology, 2*, 397-431.

- Sachs, R., & Polio, C. (2007). Learners' uses of two types of written feedback on a L2 writing revision task. *Studies in Second Language Acquisition*, 29, 67-100.
- Samuda, V., & Bygate, M. (2008). *Tasks in second language learning*. New York, NY: Palgrave Macmillan.
- Schmidt, R. W. (1990). The role of consciousness in second language learning. *Applied Linguistics*, 11, 129-158.
- Schmidt, R. W. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 3-32). Cambridge, UK: Cambridge University Press.
- Schulze, M., Wood, P., & Pokorny, B. (2010). Measuring balanced complexity in online writing. Unpublished manuscript.
- Sheen, Y. (2004). Corrective feedback and learner uptake in communicative classrooms across instructional settings. *Language Teaching Research*, 8, 263-300.
- Sheen, Y. (2010). Differential effects of oral and written corrective feedback in the ESL classroom. *Studies in Second Language Acquisition*, 32, 203-234.
- Shehadeh, A. (2011). Effects and student perceptions of collaborative writing in L2. *Journal of Second Language Writing*, 20, 286-305.
- Shintani, N. (2016). The effects of computer-mediated synchronous and asynchronous direct corrective feedback on writing: A case study. *Computer Assisted Language Learning*, 29, 517-538.
- Skehan, P. (1998). Task-based instruction. *Annual Review of Applied Linguistics*, 18, 282-286.
- Soleimani, M., Modirkhamene, S., & Sadeghi, K. (2017). Peer-mediated vs. individual writing: measuring fluency, complexity, and accuracy in writing. *Innovation in Language Learning and Teaching*, 11(1), 86-100.

- Song, W., & Usaha, S. (2009). How EFL university students use electronic peer response into revisions. *Suranaree Journal of Science and Technology*, 16, 263-275.
- Sotillo, S. (2005). Corrective feedback via instant messenger learning activities in NS-NNS and NNS-NNS dyads. *CALICO Journal*, 22, 467-496.
- Spires, H. A. (Ed.). (2017). *Digital transformation and innovation in Chinese education*. Hershey, PA: IGI Global.
- Spada, N. (2005). Conditions and challenges in developing school-based SLA research programs. *The Modern Language Journal*, 89, 328–338.
- Stein, D., Glazer, H. R., Glassman, M., & Li, X. (2017). Learning to become an online learner in a Chinese university: A tale of transformative pedagogy. In K. L. Milheim (Ed.), *Cultivating diverse online classrooms through effective instructional design* (pp. 45-65). Hershey, PA: IGI Global.
- Storch, N. (1998). A classroom-based study: Insights from a collaborative test reconstruction task. *ELT Journal*, 52, 291-300.
- Storch, N. (2005). Collaborative writing: Product, process, and students' reflections. *Journal of Second Language Writing*, 14, 153-173.
- Storch, N. (2013). *Collaborative writing in L2 classrooms*. Bristol, UK: Multilingual Matters.
- Storch, N., & Wigglesworth, G. (2007). Writing tasks: The effects of collaboration. In García Mayo (Ed.), *Investigating tasks in formal language learning* (pp. 157-177). Clevedon, UK: Multilingual Matters.
- Storch, N., & Wigglesworth, G. (2010). Learners' processing, uptake, and retention of corrective feedback on writing. *Studies in Second Language Acquisition*, 32, 303-334.

- Streiner, D. L. (2003). Being inconsistent about consistency: When coefficient alpha does and doesn't matter. *Journal of Personality Assessment*, 80, 217-222.
- Strijbos, J. W., Narciss, S., & Dünnebier, K. (2010). Peer feedback content and sender's competence level in academic writing revision tasks: Are they critical for feedback perceptions and efficiency? *Learning and Instruction*, 20, 291-303.
- Strobl, C. (2014). Affordances of Web 2.0 technologies for collaborative advanced writing in a foreign language. *CALICO Journal*, 31(1), 1-18.
- Sun, Z., & Qiu, X. (2014). Evaluating the use of wikis for EFL: a case study of an undergraduate English writing course in China. *International Journal of Information Technology and Management*, 13(1), 3-14.
- Swain, M. (1985). Communicative competence: Some roles of comprehensible input and comprehensible output in its development. *Input in Second Language Acquisition*, 15, 165-179.
- Swain, M. (1995). Three functions of output in second language learning. In G. Cook & B. Seidlhofer (Eds.), *Principle and practice in Applied Linguistics: Studies in honor of H.G. Widdowson* (pp. 125-144). Oxford, UK: Oxford University Press.
- Swain, M. (1998). Focus on form through conscious reflection. In C. Doughty & J. Williams (Eds.), *Focus on form in classroom second language acquisition* (pp. 64-81). Cambridge, UK: Cambridge University Press.
- Swain, M. (2000). The output hypothesis and beyond: Mediating acquisition through collaborative dialogue. In J. P. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 97-114). Oxford, UK: Oxford University Press.

- Swain, M. (2013). The inseparability of cognition and emotion in second language learning. *Language Teaching*, 46, 195-207.
- Swain, M., & Lapkin, S. (1995). Problems in output and the cognitive processes they generate: A step towards second language learning. *Applied Linguistics*, 16, 371-391.
- Swain, M., & Lapkin, S. (1998). Interaction and second language learning: Two adolescent French immersion students working together. *The Modern Language Journal*, 82, 320-337.
- Swan, M. (2005). Legislation by hypothesis: The case of task-based instruction. *Applied Linguistics*, 26, 376-401.
- Van den Branden, K. (2016) Task-based language teaching. In G. Hall (Ed.), *The Routledge handbook of English language teaching* (pp. 238-251). New York, NY: Routledge.
- Van Lier, L. (2002). An ecological-semiotic perspective on language and linguistics. In C. Kramsch (Ed.), *Language acquisition and language socialization: Ecological perspectives* (pp. 140-164). London, UK: Bloomsbury Publishing.
- Vurdien, R. (2013). Enhancing writing skills through blogging in an advanced English as a Foreign Language class in Spain. *Computer Assisted Language Learning*, 26, 126-143.
- Vygotsky, L. (1978). Interaction between learning and development. *Readings on the Development of Children*, 23(3), 34-41.
- Wang, Y. C. (2015). Promoting collaborative writing through wikis: a new approach for advancing innovative and active learning in an ESP context. *Computer Assisted Language Learning*, 28, 499-512.
- Ware, P. D., & O'Dowd, R. (2008). Peer feedback on language form in telcollaboration. *Language Learning & Technology*, 12, 43-63.

- Warschauer, M. (1997). Computer-mediated collaborative learning: Theory and practice. *The Modern Language Journal*, 81, 470-481.
- Warschauer, M. (2009). Digital literacy studies: Progress and prospects. In M. Baynham & M. Prinsloo (Eds.), *The future of literacy studies* (pp. 123-140). London, UK: Palgrave Macmillan.
- Warschauer, M. (2013). Comparing face-to-face and electronic discussion in the second language classroom. *CALICO Journal*, 13(2/3), 7-26.
- Warschauer, M., & Kern, R. (Eds.). (2000). *Network-based language teaching: Concepts and practice*. London, UK: Cambridge university press.
- Watanabe, Y. (2008). Peer-peer interaction between L2 learners of different proficiency levels: Their interactions and reflections. *Canadian Modern Language Review*, 64, 605-635.
- Watanabe, Y., & Swain, M. (2007). Effects of proficiency differences and patterns of pair interaction on second language learning: Collaborative dialogue between adult ESL learners. *Language Teaching Research*, 11, 121-142.
- Wigglesworth, G. (2005). Current approaches to researching second language learner processes. *Annual Review of Applied Linguistics*, 25, 98-111.
- Wigglesworth, G., & Storch, N. (2009). Pair versus individual writing: Effects on fluency, complexity and accuracy. *Language Testing*, 26, 445-466.
- Wigglesworth, G., & Storch, N. (2012). What role for collaboration in writing and writing feedback. *Journal of Second Language Writing*, 21, 364-374.
- Williams, J. (2001). Learner-generated attention to form. *Language Learning*, 51, 303-346.
- Williams, J. (2012). The potential role(s) of writing in second language development. *Journal of Second Language Writing*, 21, 321-331.

- Wolfe-Quintero, K., Inagaki, S., & Kim, H. Y. (1998). *Second language development in writing: Measures of fluency, accuracy, & complexity* (No. 17). Honolulu, HI: University of Hawaii Press.
- Woo, M. M., Chu, S. K. W., & Li, X. (2013). Peer-feedback and revision process in a wiki mediated collaborative writing. *Educational Technology Research and Development, 61*, 279-309.
- Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*(2), 89-100.
- Wu, W. S. (2006). The effect of blog peer review and teacher feedback on the revisions of EFL writers. *Journal of Education and Foreign Languages and Literature, 3*(2), 125-138.
- Wu, Y (2017). Language education in China: Teaching foreign languages. In R. Sybesma, W. Behr, Y. G. Gu, Z. Handel, C. –T. J. Huang, & J. Myers (Eds.), *Encyclopedia of Chinese language and linguistics* (pp. 515-527). Boston, MA: Brill.
- Wu, W. C. V., Petit, E., & Chen, C. H. (2015). EFL writing revision with blind expert and peer review using a CMC open forum. *Computer Assisted Language Learning, 28*, 58-80.
- Yang, M., Badger, R., & Yu, Z. (2006). A comparative study of peer and teacher feedback in a Chinese EFL writing class. *Journal of Second Language Writing, 15*, 179-200.
- Yang, Y. F., & Meng, W. T. (2013). The effects of online feedback training on students' text revision. *Language Learning & Technology, 17*, 220-238.
- Yang, Y., Zhu, X., Jin, C., & Li, J. J. (2017). Reforming classroom education through a QQ group. In H. A. Spires (Ed.), *Digital transformation and innovation in Chinese education* (pp. 211-232). Hershey, PA: IGI Global.

- Yim, S., & Warschauer, M. (2017). Web-based collaborative writing in L2 contexts: Methodological insights from text mining. *Language Learning & Technology*, 21, 146-165.
- Yoon, H. J. (2017). Linguistic complexity in L2 writing revisited: Issues of topic, proficiency, and construct multidimensionality. *System*, 66, 130-141.
- Yu, S., & Hu, G. (2017). Can higher-proficiency L2 learners benefit from working with lower-proficiency partners in peer feedback?. *Teaching in Higher Education*, 22, 178-192.
- Zeiss, E., & Isabelli-García, C. L. (2005). The role of asynchronous computer mediated communication on enhancing cultural awareness. *Computer Assisted Language Learning*, 18, 151-169.
- Zeng, G. (2017). Collaborative dialogue in synchronous computer-mediated communication and face-to-face communication. *ReCALL*, 29, 1-19.
- Ziegler, N. (2016). Taking technology to task: Technology-mediated TBLT, performance, and production. *Annual Review of Applied Linguistics*, 36, 136-163.
- Zhang, H. (2013). Pedagogical challenges of spoken English learning in the Second Life virtual world: A case study. *British Journal of Educational Technology*, 44, 243-254.
- Zhang, H., Song, W., Shen, S., & Huang, R. (2014). The effects of blog-mediated peer feedback on learners' motivation, collaboration, and course satisfaction in a second language writing course. *Australasian Journal of Educational Technology*, 30, 670-685.
- Zhou, W., Simpson, E., & Domizi, D. P. (2012). Google Docs in an out-of-class collaborative writing activity. *International Journal of Teaching and Learning in Higher Education*, 24, 359-375.

APPENDIX A

INSTRUCTIONS FOR COLLABORATIVE WRITING

**For collaborative writing groups, native English speakers*

The prompt provides information in a form of Q&A. You will learn about the following from this writing prompt

- 1) The basic requirements for the writing tasks
- 2) Content selection
- 3) Sources to refer to
- 4) Criteria of high quality academic writing

Q: What are the requirements for the two writing tasks?

A: You will complete two academic essays on the topic of *Education in Different Cultures*. The two essays should cover two sub-topics of the main topic. Each essay should be 800+ English words long. You and your partner will write the essays together. The essays should include your own analysis of the topics supported with your personal examples. Plagiarism is highly prohibited. Use www.grammarly.com to check for unoriginal text rate to prevent plagiarism. If the unoriginal text rate is higher than 10%, your essay will count as plagiarized, you will lose the assignment grades for the essays.

NOTE: Your partners might not have access to Grammarly.com, so you have to be responsible of checking for unoriginal text rate.

Q: How should I write the essays with my partner collaboratively?

A: You will use *Microsoft Word* to write, QQ for interaction and exchange of writings and feedback. The collaborative process has already been designed as tasks in each week. See the weekly instruction for specific asks, materials, assignments and due dates.

To complete the collaborative writing tasks, you will,

1. Discuss about the topic and content selection
2. Create an outline for the essay
3. Divide the writing between you and your partner based on the outline (watch the video instruction on how to divide)
4. Write your own parts
5. Send the part you wrote to your partner, your partner will organize your writing piece into a complete essay
6. Discuss with you partner how to edit your essay (watch the video instruction on how to discuss feedback)
7. You and your partner will edit the essay individually based on the feedback you discussed
8. Discuss your revisions until agreement is reached
9. Your partner finalizes the essay

Q: What can we write about *Education in Different Cultures*?

A: Here are a list of sub-topics you can use for the tasks. You may also choose other related topics, as long as the topic discusses about education and culture aspects.

- Differences and similarities of American and Chinese school life
- Characteristics of American and/or Chinese education system and how it influences students' learning and/or teachers' teaching
- Advantages and/or disadvantages of exams in terms of learning outcomes, learning motivation in different culture
- Experience of learning another language: challenges and opportunities

Q: Where can I find sources related to the topic if we are not familiar with topic?

A: There is no requirement for numbers of citation. It is recommended that the essays be based on your own knowledge and experiences. For additional information, you can search for articles on related topics using *Google Scholar* or library website. You can also refer to the report “*Comparative Indicators of Education in the United States and Other G-20 Countries 2015*” (See eCampus). If you use other source(s), make sure you properly cite the source(s) (APA format).

Q: What are the criteria for high-quality academic essays? I want to make sure our writings are up to the standards.

A: Your essays should largely accomplish all of the following:

- Effectively addresses the topic and task
- Is well organized and well developed, using clearly appropriate explanations, exemplifications, and details
- Displays unity, progression, and coherence
- Displays consistent facility in the use of language, demonstrating syntactic variety, appropriate word choice, and idiomaticity, have no grammatical errors

You and your partner need to assist each other on every aspect to make sure your essays can achieve this level.

APPENDIX B
PRE- AND POST- INDIVIDUAL WRITING TASKS GRADING RUBRIC

Scores	Vocabulary (20)	Grammar (20)	Sentence Structure (20)	Text Structure (20)	Content (10)	Coherence and Cohesion (10)
20	Displays appropriate word choice and idiomaticity in a wide range	No grammatical errors in terms of sentence structure and vocabulary	Demonstrating syntactic variety with clear meaning	Well organized and well developed, using clear and appropriate transitional words	N/A	N/A
15	Displays a range of vocabulary	Occasional noticeable minor errors that do not interfere with meaning	Demonstrating syntactic variety, though it may have ambiguity in the sentences	Generally well organized and well developed, using transitions though it may contain unclear connections	N/A	N/A
10	Display a limited range of vocabulary that may result in lack of clarity and occasionally obscured meaning	Noticeable errors in sentence structure and vocabulary that may interfere with meaning	Display limited range of syntactic structure with limited use of subordinate clauses	Somewhat organized with limited and unclear transitions	Addressing the topic well, though some points may not be fully elaborated	Displays unity, progression, and coherence
5	Display very limited range of vocabulary with noticeably inappropriate choice of words	Accumulated errors in sentence structure and vocabulary that interfere with meaning	Display very limited range of syntactic structure with very limited use of subordinate clauses	Inadequate organization and no transition	Limited development in response to the topic, very limited details	Displays unity, progression, and coherence, though it may contain occasional redundancy and digression
0	Display serious limited range of vocabulary with mostly inappropriate choice of words	Serious and frequent errors in sentence structure and vocabulary that make the essay uninterpretable	Only use simple sentence structures, no use of subordinate clauses	Seriously disorganized and no structure	Serious underdevelopment in response to the topic, little or no details	Does not display any unity, progression and coherence, and contains redundancy and digression

Explanations:

Vocabulary (20 points): the range of word choice and the complexity of vocabulary, whether advanced vocabulary is used appropriately or not

Sentence Structure (20 points): the range of syntactic variety and the complexity of sentence structures, whether complex sentence structures are used appropriately or not)

Grammar (20 points): the accuracy of vocabulary and sentences, including lexical errors and syntactical errors

Text structure (20 points): the overall organization of the text and the use of transitional words

Content (10 points): the elaborateness of the essay in response to the topic, whether details and examples are included or not

Coherence and Cohesion (10 points): the unity of the essay, whether redundancy and digression exist in the essay or not

How to use the rubric:

The top row represents the categories. The left column represents the cut score of each range. The other boxes include the descriptions of each category at the cut score level.

For example, if the rater feels the student's performance is in-between the descriptions of 20 and 15, the rater can assign a score between 20 and 15 for the corresponding category.

APPENDIX C

T-UNIT ANALYSIS AND ERROR CRITERIA

T-unit

- **Defined as: an independent clause with an attached or embedded dependent clause and (2) an independent clause only** (e.g., Hunt, 1970; Park, 2008).

Examples:

- 1 T-unit, 1 clause:
[The teacher encourages students to think by themselves].
- 1 T-unit, 2 clauses:
[The atmosphere is very active, which can also improve their thinking ability].
- 2 T-unit, 2 clauses:
[The classroom of Chinese is a kind of rectangle space with many row of the same desks], [and every student has its fixed seat].

- **If a subordinate clause is standing alone, do not count as T-units.**

Examples:

- Because you have to get the knowledge from books by reading.

- **If a coordinate clause has complete structure, count the coordinate clause as one T-unit.**

Examples:

- [And reading and writing are two essential parts to learn a foreign language.]

- **Mark the following expression as separate T-units.**

Examples:

- [I think so.]
- [Yes, it is.]
- [But why?]

Clauses (Thurman, 2003)

- **Independent clause**

Defined as: a group of words that has a verb and its subject and could stand alone as a sentence

Examples:

- The life at school is very colorful.
- We live in a digital society.

- **Coordinate clause**

Defined as: an independent clause connected with another independent clause through a coordinating conjunction.

- The following count as coordinating conjunctions: again, also, and, but, for, however, moreover, nor, or, otherwise, so, that is, then, therefore, yet

■ Subordinate clause

Defined as: a clause with a verb and its subject that has to be attached to an independent clause through a subordinating conjunction.

- The following count as subordinating conjunctions: after, although, as, as if, as (many) as, because, even if, even though, if, in order, more than, once, only (if), since, so that, that, until, when, where, which, while, who, whom, whose, why

■ Error in T-unit (in reference to native English norms)

- Consider the following mechanical errors in the pre- and post-tests in counting erroneous T-unit:
 - Capitalization errors
 - Spelling errors
 - Misuse of periods and commas
- Consider the following grammatical errors in the pre- and post-tests in counting erroneous T-unit (Park, 2008; Thurman, 2003):
 - Tense errors:
 - Omission of the tense morphemes
 - Missing *-ed* for regular past tense
 - Overgeneralization of the tense morphemes
 - Use *thinked* for *thought*
 - Use of the base form of irregular verbs
 - Use *think* for *thought*
 - Use of the base form of verbs for passive and progressive forms and gerund
 - Passive form: use *translate* for *was translated*
 - Progressive form: use *develop* for *developing*
 - Gerund: use *stop dream* for *stop dreaming*
 - Subject-Verb agreement errors:
 - Use of plural verb when the subject is singular or uncountable
 - *Every coin have two sides.*
 - Use of singular verb when the subjects are plural
 - Reading and writing makes us smart.
 - There is teachers in traditional schools.
 - Preposition errors:
 - Omission of prepositions
 - Use of incorrect prepositions
 - Plural errors:
 - Omission of the plural
 - Use *book* for *books*
 - Use *man* for *men*
 - Use of the regular plural forms for irregular plural nouns
 - Use *foots* for *feet*
 - Add plural marks for uncountable nouns

- Use *happineses* for *happiness*
- Pronoun errors:
 - Misuse of subject pronoun and objective pronoun
 - *Reading can benefit we (us).*
 - *Me (I) and my roommate read at night.*
- Article errors:
 - Omission of indefinite and definite articles
 - Use of incorrect articles
 - Use *the* for *a* or *an*
 - Use *a* or *an* for *the*

APPENDIX D

GUIDELINES FOR INTERACTIONAL FEEDBACK

MUST FOLLOW

1. You can only talk about where, why and how to revise in the text-chat with your partner. **DO NOT** write your feedback in the traditional way and send to your partner without discussion. Your discussion about feedback should include:

- **where** you think your essay need to be revised,
- **why** you should revise certain areas,
- **how** to revise, and
- **why** your suggestions are reasonable and accurate.

See example of traditional way and feedback discussion in the table below.

2. **DO NOT** take the responsibility of providing feedback on your own. Encourage your partner to provide suggestions and feedback as well. This collaboration is not a tutoring activity.

3. Provide feedback on the whole essay. **DO NOT** only provide feedback on your partner's writing.

4. **Ask for clarifications** if you are not clear about what your partner means or why your partner give certain feedback.

必须遵循以下要求

1. 你只可以和合作伙伴已聊天的形式讨论哪里需要修改、为什么需要修改以及怎样修改。必须以讨论的模式交换意见，请勿只在文章中以传统模式提供修改意见并发给合作伙伴。讨论需包含以下内容：

- 文章哪里需要修改，
- 为什么指出的部分需要修改，
- 可以怎样修改，及
- 为什么你们的修改方式和意见是合理准确的。

传统模式范例及讨论修改方案范例参考以下表格

2. **不要只**专注于提出修改意见。鼓励支持你的合作伙伴提出意见并讨论。本次项目是一个合作活动。

3. 针对全文提出修改意见。**不要只关注与对方写的内容。**
4. 在不理解不懂对方的情况下，**及时向对方询问：让对方给予进一步的解释说明。**

Guiding Questions to help with feedback discussion 帮助讨论修改方案的指导性问题

- | | |
|--|---|
| 1. Does our essay include both 1) <u>examples of our own experience</u> or stories and 2) <u>analysis of how the experiences influences students' learning and/or teacher's teaching</u> ? | 1. 我们的文章包含了以下内容没有：1) 自身经历或故事的例子 ；2) 关于这些经历对学生学习和 / 或教师教育产生的影响 ？ |
| 2. Does our essay have a clear structure? Are properly transitions used in the essay? | 2. 我们的文章是否有清晰的结构和合理运用的转折语（连接词句）？ |
| 3. Does our essay read coherently (no redundancy and digression, points clearly connected with each other etc.)? | 3. 我们的文章是否连贯通顺（无冗长的解释和离题现象）？ |
| 4. Does our essay has long sentences that can be written more succinct or short sentences that can be combined? | 4. 我们的文章是否有可写的更简练的长句或可以合并起来的短句？ |
| 5. Are there any words or phrases that can be substituted with better ones? | 5. 是否有词或词组可以选用更合适的词或词组？ |
| 6. Are there any grammatical errors? | 6. 是否有语法错误？ |
| 7. Are there any errors on punctuations? | 7. 是否有标点错误？ |
| 8. Are there any spelling errors? | 8. 是否有拼写错误？ |

Original Text / 原文

In the past decade, teachers starts to realize that tests may not be the best way to review student’s learning. In China, testing have a long history. Students and teachers used to this learning style. In the US, testing is not the only standard to evaluate students performance.

(Second paragraph of an essay written by two authors)

Traditional Way / 传统模式

In the past decade, teachers starts to realize that tests may not be the best way to review-assess student’s learning. (Transition) To compare testing culture in China and the US, we will discuss how the history influences the system of testing in both countries. In China, testing have has a long history. Students and teachers are used to this learning style. (examples) In the US, testing is not the only standard to evaluate students’ performance. (examples)

Feedback Discussion / 讨论修改方案

Jane: I think overall, our second paragraph looks good. However, I think we can revise it to make it better.

Ming: Yes, I agree.

Jane: Let’s talk about content first.

Ming: Okay.

Jane: I like how we talk about the differences between China and US. But do you think it might be better if we add some examples for each culture? I think examples can help us strengthen our claims.

Ming: Yes, I agree. But what kinds of examples should we include? I’m not sure how to write examples for the Chinese culture.

Jane: What do you mean? Like for the US culture, I can add information on other ways to evaluate students’ performance to show that testing is not the only way.

Ming: Oh, I see. Then I can add information like when we study, our only purpose is to get higher grades in tests. Test is everything.

Jane: Yeah, that’s good.

Ming: Great!

Jane: For transition, I think before we start to talk about the difference between China and US, we may need to a transition.

Ming: Why?

Jane: Because our first sentence is a general statement, the Chinese and American educations are examples. We need to transition to shift from statement to

Yellow: suggestions of where and how to revise

黄色：修改哪里和如何修改

Blue: Reasons and examples of the suggestion

蓝色：为什么要修改以及修改范例

Gray: clarification questions

灰色：对不明白的地方进一步提问，澄清理解

You don't need to color code in your chat logs.

在你们的聊天记录中不需要用颜色标记。

Discuss feedback on content

关于内容修改方案的讨论

Discuss feedback on transitions

and organizations

关于转折语（连接语）及结构

修改方案的讨论

examples. Some like “To compare testing culture in different culture, we discuss the difference between American and Chinese culture.”

Ming: Oh, I see. Okay. That’s clearer.

Jane: Great.

Ming: Oh, I noticed some grammar errors. The first sentence, “teachers” should “start” to realize.

Jane: Yes. Also, in China, “testing” should use singular as well.

Ming: Oh, right.

Jane: I think “tests may not be the best way to review student’s learning”, it may be better to use “assess” instead of review.

Ming: Okay. But why?

Jane: Review means looking over, assess is to evaluate.

Ming: Oh, I see. Thanks.

Jane: Another is “Students and teachers used to this learning style.” Should be “are used to”, we are talking about a habit here.

Ming: Okay. What’s the difference between “used to” and “are used to”?

Jane: It means what people do in the past.

Ming: Oh. I see. I will make these revisions.

Jane: Great. Do you notice any other errors?

Ming: I’m not sure, but should “students performance” be “students’ performance” in the last sentence?

Jane: Oh, right. Thanks for pointing out.

Discuss feedback on grammar,
vocabulary and sentence structures
关于语法、词汇及句子结构修改
方案的讨论