Computer-based Writing and Paper-based Writing:
A Study of Beginning-level and Intermediate-level Chinese Learners’ Writing

Dissertation

Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of The Ohio State University

By

Hana Kang, M.A.
Department of East Asian Languages and Literatures

The Ohio State University

2011

Dissertation Committee:
Professor Marjorie K.M. Chan, Advisor
Professor Alan Hirvela, Co-advisor
Professor Mark Bender
Copyright by

Hana Kang

2011
Abstract

Chinese writing is one of the most difficult challenges for Chinese learners whose first language writing system is alphabetic letters. Chinese teachers have incorporated computer-based writing into their teaching in the attempt to reduce the difficulties of writing in Chinese, with a particular emphasis on composing (as opposed to simply writing individual Chinese characters). However, there is a lack of study to fully understand the complexity of Chinese learners’ computer-based and paper-based writing modes and their writing development. This study compares these two writing modes of beginning-level and intermediate-level Chinese learners and investigates how they develop Chinese writing by analyzing their writing errors.

This study uses “mixed methods” that include a combination of qualitative and quantitative approaches to examine participants’ Chinese writing. Surveys and interviews were conducted to examine participants’ views of Chinese writing and their attitudes toward computer-based and paper-based writing. In total, 58 beginning-level and 12 intermediate-level learners participated in the survey study. Individual writing sessions were arranged with 16 beginning-level and 12 intermediate-level participants for analyzing their writing process. Their paper-based writings were recorded using the Smartpen, a state-of-the-art pen-movement tracking device. Camtasia Studio, a computer
screen capture program, was used to record computer-based Chinese writing. Two native Chinese teaching assistants graded participants’ writing using a ten-point scale to examine their writing with respect to clarity (in terms of character, vocabulary, and grammar error) and organization (in terms of style of writing and use of linking words).

The survey data revealed that participants regarded Chinese writing as “handwriting of Chinese characters.” Due to the difficulty of learning Chinese characters, they thought that they would write Chinese better with computer typing. Different from participants’ perceptions on computer-based writing, paired t-test results of intermediate-level participants’ writings indicated that they wrote Chinese essays better with paper-based writing in terms of writing clarity and organization. Computer-based writing only helped participants produce fewer character errors. Interestingly, when participants wrote unfamiliar genres of writing, there was no difference between computer-based and paper-based writing. In addition, the analysis of the Chinese character writing process indicated that there was a correlation between following correct stroke-sequences and producing correct characters. By analyzing character errors and stroke-sequence errors, I identify three developmental stages of Chinese character writing: Pinyin writing, acquisition of stroke-shapes and rules of compound characters, and matching pronunciations with characters.

This study contributes to the Chinese writing field by applying new methods to examine learners’ writing and experimenting with novel technologies to analyze their writing process. The findings reveal the importance of teaching correct stroke-sequences in Chinese character writing. Furthermore, this study discovers that computer-based writing allows Chinese learners to produce correct characters. Finally, it points out other
important aspects of Chinese writing, including the syntax, genre, and use of Chinese resources, as they also influence Chinese learners’ writing.
Dedication

To my parents and Chaoli
Acknowledgements

I thank the Center for the Study and Teaching of Writing (CSTW) at The Ohio State University for conferring me the Dissertation Research Award. The funding provided by this award allowed me to acquire and utilize a Smartpen and a digital camcorder for my dissertation research. It also enabled me to compensate my participants for their time and efforts spent on Chinese writing for this research purpose.

Without great help from numerous people, I could not come to this far and finish my dissertation. First, I would like to express my deepest gratitude to my advisor Dr. Marjorie K.M. Chan (Ma Laoshi) for her warmhearted advice and support to my graduate study and my personal life. Ma Laoshi, you always welcome me at your office or home whenever I need your advice. You taught me not only Chinese linguistics but also ethical responsibilities as a teacher and a researcher. I will always remember that one should not abuse one’s power over students. I am also thankful for your trust to help you organize the 20th North American Conference on Chinese Linguistics (NACCL-20) and edit the conference proceedings. I really enjoyed working with you from which I learned the essential aspects of an academic life. Ma Laoshi, 暖謝！謝謝！

I would like to thank Dr. Alan Hirvela, my co-advisor, for his valuable time and advice on my dissertation. Dr. Hirvela, from the first time I met you, you gave me good advice on research, presentation, and publication. Without your encouragement, I could
not have explored many research opportunities and presented my studies at various conferences. Your wonderful advice on the “Four Ps” of life (prosperity, patience, perseverance, and pride) inspires me to lead a meaningful life.

Dr. Mark Bender, as my dissertation committee member, you always managed to reserve time for me on top of your busy schedule. I thank you for your kind advice to my study and teaching. I also learned a lot as your teaching assistant of EALL 131 class, which built a solid foundation for me to teach introductory East Asian cultures classes.

I would also like to thank Dr. Youngjoo Yi. Dr. Yi, you taught me how to survive in the graduate school and shared your research experiences without hesitation. You kindly answered many questions and puzzles I had during the past several years.

There are many other people to whom I owe my thanks: Dr. Eun Hye Son, Debbie Kincely, Steven Knicely (史老师), Dr. Eric Yang, Soyoung Han, Dr. Jing Yan, Chunsheng Yang, Rongbin Zheng, Jia Yang, Bo Zhu, and my participants whom I cannot reveal their names. Dr. Eun Hye Son, I thank you for your pray and emotional support.

I would like to thank my family for their sacrifice and support. 부모님, 저를 위해 두 분의 인생을 희생하시면서 미국에 와서 더 좋은 교육기회를 주시고, 박사과정 공부 기간 동안 항상 저를 이해해 주시고, 믿어주시고, 격려해주셔서...
감사합니다. I am really grateful to my brother Shinho Kang who always found solutions when I had computer problems. I also thank my sister-in-law Elizabeth Chase-Kang who read my dissertation chapters. Finally, I thank my husband Dr. Chaoli Wang who encouraged me to finish my dissertation by saying “할 수 있어 加油!” Chaoli, I really appreciate your tremendous help on my dissertation writing. I feel lucky to have you as my husband.
Vita

2001……………………………………….. B.A. Communication and Chinese
Rutgers, The State University of New Jersey

2004……………………………………… M.A. Chinese Linguistics
Department of East Asian Languages and Literatures, The Ohio State University

2002 - 2008……………………………. Graduate Teaching Associate
Department of East Asian Languages and Literatures, The Ohio State University

Spring 2006, Summer 2007, and July 2008 - June 2009………………… Lecturer
Department of East Asian Languages and Literatures, The Ohio State University

August 2009 - Current………………… Instructor
Department of Humanities, Michigan Technological University
Publications


Field of Study

Major Field: East Asian Languages and Literatures

Concentration: Chinese Linguistics

Minor Field: Foreign/Second Language Education
# TABLE OF CONTENTS

Abstract ............................................................................................................. ii
Dedication ........................................................................................................ v
Acknowledgements ........................................................................................ vi
Vita .................................................................................................................... ix
List of Tables .................................................................................................. xvi
List of Figures .................................................................................................. xix

1. Introduction .................................................................................................. 1
   1.1 Statement of the Problem ........................................................................ 5
   1.2 Significance of the Study ........................................................................ 9
   1.3 Research Questions .............................................................................. 12
   1.4 Definition of Terms .............................................................................. 13
      1.4.1 Writing Process ............................................................................. 13
      1.4.2 Paper-based Writing ..................................................................... 14
      1.4.3 Computer-based Writing ................................................................. 14
      1.4.4 Writing Errors ................................................................................ 14
         1.4.4.1 Character Errors ..................................................................... 15
         1.4.4.2 Stroke-Sequence Errors ............................................................. 15
         1.4.4.3 Lack of Clarity of Writing ......................................................... 15
         1.4.4.4 Poor Organization of Writing ................................................... 15
   1.5 Organization of Dissertation ................................................................... 16

2. Chinese Writing System, Computer Input Methods, and Literature Review ......... 17
   2.1 Chinese Writing System .......................................................................... 17
2.2 Studies on Chinese Language Learners’ Writing............................................. 26
2.3 Chinese Computer Input Methods.............................................................. 30
2.4 Studies on Computer-based Chinese Writing.......................................... 34
3. Research Methods, Research Site, and Participants ............................... 38
  3.1 Rationale for Mixed Methods................................................................. 39
  3.2 Research Site.......................................................................................... 42
  3.3 Pedagogical Theory behind the Chinese Program.................................. 43
    3.3.1 Reading and Writing Textbooks......................................................... 45
    3.3.2 Teacher Training.............................................................................. 46
  3.4 Participants.............................................................................................. 48
  3.5 Researcher............................................................................................... 50
  3.6 Data Collection......................................................................................... 54
    3.6.1 First Phase: Observation (Autumn Quarter 2008).............................. 54
    3.6.2 Redefining Research Questions......................................................... 57
    3.6.3 Second Phase: Data collection (Winter and Spring Quarters 2009).... 59
      3.6.3.1 Survey Study.............................................................................. 59
      3.6.3.2 Individual Writing Sessions......................................................... 59
      3.6.3.3 Paper-based Writing (Using Smartpen)........................................ 62
      3.6.3.4 Computer-based Writing (Using Camtasia Studio).................... 65
      3.6.3.5 Cross-examining Data with Participants.................................... 68
  3.7 Data Analysis........................................................................................... 69
  3.8 Summary................................................................................................. 72
4. Results: Demographic information of participants and their computer-based writing and paper-based writing................................................................. 73
  4.1 Demographic Information of Participants............................................. 74
    4.1.1 Demographic Information of Beginning-level Participants............... 74
    4.1.2 Demographic Information of Intermediate-level Participants.......... 79
  4.2 Participants’ Self-evaluation of Their Chinese Writing and Their Attitudes toward Computer-based Writing and Paper-based Writing.......................... 83
    4.2.1 Chinese Writing and Beginning-level Participants.......................... 83
4.7.1.2 Speed of Writing: Intermediate-level participants .................................. 140
4.7.2 Length of Writing ......................................................................................... 141
4.7.3 Clarity of Writing ......................................................................................... 144
4.7.4 Organization of Writing ............................................................................... 147
4.7.5 Correlation among Use of Resources, Length, Clarity, and Organization of
Writing .................................................................................................................. 149
4.8 Characteristics of Chinese Learners and Their Chinese Writing .................. 155
  4.8.1 Chinese as a Heritage Language Beginning-level Learners: Xiao Huang and
Xiao Zhao .............................................................................................................. 156
  4.8.2 Chinese as a Foreign Language Beginning-level Learners: Xiao Shi and Xiao
Bai ......................................................................................................................... 164
  4.8.3 Intermediate-level Chinese Learner: Xiao Kong ........................................ 168
  4.8.4 Intermediate-level Chinese Learner: Xiao Li ............................................. 170
  4.8.5 Intermediate-level Chinese Learner: Xiao Mei and Xiao Zheng ............... 173
5. Discussions and Implications .......................................................................... 182
  5.1 Characteristics of Chinese Learners and Their Chinese Class .................... 183
  5.2 Development of Chinese Learners’ Computer-based Writing and Paper-based
Writing ..................................................................................................................... 185
    5.2.1 Chinese Learners’ Definition of Chinese Writing ..................................... 186
    5.2.2 Chinese Learners’ Attitudes toward Chinese Computer-based Writing and
Paper-based Writing .............................................................................................. 187
    5.2.3 Chinese Character Errors of Computer-based Writing and Paper-based
Writing ..................................................................................................................... 188
    5.2.4 Patterns of Character Writing Errors of Beginning-level and Intermediate-level
Participants ............................................................................................................. 190
    5.2.5 Influence of the Two Writing Modes on Writing Errors ......................... 193
    5.2.6 Influence of the Two Writing Modes on Clarity of Writing and Organization of
Writing .................................................................................................................... 194
  5.3 Implications ................................................................................................... 196
    5.3.1 Chinese Writing as Social Interaction ..................................................... 196
5.3.2 Suggestions for Chinese Writing Instructions ........................................... 197
5.3.3 Suggestions for Chinese Dictionary Usage............................................. 199
5.3.4 Importance of Using the Two Writing Modes......................................... 200
5.4 Limitations.......................................................................................... 201
5.5 Conclusions......................................................................................... 203
References.............................................................................................. 206

Appendix: Chinese writing acquisition studies in the *Journal of Chinese Teachers Association* ................................................................. 213
LIST OF TABLES

Table
1. Daily Performance Grade from the Department’s Website.......................... 47
2. Participants in Winter Quarter 2009.......................................................... 49
3. Participants in Spring Quarter 2009.......................................................... 49
4. Description of Beginning-level Writing Tasks............................................ 60
5. Description of Intermediate-level Writing Tasks......................................... 61
6. Grading Criteria for Clarity and Organization of Chinese Writing............... 71
7. Prior Foreign Languages Studied by Beginning-level Participants.............. 76
8. Majors of Beginning-level Participants................................................... 77
10. Foreign Languages Studied by Intermediate-level Participants.................. 80
11. Majors of Intermediate-level Participants............................................... 81
12. Paired T-test Results of Initial and Exit Surveys: Self-evaluation of the four
    language skills....................................................................................... 90
14. Less Important Language Skills: Beginning-level participants............... 92
15. Intermediate-level Participants’ Use of Computer Resources for Chinese
    Language Learning in Exit Survey......................................................... 95
17. Less Important Language Skills: Intermediate-level participants............... 98
18. Comments in Initial and Exit Survey: Intermediate-level participants........ 98
19. Paired T-test Result of Character Errors in Computer-based Writing and Paper-based Writing ................................................................. 106
20. Beginning-level Participants’ Character Error Scores in Ascending Order…… 109
21. Pearson’s Correlation Result of CEP and SSE: Beginning-level participants.... 111
22. Pearson’s Correlation Result of CEP and SSE: Intermediate-level participants ...................................................................................... 112
23. Pearson’s Correlation Result of Speed of Writing and Stroke-sequence Errors .................................................................................. 113
24. Examples of Type 1 Paper-based Character Errors................................. 116
25. Examples of Type 2 Paper-based Character Errors................................ 117
26. Examples of Type 3 Paper-based Character Errors................................ 118
27. Examples of Type 4 Paper-based Character Errors................................ 118
28. An Example of Type 5 Paper-based Character Error................................ 119
29. Intermediate-level Participants’ Character Errors: Paper-based writing…… 122
30. Computer-based Character Errors due to Limited Pinyin Knowledge........ 123
31. Character Errors: Failure of recognizing correct characters...................... 125
32. Participants’ Preference of Chinese Character Sets.................................... 127
33. Character Errors: Wrong stroke-shape and stroke-sequence..................... 130
34. Paired T-test Result: Number of revisions in computer-based writing and paper-based writing................................................................. 133
36. Speed of Writing of Intermediate-level Participants: Computer-based writing and paper-based writing................................................. 141
37. Length of Writing of Intermediate-level Participants: Computer-based writing and paper-based writing............................................... 142
38. Descriptive Statistical Analysis of Length of Writing Based on Different Genres ......................................................................................... 143
39. Paired T-test Result of Length of Writing: The two different genres......... 144
40. Paired T-test Result of Clarity of Writing: The two writing modes......... 145
41. Descriptive Statistical Analysis of Clarity of Writing Based on Different Genres

42. Paired T-test Result of Clarity of Writing: Genre and writing modes

43. Descriptive Statistical Analysis of Organization of Writing Based on Different Genres

44. Paired T-test Result of Organization of Writing: Genres and writing modes

45. Pearson’s Correlation Result of Use of Resources and Length of Writing

46. Pearson’s Correlation Result of Use of Resources and Organization of Writing

47. Summary of Paired T-test Results of Intermediate-level Participants’ Computer-based Writing and Paper-based Chinese Writing

48. Summary of Pearson’s Correlation Results: Resources, Length, Clarity, and Organization of Writing

49. Self-evaluation of the Four Language Skills for Xiao Shi and Xiao Bai

50. Writing Scores of Xiao Kong

51. Summary of Pearson’s Correlation: Stroke-sequence errors, character errors, and speed of writing

52. Different Patterns of Paper-based Writing Errors: Beginning-level and intermediate-level participants

53. Stages of Chinese Character Writing Acquisition in Beginning-level and Intermediate-level Chinese Learners
LIST OF FIGURES

Figure

1. Character 羊, yáng ................................................................. 20
2. Semantic-phonetic Compound Characters ........................................... 20
3. Directions of Basic Strokes (Coulmas 1991, p.97) ......................................... 22
4. The QWERTY Keyboard Layout of Cangjie ............................................... 31
5. The QWERTY Keyboard Layout of Zhuyin Fuhao with Phonetic Symbols in Red Boxes .................................................................................. 32
7. Writing Error of Character 时 shí ........................................................... 55
8. Writing Error of Character 起 qǐ ........................................................... 56
9. Picture of Smartpen (www.livescribe.com) ............................................... 63
10. Dot Paper with Buttons for Smartpen ...................................................... 63
11. Smartpen Video Playing of Handwriting of Character 文 wén: A sequence of still pictures (the stoke-sequence is shown using a more saturated green color) .................................................................................. 64
13. Screenshot of Camtasia Studio Interface ............................................... 66
14. Starting the Function of Recording in Camtasia Studio .............................. 67
15. Recording Movements on Computer Screen ............................................ 67
16. Screen Capture of the Process of Typing Character 时 shí .......................... 68
17. Score of Character Errors ....................................................................... 70

xix
18. Score of Character Stroke-sequence Errors ........................................... 70
21. Use of Language-learning Computer Software: Beginning-level participants .......................................................................................................................... 85
22. Beginning-level Participants’ Preference of Writing Modes: First language .......................................................................................................................... 86
23. Beginning-level Participants’ Preference of Chinese Writing Modes .......... 87
24. Self-evaluation of the Four Language Skills: Beginning-level participants .......................................................................................................................... 89
25. Intermediate-level Participants’ Preference of Writing Modes: First language .......................................................................................................................... 94
27. Use of a Cantonese Lexical Item in Xiao Huang’s Paper-based Writing ...... 158
28. Character Writing Error of 候 hou: Xiao Huang ............................................. 159
29. Typing Process of Character 候 hou: Xiao Huang ............................................. 160
30. A Sample of Paper-based Email Writing: Xiao Zhao ................................. 162
31. A Sample of Paper-based Dictation Writing: Xiao Shi ............................... 166
32. Use of Pinyin in Paper-based Writing: Xiao Bai ......................................... 167
33. Use of the Translation Function in Online Dictionary: Xiao Li ................. 171
34. Use of a Korean-Chinese Electronic Dictionary: Xiao Mei ......................... 175
35. Sentence Error Reflecting Imposition of Korean Syntax: Xiao Mei ............. 176
36. An Example of Argumentative Writing: Xiao Mei ...................................... 177
Chapter 1

Introduction

The complex practices involved in Chinese writing present many challenges for both learners and teachers of the Chinese language. Having first been a Chinese language learner myself, I can attest to the many obstacles to learning to write in Chinese. When learning Chinese as a foreign language, I encountered difficulties not only in learning the characters but also in understanding the differences between spoken and written Chinese. Even now as a teacher of Chinese, I struggle to find the best teaching methods to help my students learn to write in Chinese. To assist my students, I try to incorporate current technologies such as computer software and other online resources to help ease the acquisition of Chinese writing. However, I have received mixed feedback from other teachers about the use of computer technology in the Chinese writing classroom. Some teachers fear that the use of computer might actually inhibit or prevent learners from developing their Chinese writing skills. Their argument is that students need to experience the stroke-by-stroke formation of the characters in their finger tips in order to embed the process into their brains. I remain skeptical of this contention because most Chinese learners have already been actively using computer technologies such as word-processing software, dictionary software, and translation software programs to
assist their Chinese writing assignments. The use of computer technologies occurs frequently even the learners are specifically requested by teachers to turn in handwritten assignments using pen and paper. I therefore believe that incorporating these computer-based aids into teaching can make students feel more at ease and comfortable in their writing. After all, they use computers to write in their native language. Nevertheless, no comprehensive research exists that investigates this unsolved issue of how best to teach Chinese writing. Therefore, it is necessary to study how Chinese learners learn to write before we can identify which mode of writing acquisition (computer-writing on screen or handwriting on paper) is better for the learners.

Due to the complexity of the writing and composing process, even in one’s native language, writing has been one of the most important topics in applied linguistics for over half a century (Hyland 2002). Scholars have investigated various aspects of writing such as text analysis (Brandt 1986; Halliday 1994) and writing process (Bereiter & Scardamalia 1987; Flower & Hayes 1981). Even the impact of technology on the writing process in one’s native language has been heavily studied (Milone 1984; Reinking & Bridwell-Bowles 1991; Yi & Hirvela 2010). In the second/foreign language acquisition field, writing has also received due attention from scholars. However, those studies deal primarily with the various aspects of writing in English as a second language or other commonly taught languages based on the Roman alphabet such as Spanish, French, and German (Serrano & Howard 2007; Thorson 2000; Way et al. 2000). In the teaching and research of Chinese as a foreign language in the United States, only a few studies pertain to Chinese writing. For example, 21 out of 677 articles since 1996 to August 2010 —
only 3% of the articles\(^1\) — in the *Journal of the Chinese Teachers Association* are related to Chinese writing acquisition. Moreover, the approach to writing research is largely limited to one area, namely, that of Chinese character acquisition. Unlike issues for English and the Romance languages which have been widely studied, the wider range of issues associated with writing composition has not been addressed for the Chinese language learners.

Learning to write Chinese characters is one of the biggest obstacles for Chinese learners in the United States. As a result, most beginning-level learners often do not advance beyond the introductory level of Chinese (Xu & Jun 2005). This reality makes teaching Chinese characters a core task of Chinese writing instruction. Even now teachers argue about the appropriate time that should be spent on introducing the Chinese writing system to learners in their curriculum. As a matter of fact, this difficulty of learning Chinese characters is reflected in the early Chinese writing acquisition research in the United States. Those early studies even debated whether or not teachers should teach Chinese characters to beginning-level learners at all (Chin 1973). While studies in the 1970s focused on finding the reasons for teaching Chinese characters to beginning-level learners, later Chinese writing acquisition studies did go a step further and investigated the methods for teaching characters to learners.

Since the 1990s, Chinese writing research has focused on character recognition and the effectiveness of teaching various character learning strategies (Ke 1998; Shen 2005). In these studies, experiments were conducted on Chinese learners to identify which character learning strategies they used. These researchers concluded that learners

\(^1\) See the Appendix.
who utilized character learning strategies performed better in character recognition tests as well. Their results provide pedagogical tools to Chinese teachers to teach Chinese learners. A limitation of these studies is that they did not examine the use of computer technology in Chinese writing acquisition, possibly because typing Chinese in computers was not popular yet among learners at that time. Nowadays, Chinese learners use computer technology for different tasks and it has become an indispensable part of their Chinese learning. However, until Xu and Jen (2005), no studies have investigated the use of computer technology in Chinese writing. Xu and Jen (2005) compared computer software technologies to those of handwriting on paper in teaching Chinese writing. Despite the different natures of computer typing and handwriting, they treated the two sets of writing scores from computer-based writing and paper-based writing as the same. They claimed that learners preferred to use computers instead of handwriting. Furthermore, they asserted that the computer input method developed by them helped learners produce accurate sentences.

Before we discuss the effectiveness of computer-based writing in Chinese writing acquisition, we must first realize that computer typing in English is very different from typing in Chinese. Most popular Chinese computer input systems require users to type the phonetic letters of the Pinyin system for each character. Pinyin is the short form for Hanyu pinyin (汉语拼音) and is the official Romanization system in the People’s Republic of China (P.R.C.). It is also the most popular Romanization system of Chinese outside of the P.R.C., widely taught in schools and used in publications (Chen 1999, p. 187). However, Pinyin differs from the English alphabet in several aspects. For example, the Pinyin initials of j [tɕ], ch [tʂʰ], and sh [ʂ] are pronounced differently in English as j
[dʒ], ch [tʃ], and sh [ʃ], making it difficult for English speakers to learn the *Pinyin* system (Norman 1988). Using computers to write Chinese also requires training and practice. Therefore, it is difficult to claim that the use of computer-based Chinese writing eases the difficulty of learning to write in Chinese.

Researchers who study computer-based writing for Chinese learners have not paid due attention to the difficulties involved with learning computer-based Chinese writing. Teachers and researchers have not developed a trajectory indicating when learners should start using computers for Chinese writing, nor do they know how the learners feel about using computers to practice their writing. Furthermore, there are no studies that compare the teaching of writing in Chinese using a computer versus the teaching of writing by means of handwriting on paper. Studying the techniques for teaching writing will enable researchers and teachers to understand more about learners’ writing processes. In addition to learning about writing strategies by student observation, researchers and teachers can learn more about how they view Chinese writing, and how they switch between computer-based writing and paper-based writing. Therefore, it is important to study the complex processes of Chinese learners’ writing, including both computer-based writing and paper-based writing.

### 1.1 Statement of the Problem

There are at least four problems in the current research on Chinese learners’ writing. First, compared with other areas such as listening, speaking, and the acquisition of vocabulary and grammar, there is little research conducted on Chinese writing.
Second, there is no longitudinal study that investigates how Chinese learners acquire Chinese writing system and develop their Chinese writing skills. Third, the research methods reported in the literature have focused on a quantitative approach, without heed to qualitative research. Last, the limited research on writing Chinese has not fully investigated the effect of using computer technology on learners’ Chinese writing.

The first and second problems are likely due to the limited number of advanced learners of Chinese in the past. However, in the United States, the number of Chinese learners has been growing every year. According to the Modern Language Association, in 2006, at the higher education level, there were 51,582 American students learning Chinese, a 51% increase over 2002. The Asian Society also reported that the number of Chinese programs in pre-kindergarten through the 12th grade in the U.S. has grown by almost 200% since 2004. Chinese teachers and researchers now have the opportunity to observe more advanced learners in their programs. Studying Chinese learners’ writing will benefit current Chinese learners, who need more writing instructions beyond the character acquisition level. Moreover, researchers also have the opportunities to investigate different developmental stages of Chinese writing by comparing learners at different levels. Results from such research would be helpful for designing suitable writing materials.

The third problem concerns the one-dimensional quantitative approach to researching how non-native Chinese learners learn to write. This quantitative method is very useful when researchers examine the effectiveness of particular character learning

---

strategies and learners’ change of behavior patterns in Chinese character learning. However, if researchers want to examine the whole procedure of the Chinese writing by Chinese learners, a quantitative approach, by itself, is severely limited when trying to capture the nature of writing. For instance, Chinese writing can be analyzed from a cognitive process perspective (e.g., planning, actual writing, using references, and editing) and a social practice perspective (e.g., interactions between reader and writer, and attitudes toward particular genres). Qualitative approaches will assist researchers to observe Chinese writing from the learners’ perspectives, such as their attitudes toward learning Chinese writing. The data from qualitative studies will also guide researchers to design research hypotheses and experiments. Considering that there are few studies of Chinese learners’ writing, it is difficult to design a quantitative study on the development of Chinese learners’ writing. However, scholars can design effective quantitative studies based on the findings of qualitative approaches. Furthermore, the two research approaches, quantitative and qualitative, are mutually beneficial when analyzing data of Chinese learners, their processes and development of Chinese writing. Therefore, the best way is to utilize both quantitative and qualitative approaches in this study in order to examine the complexity of the nature Chinese learners’ writing.

The fourth and final problem pertains to the reality that scholars have not paid due attention to the use of computer technology in Chinese writing. Obviously, very few of the early Chinese learners practiced Chinese writing with computers so this area may be only just opening up in recent years. In addition, researchers have not gone far enough to tackle the controversy among Chinese teachers about whether to teach with computers at all when teaching Chinese writing. In other areas of Chinese learning, such as listening
and speaking, many teachers embrace computer technology for the preparation of their own materials and instructions. Researchers have also introduced teachers to the use of state-of-the-art computer technology such as speech-analysis programs and concordance software (Chan 2002, 2003). However, when it comes to using computer technologies as a tool for teaching Chinese writing, many Chinese teachers hesitate to recommend them.

Some Chinese teachers think that allowing students to use computers for practicing their Chinese writing will hinder their acquisition of characters. For this reason, they prefer their learners to practice paper-based Chinese writing. On the other hand, some teachers believe that computer-based Chinese writing reduces difficulties in learning Chinese. Despite the two different views about computer-based learning, only one study was conducted on the effectiveness of teaching computer-based vs. paper-based Chinese writing (Xu & Jen 2005). This lack of study limits Chinese teachers in knowing about the strengths and weaknesses of one method over the other. Furthermore, it is difficult for teachers and researchers to predict how Chinese learners would respond when faced with one teaching method over the other. In order to evaluate the effectiveness of teaching with either of these two different writing modes (computer-based writing and paper-based writing), it is necessary to investigate how Chinese learners practice computer-based writing and paper-based writing. It is also crucial to conduct longitudinal studies on how students develop Chinese writing skills over time in order to understand how they change their writing strategies from beginning-level to intermediate-level of Chinese. Results of these studies will help teachers and researchers develop effective Chinese writing instruction by leveraging the strengths of both writing modes.
1.2 Significance of the Study

By tracking Chinese learners’ progress during one academic year, this study investigates how beginning-level and intermediate-level Chinese learners develop their Chinese writing skills using both computer and pen-and-paper methods. Because of the ubiquitous use of computer technology, Chinese learners have already been exposed to computer-based writing at early stages of their Chinese learning. However, little is known about Chinese learners’ process of writing, such as each of the writing steps related to Chinese character writing (in terms of stroke-direction and stroke-sequence) and the process of Chinese computer typing and editing of their composition. Therefore, this study focuses on learners’ process of writing Chinese characters for compositions in computer-based writing and paper-based writing.

The main contributions of this study are three-fold. First, it provides a longitudinal study of the Chinese writing process by examining beginning-level and intermediate-level Chinese learners’ writing errors and reporting on how learners’ writing developed over a period of one academic year. This study examines student writing in detail to reveal each step of the process from learning Chinese characters to write compositions in Chinese. Second, this study utilizes both quantitative and qualitative methods to fill in gaps in our knowledge of learners’ Chinese writing process. Third, this study utilizes new, technology-based, data-collecting methods and tests them in the process. These three contributions are discussed in greater detail in the remainder of this subsection.
Regarding the first contribution, this study is one of the first to center on investigating the actual processes involved in learners’ Chinese writing. It examines the writing errors of beginning-level and intermediate-level Chinese learners’ writing. The analysis of learners’ writing errors will reveal different patterns depending on the proficiency of the learners and on which writing mode was used. Previous studies only examined how learners acquire the ability to recognize and to write Chinese characters. However, Chinese learners are taking classes beyond the beginning-level and they need more guidance on Chinese writing. Researchers in other language fields have conducted studies on learner errors and types of error in order to understand the process of writing acquisition (VanPatten 1998). Through a similar investigation into error analysis, this study will reveal how Chinese learners develop their writing using both computer and pen-and-paper, by focusing on a minute-by-minute examination of their writing process. By examining various patterns of learners’ writing errors, this study will reveal how learners develop their writing skill, and how the two different writing modes influence their writing. The results can contribute toward serving as a guide for teachers and researchers in the development of computer-based or paper-based Chinese writing materials. The results can also suggest ways to incorporate both modes of writing to teach Chinese learners.

Second, this study utilizes a camcorder, a pen-movement tracking device, and screen video capture software to analyze how learners write characters, stroke-by-stroke, and how they type Chinese characters using their choice of computer input method. This data collection method aims to discover in minute detail the nature of the participants’ writing process. For example, the Chinese learners’ writing errors can be due to various
reasons, and we can better understand those reasons through a minute-by-minute capture of the processes rather than simply viewing the end results. In other words, this is somewhat akin to the use of eye-tracking devices to learn about reading strategies through following the subjects’ eye movement. In the case of writing Chinese, capturing the writing process using computers is a complex process.\(^4\) Chinese computer-based writing requires different language skills compared to paper-based writing that involves character recall and its component parts. Therefore, the nature of errors only can be studied by observing, minutely, every single typing step in the process of the Chinese learners’ writing. To best facilitate this, the learners’ writing (especially computer typing) is revealed using screen video capture software. To the best of my knowledge, this method has not been used previously in Chinese writing research.

Last, this study will generate data from both quantitative and qualitative methods for gathering and analyzing the results. Previous Chinese writing studies tended to rely on quantitative methods only. However, the quantitative approach is limited in its ability to incorporate factors such as social and physiological influences on learners of Chinese writing. Since the purpose of this study is to investigate how Chinese learners practice writing and how they use the two different writing modes, a qualitative approach is also needed to complement quantitative research. I aim to find emerging themes and patterns (Miles & Huberman, 1994) and apply statistical analysis to report on the patterns of learners’ writing errors. Hence, this study also adopts the ethnographical approach to investigate learners’ views and behaviors and how these change over time through their

\(^4\) Unlike English computer-typing, Chinese computer-typing normally involves three parts: 1) Pinyin-typing, 2) character recognition, and 3) character selection from a pop-up panel (which shows a list of Chinese characters for the selection).
learning progress. This mixed method approach will help us better understand the complexity of Chinese learners’ writing.

1.3 Research Questions

In order to investigate the development of Chinese learners’ computer-based writing and paper-based writing, this study aims to answer the following six research questions:

1) What is the learners’ definition of “Chinese-writing” based on the different modes (computer vs. paper) of writing?
2) Do learners’ attitudes toward Chinese writing change depending on whether it is computer-based writing or paper-based writing? And if so, how did their attitudes change?
3) How do learners’ computer-based writing errors differ from those produced by paper-based writing?
4) Are there distinct patterns of writing errors characteristic for each level (beginning-level and intermediate-level) of Chinese learners?
5) Are the error patterns influenced by the two different modes of writing (computer-based writing and paper-based writing)?
6) Does one mode of writing (computer-based or paper-based) aid Chinese learners to produce better writing in terms of clarity and organization of writing? If so, which mode and why?
It is important to know the learners’ definitions of “Chinese writing” and their attitudes toward Chinese writing (Questions 1 and 2). This is because their understanding of Chinese writing may influence their writing accuracy. For example, I have observed that Chinese learners who treat “Chinese-writing” simply as writing individual Chinese characters tend to encounter more difficulties in reading and understanding authentically written Chinese materials (Kang 2006). Questions 1 and 2 can facilitate an understanding of the nature of their writing errors in this regard.

The findings from Questions 3, 4, and 5 will aid in determining whether the use of different modes of Chinese writing by learners at different levels (beginning-level and intermediate-level) will result in different patterns of writing errors. The results will enable researchers to develop suitable teaching materials to meet the learners’ needs. The findings from Question 6 can provide more information for researchers when comparing computer-based writing to paper-based writing.

1.4 Definition of Terms

1.4.1 Writing Process

The term “writing process” is derived from the concept of “writing as a cognitive process” (Hyland 2002). This approach to writing emphasizes the importance of how a final written product is planned, drafted, revised, and edited (Flower & Hayes 1981). This study borrows the cognitive process approach to writing but focuses on how a particular draft of writing is produced. Here, the main focus is on how learners compose Chinese writing, use resources, and edit their writing during a writing session. This study
does not examine how learners revise multiple drafts. Since learners are not always aware of their writing process, they cannot effectively explain it to the researchers (Scott & New 1994). Additionally, due to the complexity of an on-going writing process, it is difficult for researchers to observe and analyze the learners’ writing in real time. In this research, I record an entire writing session using a camcorder, a computer screen video capture program, and a pen-movement recording device.

1.4.2 Paper-based Writing

This study defines “paper-based writing” as the final product produced by writing on paper using pen or pencil; that is, a handwritten product. In this study, learners can make use of any resources, either print-based or digital-based, to produce their paper-based writing.

1.4.3 Computer-based Writing

“Computer-based writing” refers to the final product completed with computer word-processing software. In this study, learners can consult either print-based or non-print-based resources to produce their computer-based writing.

1.4.4 Writing Errors

In this study, “writing errors” are classified into four categories, the first two being the more traditional kinds of errors at the character level and the remaining two involving composition and stylistics: 1) character errors, 2) character stroke-sequence errors, 3) lack of clarity of writing, and 4) poor organization of writing.
1.4.4.1 Character Errors

Character errors happen when learners produce incorrect characters, such as homophone errors and ill-formed characters and random character errors. The homophone character error is due to incorrect character selection, which can occur in either computer-based writing or paper-based writing. Ill-formed character errors are caused by missing strokes or too many strokes or ill-properly-formed strokes.⁵

1.4.4.2 Stroke-sequence Errors

Stroke-sequence errors happen when learners produce the correct characters but do not follow the correct stroke-sequences.

1.4.4.3 Lack of Clarity of Writing

This study is concerned with the process of writing and the overall improvement of learners’ writing. In order to determine where the clarity problems are, this study uses a ten-point scale to evaluate writing clarity. Clarity of writing includes the evaluation of the learners’ correct usage of character, vocabulary, and grammar. If the learners’ writing presents no difficulty in understanding by native Chinese, it will receive ten points.

1.4.4.4 Poor Organization of Writing

Organization of writing is evaluated based on how students have organized their written compositions. Just as with English, well-organized Chinese compositions have a main idea, an introduction, followed by supporting ideas, examples, and a conclusion.

⁵ For example, if a participant wrote  хоз for character 元, it counts as a character error.
They also contain smooth transitions between sentences. The ten-point scale is also used here for evaluating how well or how poorly a learner’s writing is organized.

1.5 Organization of Dissertation

In this chapter, I explained what gaps exist in Chinese writing research and the importance of this study. In Chapter 2, I review the studies related to Chinese learners’ writing, such as Chinese learners’ attitudes toward Chinese writing, character recognition, character learning strategies, and Chinese computer-based writing. Chapter 3, the methodology chapter, describes the data collection site, the procedures of data collection, and the technology used for recording the learners’ writing. Chapter 4 presents some quantitative results based on statistical analyses. The chapter consists of two parts: 1) the results from the Chinese learners’ surveys and 2) the results from the learners’ computer-based writing and paper-based writing. Chapter 4 also includes a set of examples to provide qualitative analysis. In Chapter 5, the conclusion chapter, I summarize the findings and offer some implications of this study for future Chinese writing research and its application in teaching approaches and methodologies.
Chapter 2

Chinese Writing System, Computer Input Methods, and Literature Review

This chapter discusses the complexity of the Chinese writing system and how various computer input methods attempt to render Pinyin into typed characters. It also examines research on the experiences of Chinese learners’ writing in both computer-based writing and paper-based writing. First, I will discuss some studies about the Chinese writing system from the perspective of reading and writing research. Second, studies on Chinese learners’ character acquisition are examined. Third, I briefly explain what is involved in Chinese computer-typing using the QWERTY keyboard. Since there is a lack of user studies on Chinese input methods, I will also point out problems that Chinese learners encounter when typing Chinese characters. Finally, the chapter closes with a discussion of some of the current studies on Chinese computer-based writing.

2.1 Chinese Writing System

Chinese as a Foreign Language learners whose first language is English consider learning Chinese writing as the most challenging part of learning Chinese. This is due to the huge difference between English and Chinese orthographies. Chinese learners
encounter two big challenges when they learn how to write in Chinese. One is that Chinese characters and their pronunciations are not transparent compared with other writing systems such as Korean Hangul or English. Many Chinese learners and some other people as well view the Chinese writing system as simply consisting of pictographs or ideographs. However, this is a misconception. Scholars agree that Chinese writing is a logography, comprising graphemes (or basic graphic units corresponding to the smallest segments of speech in writing) that simultaneously encode the sounds and meaning at the syllable level (Coulmas 1991; DeFrancis 2002; Hansell 2002; Shu & Anderson 1999; Sun 2006). However, researchers also point out that a strict distinction between phonography and logography in writing systems is problematic. When phonographic English writing system is compared with Finnish or Korean writing systems, it displays relatively more logographic features. For example, there are three ways to spell the same sound in the words, *sent, cent,* and *scent,* representing three different meanings. A strictly phonographic system would have reduced that to just one spelling such as *sent.* Linguists claim that every writing system contains some degree of both phonographic and logographic features. For example, Xu Shen (100CE) categorized six principles of Chinese writing which demonstrate that the Chinese writing system also contains phonographic features.

Xu Shen’s six classifications categorize the Chinese writing system into 象形 *xiàngxíng* (pictographic), 指示 *zhīshì* (ideographic), 会义 *huìyì* (consisting of semantic-semantic compounds), 假借 *jiàjiè* (phonetic loan), 转注 *zhuǎnzhù* (explanatory or expository writing), and 形声 *xíngshēng* (semantic-phonetic compound characters). The
象形 xiàngxíng or pictographic category refers to characters that in origin resemble objects in the real world but the modern forms no longer show any clear resemblance. 形声 xínghēng or semantic-phonetic compound characters comprise the majority of Chinese characters (Chen 1999; DeFrancis 2002; Erbaugh 2002; Feldman & Siok 1999; Norman 1988; Shu & Anderson 1999; Sun 2006). They constitute 74% of the most commonly used 2,000 Chinese characters (Chen 1999 p. 135).

形声 xínghēng or semantic-phonetic compound characters consist of a grapheme indicating the meaning and a grapheme indicating the sound. For example, 羊 yáng in Figure 1 is a pictograph that was evolved from the picture of a sheep’s head. The character bears the meaning of “sheep” and has the pronunciation of yáng in modern standard Chinese (“Putonghua”). This character, 羊 yáng, serves as the phonetic component for other Chinese characters, such as the two characters shown in Figure 2, which are examples of semantic-phonetic compound characters. The first character 洋 (ocean) has two components, 氵 and 羊. The three strokes 氵 on the left side of the character represent the semantic component (often referred to as the “radical”), and contains the meaning of “water.” 羊, which is on the right side of the character, is the phonetic component with pronunciation yang, as shown in Figure 1. Therefore, in the character 洋 yáng, 羊 yáng serves as a phonetic component to give clues to pronunciation of the character, while 氵 serves as a semantic component to give hints to the meaning of character. As a composite graph, 洋 is pronounced yáng and means “ocean.” As hinted by the “water” radical, this word has something to do with water in its meaning.
The second semantic-phonetic compound character in Figure 2, 蟲, is also pronounced yáng and means “rice weevil.” In these two semantic-phonetic compound characters, the pronunciation is identical to that of the Chinese character 羊 (sheep) as a free standing character. However, the phonetic component often only provides hints, differing sometimes in tone and/or segments from when it is used as a standalone character.

<table>
<thead>
<tr>
<th>Character</th>
<th>羊</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pronunciation</td>
<td>yáng</td>
</tr>
<tr>
<td>Character meaning</td>
<td>Sheep</td>
</tr>
</tbody>
</table>

Figure 1. Character 羊, yáng

<table>
<thead>
<tr>
<th>Character</th>
<th>洋 (氵+羊)</th>
<th>蟲 (虫+羊)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character pronunciation</td>
<td>yáng</td>
<td>Yang</td>
</tr>
<tr>
<td>Semantic radical meaning</td>
<td>氵 water</td>
<td>虫 insect</td>
</tr>
<tr>
<td>Character meaning</td>
<td>ocean</td>
<td>rice weevil</td>
</tr>
</tbody>
</table>

Figure 2. Semantic-phonetic Compound Characters
As the 形声 xíngshēng semantic-phonetic compound characters show, the Chinese writing system contains some degree of phonographic features which is different from many Chinese learners’ understanding about the Chinese writing system. Despite DeFrancis’ (2002) emphasis on the value of the phonetic component in Chinese characters, according to Fan et al. (1984), only 26% of phonetic components are estimated to represent the sounds of their characters without varying in tones (Feldman & Siok 1999). For this reason, Chinese learners still need to develop strategies to memorize and to write characters.

The other difficulty Chinese learners encounter concerns the need to write Chinese characters by following proper stroke-sequences. Figure 3 shows the shapes and directions of the basic strokes.
<table>
<thead>
<tr>
<th>Basic stroke</th>
<th>English name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dot</td>
</tr>
<tr>
<td>2.</td>
<td>Horizontal</td>
</tr>
<tr>
<td>3</td>
<td>Vertical</td>
</tr>
<tr>
<td>4</td>
<td>Downward left</td>
</tr>
<tr>
<td>5</td>
<td>Downward right</td>
</tr>
<tr>
<td>6</td>
<td>Upward</td>
</tr>
<tr>
<td>7</td>
<td>Horizontal hook</td>
</tr>
<tr>
<td>8</td>
<td>Vertical hook</td>
</tr>
<tr>
<td>9</td>
<td>Slanted hook</td>
</tr>
<tr>
<td>10</td>
<td>Horizontal bend</td>
</tr>
<tr>
<td>11</td>
<td>Vertical bend</td>
</tr>
<tr>
<td>12</td>
<td>Vertical and rightward raising</td>
</tr>
</tbody>
</table>

Figure 3. Directions of the Basic Strokes (Coulmas 1991, p.97)

It is important to observe stroke-sequences and proportions of strokes in order to produce legible characters (Coulmas 1999; Sun 2006). Knowing stroke-sequences enables Chinese learners to use Chinese dictionaries effectively because most dictionary index systems are based on the stroke number. In order to count the correct number of strokes, learners must know the sequence of strokes. However, as Figure 3 shows, the direction of each stroke differs from one another. Furthermore, the basic stroke-shapes can be slightly different when combined with other strokes. In addition, it is difficult to
determine the stroke-sequence by just reading characters. For this reason, Chinese children are taught to write each character by strictly following stroke-sequence rules.

There are four general rules for stroke-sequences (Sun 2006). The first rule is to write from top to bottom. The second rule is to write from left to right. The third is to write the horizontal stroke before the vertical one. The last rule is to write the outside portion first and then the inside one. These four rules provide only a general idea of how to write Chinese characters. When many strokes are involved in a character, Chinese learners, especially whose first language is English, often become clueless. The English alphabet is arranged horizontally from left to right. However, Chinese characters are written from top to bottom, such as 这 zhè “this.” In this example, the top-right portion of the character, 文, is written first, followed by the bottom-left portion of the character, 这. This style of writing differs greatly from that of Chinese learners, especially those whose first language is English. Therefore, without detailed writing instructions, Chinese learners often fail to figure out how to write characters with the correct stroke-order. As an example, my students often complain to me about the difficulty of remembering the stroke-sequences and stroke-directions. They often abandon the stroke-sequences and write characters in their own ways. As a result, their Chinese writing is often illegible or they were not able to look up the characters in Chinese dictionaries or other resources.

A few studies on Chinese children’s writing confirm the need for further investigation of different methods involved with teaching character writing. Law et al. (1998) conducted research on Chinese kindergarteners. Using pressure pads and computer software, the children’s step-by-step stroke-sequences were recorded during
their Chinese character writing. These recorded stroke-sequences were then encoded to mark the errors that the children made. Results from this study emphasized the importance of teaching basic stroke-forms and stroke-sequences. The results indicated that stroke reversal led to poorer and slower handwriting. Incorrect stroke-sequence also hindered Chinese children from accurately counting of the numbers of strokes in a character. Their results further revealed that Chinese children often made mistakes on the horizontal hook (\( \rightarrow \)) and the bended strokes (\( \rightarrow \) and \( \leftarrow \)), which could lead to miscounting the stroke number. The authors suggested that instructions on strict ordering of stroke-sequences would help Chinese children develop characters automatically (Law et al. 1998). The results of this research showed the need for more studies on Chinese learners’ stroke formation and stroke-sequences. However, no study has been conducted on how Chinese as a Foreign Language learners actually write each stroke in order to form a character. It is necessary to investigate how Chinese learners write Chinese characters stroke by stroke. The results will help Chinese teachers develop more effective methods to teach and correct Chinese learners’ character writing.

In addition to the problem of recognizing and writing Chinese characters, Chinese learners in the United States face one more challenge: learning two sets of standard Chinese writing systems (traditional and simplified). Some institutions in the United States introduce traditional characters at the beginning level and later introduce simplified characters. Through my own learning and teaching experience, I have noticed that learners struggle when switching from traditional characters to simplified characters. Traditional Chinese characters are usually used in Taiwan and throughout Chinese communities in North America. Simplified Chinese characters are adopted mainly in the
People’s Republic of China and the Chinese community in Singapore. Simplified Chinese characters were promulgated by the P.R.C. government to achieve a higher literacy rate after 1949. The simplification of characters pertains to reduction in both the number of strokes per character as well as the total numbers of the characters (Chan & He 1988). For example, the traditional character for “buy” is 買 māi, which is written in eleven strokes. The simplified character for “buy” is 买 măi, written in only six strokes.

Learning two Chinese writing systems in the early learning stage becomes quite a burden for new students. Due to the fewer number of strokes in simplified characters, Chinese learners often believe that writing simplified characters is easier. However, when switching from traditional to simplified characters, students often mention the difficulty of matching traditional characters with simplified characters. For instance, Chinese learners often cannot associate the traditional character 買 māi with its simplified version 买 măi due to the different outlines of the characters. Chinese teachers are often not explicit enough when teaching the rules of character simplification. As a result, Chinese learners fail to make the error-free transfer when switching from traditional to simplified characters. Nevertheless, there is no study that investigates how learners make the transition between these two writing systems. If researchers would define and categorize repetitive error patterns that emerge when learners switch from traditional to simplified characters, better methods can be developed to ease that process of learners’ switching from traditional to simplified characters.

Chinese learners encounter three major problems when learning character writing. The first problem is that Chinese orthography is less transparent with respect to script and
sound. The second problem is identifying stroke-shapes and following stroke-sequences in their writing. The last problem, depending on their institutions, involves some learners having to switch from traditional characters to simplified characters (or vice versa). However, there is no study of Chinese learners’ character production in order to provide information about how students learn to overcome these obstacles.

2.2 Studies on Chinese Language Learners’ Writing

As pointed out in Chapter 1, there is a lack of study on how Chinese language learners learn to write. Furthermore, most existing work is restricted to character recognition and character learning strategies. These studies are not directly related to Chinese writing per se although they provide information about how Chinese learners acquire reading and writing knowledge of Chinese characters. For example, in one of the early studies on the teaching of Chinese characters, Mickel (1980) explained how he systematically introduced Chinese characters to his American students. He suggested teaching the origin of the characters and their structure so that learners can more easily remember them. Although he never evaluated the effectiveness of his teaching methods, they have become the most common approach to Chinese character instruction.

The following Chinese character acquisition studies investigated character recognition. This line of research can be categorized into two kinds. One is the study of native Chinese readers’ phonological activation while recognizing characters (Cheng & Shi 1988; Perfettit, Zhang, & Berent 1992; Perfettit & Zhang 1995; Xu et al. 1999). The other is research on Chinese learners’ character recognition. Hayes (1988) compared the
character recognition strategy of native Chinese to that of advanced-level Chinese learners. His study revealed that native Chinese focused on the sound of characters whereas learners concentrated mainly on the graphic of characters. His study showed that learners have difficulty in connecting the pronunciation with the characters.

Other studies confirm that Chinese learners are heavily influenced by the graphical shapes of characters. Everson and Sergent (1992) designed experiments to test how the density (number of strokes) and frequency of characters affected both beginning-level and advanced-level Chinese as a Foreign Language learners. They found that the more strokes in a character, the longer the reaction time needed to recognize the character, regardless of their levels of Chinese proficiency. The studies of Hayes (1987a, 1987b) and Everson and Sergent (1992) indicated that Chinese as a Foreign Language learners recognize Chinese characters faster if the characters contain fewer strokes. However, they did not specify whether they tested traditional or simplified Chinese writing styles in their studies. Therefore, their results could lead some to incorrectly conclude that simplified Chinese characters are faster to recognize than traditional characters. Although the goal of simplification of Chinese characters was to reduce the number of strokes in writing characters, as Chan and He (1988) pointed out in their study, it is not always the case that simplified characters have fewer strokes. Moreover, one of the rules of simplification of Chinese characters, namely, the replacement of homophonous components, may influence character recognition of Chinese as a Foreign Language learners in a negative manner. There are also issues of confusability with simplified characters. For example, 厂 chăng (factory) and 广 guăng (wide) have possible problems of production (writing) and perception (reading). Without a comparative study on
traditional and simplified Chinese character recognition and learners’ character-learning strategies, it is difficult to draw definitive conclusions.

Studies on character learning strategies have been conducted from teachers’ point of views, such as how to introduce characters to learners, as discussed above. However, student perspectives have also been studied. For example, Ke (1998) used the survey method and asked 223 first-year Chinese as a Foreign Language learners about their views on effective character learning strategies. The results revealed that Chinese as a Foreign Language learners do not pay attention to the stroke-order and the sound of characters. They understood that knowing each component of characters, such as the semantic component (the “radical”) and the phonetic component helped them with character memorization. McGinnis (1999) and Tseng (2000) also used self-assessment and self-reporting methods to investigate Chinese as a Foreign Language learners’ approach to learning characters. McGinnis (1999) showed that a popular strategy for first-level Chinese as a Foreign Language learners is to copy characters repeatedly. Learners also used mnemonic devices, such as making up personal stories for each character, to help them remember characters. Tseng (2000) reported that there are 15 different character-learning strategies but the most popular one is simply copying characters. The results of these three studies indicate that for learners, the characters’ pronunciation was not considered especially important in learning characters. Based on the findings of these three studies that emphasize handcopying of characters, it is likely that Chinese learners, especially the beginning-level learners, would encounter difficulties when they type Chinese characters on a computer using an alphabet-based input method such as the Pinyin.
While Ke (1998), McGinnis (1999), and Tseng (2000) relied on surveys and self-reporting from learners, Shen (2005) adopted common character-learning strategies and applied them to Chinese learners from the beginning-level to advanced-level. She used statistical analysis to study the results and revealed that learners primarily used orthographic knowledge based strategies to learn characters. Orthographic knowledge based strategies depend on the understanding of how character components (such as radicals, graphemics, semantics, and phonetics) encode characters. As opposed to the previous studies, Shen (2005) determined that one of the most commonly used strategies was the repetition of character sounds, even to the extent of focusing on Pinyin spelling and tones. In a later study, Wang et al. (2009) examined the effects of metacognitive strategies and beliefs on Chinese as a Foreign Language learning outcomes. They also indicated that learners paid attention to the connection between the sound (pronunciation) and the shape of the Chinese characters. The findings from these two studies differ from previous research. The reason might be that the participants of Shen (2005) and Wang et al. (2009) actively used current computer-based technology such as multi-modal, audio-visual, and interactive e-learning to study Chinese. Wang et al. (2009) recognized the important role of interactive media in Chinese writing acquisition. However, teachers of Chinese do not have enough information about how Chinese learners practice their writing with current Chinese learning technology such as computer typing. As opposed to typing English on computers, typing Chinese on computers requires multiple Chinese language skills.
2.3 Chinese Computer Input Methods

In order to understand the nature of Chinese computer-based writing, this section introduces Chinese computer input methods. For the purpose of this discussion, the “input methods” refer to the use of the QWERTY keyboard. Because Chinese is logographic, it is difficult to have a one-to-one match between the keys and the characters. Therefore, Chinese uses complex and multiple input methods. There are two different kinds of Chinese computer typing. One is based on the shape of characters such as Cangjie 仓颉 and Wubizixing 五笔字型. The other is phonetic-based such as Pinyin 拼音 and Zhuyin Fuhao 注音符号. Zhuyin Fuhao is a phonetic system that transcribes sounds in Mandarin Chinese with symbols that are not based on the Roman alphabet; instead, they look like simple components or Chinese characters. For example, 大 “big” is transcribed as ㄉㄢ in Pinyin but it is transcribed as ㄉㄚˋ in Zhuyin Fuhao, with ㄉ to transcribe the syllable initial consonant, ㄚ the vowel, and ˋ the tone diacritic. Zhuyin Fuhao is mainly used to educate Chinese and Chinese learners in Taiwan.

Shape-based input methods such as Cangjie have keys remapped on the QWERTY keyboard for the components of characters that would be input in sequence to yield the complete character as the output. Basic components of characters are shown in Figure 4.
Users of shape-based Chinese input systems must know how each particular system divides a character into different parts. For example, in the case of the Cangjie input method, the traditional character 車 chē “car” is divided into three components 十, 田, and 十. The corresponding key for 十 on the QWERTY keyboard is J and that of 田 is W. Therefore, the keys for 車 chē are JWJ as shown in Figure 4. Shape-based Chinese input systems use different ways to encode each part of the characters, requiring hours of training before one is familiar with the typing. For this reason, Chinese learners seldom choose the Cangjie method.

The Pinyin-based input method is the most popular among computer users in the P.R.C. and Chinese language learners who learn Chinese using Pinyin. According to Chen (1997), over 97% of users in China use Pinyin\(^6\) for their Chinese input (Xiao, Liu, and Wang 2007).  

---

\(^6\) Pinyin is the official Romanization system to transcribe Chinese characters in the P.R.C.
As Figure 5 shows, in order to type Chinese with Zhuyin Fuhao, users need to memorize the location of phonetic symbols. As opposed to Zhuyin Fuhao, the Pinyin Romanization system uses the letters of the Roman alphabet. As a result, users do not need to memorize the layout of the symbols on the keyboard if they use the QWERTY keyboard and know how to type English (or other languages that use the Roman alphabet). However, Chinese computer typing is different from typing alphabet-based scripts. It normally involves three steps: Step 1: Pinyin-typing (the Romanization system of Chinese pronunciation), Step 2: character recognition, and Step 3: character selection from a drop-down panel that presents a list of suggested characters (see Figure 6 with an example using 你 nǐ “you” in Chinese typing).
Step 1: Typing the Pinyin Romanization, \( nî \).

Step 2: Recognizing and selecting the character 你 \( nî \).

Step 3: The selected character, 你 \( nî \), is displayed as text.

Figure 6. Computer-typing 你 \( nî \) “You” in Chinese

Unlike paper-based Chinese writing, these three steps require different language skills. Therefore, scholars should not use a static approach to analyze writing. In addition to studying the students’ final written product, they should investigate all the writing steps and the processes that learners have taken to produce their composition (Lee 2006). New methods that investigate the entire Chinese writing process must be developed in order to understand the nature of learners’ writing errors.
2.4 Studies on Computer-based Chinese Writing

The biggest challenge for Chinese computer-assisted language learning (CALL) is to find the best method for dealing with the differences between handwriting and Chinese computer typing. As the input system of CALL is based on Pinyin, scholars are debating how computer writing will benefit memorization of Chinese characters. In one of the earliest Chinese CALL studies, Cheng (1973) reported on the benefits of computer technology but worried about Chinese input methods. The problem is that the technology of the 1970s did not allow students to input Chinese characters directly in Pinyin. Cheng (1973) stated that because the participants were beginning-level learners, there was no need to be concerned about Pinyin homophone problems due to their very limited vocabulary knowledge. After personal computers became affordable, Chinese input methods also became more user-friendly. For example, before the Windows 2000 operating system, users had to download additional software programs such as NJ Star in order to read and type Chinese. However, beginning with the Windows 2000, Chinese language packages have been included in the operating system by default. In addition, more Chinese learners are able to access Chinese online social networks, which also help them in their learning of Chinese.

Teachers and Chinese CALL researchers have observed benefits of using computer technology in Chinese language classrooms. Computer multimedia technology helps learners practice pronunciation and memorize characters. Many software programs and websites have been created and reviewed by researchers (Hsieh & Fei 2009). However, most CALL studies focus on the learners’ attitudes toward Chinese CALL,
listening, speaking, character learning, and computer-based dictionary usage. For example, Ihde and Jian (2003) conducted a survey study of learners’ views about the Chinese online learning environment which indicated that the participants were not excited about using technology. Their participants complained about the difficulties of inputting and displaying Chinese on the computer. Ihde and Jian (2003) assumed that this might be due to the lack of teachers’ guidance on the use of technology. Zhang (2004) used an online learning environment system called WebCT to create listening exercises and investigated student performance and reaction. Zhang (2004) noted that the WebCT exercises received positive reviews from students, and they allowed teachers to monitor the learners’ progress very effectively. Yu and Michaels (1998) examined the effects of multimedia on beginning-level Chinese classes, concluding that such multimedia aided the learners’ listening, speaking, and character acquisition abilities. Lu (1997) used computer dictionaries in Chinese reading to show word boundaries so that learners can be trained to read Chinese text more effectively. Chinese CALL scholars argued that computer technology benefits Chinese learners in all aspects. However, only two studies examined how computer-based Chinese writing programs influence the students’ writing ability (Xu & Jen 2005; Zhang 2009).

Xu and Jen (2005) developed their own Pinyin-based computer input method and claimed that when learners used it, they performed better with Chinese word-processing software than pen-paper. Many Pinyin input methods do not require users to type the full Pinyin spelling of Chinese words before a pop-up panel begins to display candidate characters in the order of their frequencies of usage. This allows users to select the intended character from the panel, thus reducing mistakes and saving time for character
look up. However, the input method which Xu and Jen (2005) developed requires users to input the entire Pinyin and it does not display the characters based on their frequency. In fact, their input method only shows the characters which Chinese learners are required to learn. Xu and Jen (2005) argued that their program accelerated the development of the participants’ capability to speak, listen, and read more than learners who did not use their software program. However, their research was limited to beginning-level learners only, and it only tested individual character writing, not the holistic writing of compositions. In addition, the input method only displays a limited number of characters. It remains unclear how well participants who use this computer input method are able to “write” in Chinese compared with other Pinyin-based input methods.

Rather than testing only for individual character writing as done by Xu and Jen (2005), Zhang (2009) examined her second-year Chinese students’ essays that were submitted to an online discussion board called WebCT. Based on the concept of class community, Zhang (2009) reported that the learners created an online learning community that benefited them in their Chinese learning. She argued that the practice of peer-review and revision of essays in the discussion board helped their essay writing. Zhang (2009) did not claim that online writing activities improved Chinese learners’ writing. However, she stated that it did create a positive learning environment for writing.

Xu and Jen (2005) and Zhang (2009) tried to demonstrate the benefits of Chinese computer-based writing. Nonetheless, their studies do have limitations. For example, because Xu and Jen (2005) focused on character writing, it is difficult to predict whether learners will perform better with computers when writing characters. Their Chinese computer input program only displayed characters from the program’s vocabulary list in
the character panel. Most popular Chinese input methods, however, display all homophone characters on the character panel. For this reason, learners will encounter difficulties in recognizing characters when they write with other Pinyin input methods. Because her research was classroom oriented, Zhang (2009) could not draw conclusions about any computer-assisted Chinese writing that may have taken place outside the classroom. Additional studies that capture the whole process of writing and editing would shed more light on the best practices for learning Chinese writing, especially those that also compare findings between computer-based and paper-based Chinese writing.

In this chapter, I explained the Chinese writing system and the complexity of Chinese computer-input methods. I also examined studies related to Chinese character learning and computer-assisted Chinese writing. Recent studies of character learning strategies indicate that Chinese learners’ writing is influenced by the use of computer technology, including free software such as online dictionaries, which also seemed to influence Chinese learners’ character learning strategies. However, there are no studies conducted to investigate the influence of computer technology in Chinese learners’ writing. In order to examine the comparative benefits of both computer-based writing and paper-based writing, it is imperative to investigate the holistic process of writing, including character-writing and composition. In the next chapter of methodology, I will provide background information of the participants, research site, data collocation methods, and procedures used.
Chapter 3

Research Methods, Research Site, and Participants

The goal of this study is to describe the writing processes of Chinese learners using computer-based writing and paper-based writing and to examine the differences between beginning-level and intermediate-level learners’ Chinese writing in both modes in order to understand learners’ developmental stages. This study also takes Chinese language curriculum into consideration and reports on how it affected the learners’ writing performance. To the best of my knowledge, this study is the first to analyze the recordings of each Chinese learner’s writing, including both movement of the Smartpen in handwriting and movement involving activity on the computer screen. In order to capture a learner’s whole writing process, I employ mixed methods to conduct this research. In this chapter, I discuss the rationale for my mixed methods and describe the research site and participants. I also describe the procedure of data collection and data analysis.
3.1 Rationale for Mixed Methods

In order to achieve my research goals, I employ mixed methods (quantitative and qualitative). The main goal of this study is to present the complete picture of computer-based and paper-based writing processes of beginning-level and intermediate-level Chinese learners. Previous Chinese writing studies (e.g., Ke 1998; Shen 2005; Xu & Jen 2005) have mainly used quantitative approaches to investigate how Chinese language learners learn to write. The purpose of those studies was to find or evaluate the effectiveness of learning strategies for writing. Moreover, previous Chinese writing studies were not interested in describing the Chinese learning environment, which can influence the learners’ writing acquisition. For this reason, scholars seemed to favor the quantitative approach. However, I believe that language learning is a social activity and language learners consistently evaluate their relationships to the target language society. Based on their evaluations, they have different desires to learn languages.

Gardner and Lamberts (1972) defined this learners’ desire to access material resources of the target language as instrumental motivation. Norton (2000) described learners’ desire to learn foreign language as an “investment” and she claimed that scholars need to understand learners’ “investment” in relation to their identity and target language society. Depending on their motivation or investment, each of the learners focuses on some particular language skill(s). For example, the participants of one study (Mckay & Wong 1996) placed different values on each of four language skills and allocated their time accordingly to learn these four skills. The same thing can be said for Chinese learners. They also constantly evaluate the value of the four Chinese language
skills with respect to their connections to Chinese people. Additionally, the teachers’ views on Chinese writing and the Chinese language curriculum play an important role in forming students’ views on language learning.

If I only aim to find general patterns in Chinese learners’ writing development in relation to computer-based writing and paper-based writing, a quantitative method would suffice. However, if my goal is to understand how learners navigate the complex Chinese writing process, a quantitative method by itself is not sufficient. Quantitative studies often rely on statistical information that does not adequately describe the influence of the learners’ views toward Chinese writing. A quantitative method also would not provide this kind of direct access to essential data and writing experiences of the participants. Furthermore, due to the lack of studies on Chinese learners’ writing, it is difficult to generate a feasible hypothesis about Chinese learners’ writing without qualitative observations of their writing practice.

Symonds and Gorard (2010) argued that mixed methods provided researchers with a structure to understand phenomena. They also claimed that mixed methods have become a common research approach in social science and education research. Many researchers have pointed out the strength of using mixed methods (Campbell & Fiske 1959; Greene, Caracelli & Graham 1989; Tashakkori & Teddlie 1998). One of the strengths stems from the combination of systematic observation and interview techniques of mixed methods that can assist researchers in designing research questions. Using mixed methods provides a richness of data, interpretation, and usefulness of findings (Collins, Onwuegbuzie & Sutton 2006). Another strength is that mixed methods allow
for data triangulation,\(^7\) which increases the credibility and validity of results (Cohen & Manion 1986). Mixed methods combine the strength of both quantitative methods (e.g., finding trends and generalizations) and qualitative methods (e.g., including detail and depth of data). With this combination, researchers can obtain different data on the same topic to validate their findings. These are also my reasons to employ mixed methods in this study.

According to Creswell and Plano-Clark (2006), there are four types of mixed methods design, i.e., triangulation design, embedded design, explanatory design, and exploratory design. The exploratory design, one of the research methods I adopted, is suitable for exploring phenomena. It consists of two research phases. During the first phase, data collection, researchers explore the topic using qualitative methods to find themes and patterns from the data. In the second phase, researchers develop an instrument to collect quantitative data. This research method is especially useful when there is not a dominant framework or theory about the research topic (Creswell et al., 2003). Because only a few studies on Chinese learners’ writing development are available, the exploratory design works well for my study in the following aspects. First, it helps me identify the emerging themes from my observations of Chinese learners’ writing activities. Second, based on the findings from the first phase of data collection, I develop a quantitative instrument including surveys and writing tasks. Finally, during the second phase of data collection, I mainly utilize a quantitative method to report general patterns of Chinese learners’ writing. The exploratory design allows me to capture the

---

\(^7\) The qualitative method utilizes more than one method to gather data, such as interviews, observations, questionnaires, and cross-examination of the results with participants.
complexity of Chinese learners’ writing and to find general patterns of writing development among beginning-level and intermediate-level learners. Before I explain how I revised the research questions, I describe the research site, the pedagogical theory I used to design the Chinese class, and the participants and their motivations as well as my own background and teaching philosophy. Because a qualitative research methodology considers how the researchers’ understanding of the world influences data analysis, I explain how I studied Chinese and how my learning experience influences my views about Chinese writing.

3.2 Research Site

The research took place at a large state university in the midwest of the United States. The Chinese program in this university offers Chinese major and minor programs to undergraduate students. Most undergraduate students are required to take 20 credit hours of foreign language classes. Some majors, such as international studies, require an additional 10 credit hours. The Chinese program offers two types of classes: classroom teaching and individualized instruction. Unlike classroom learning, in individualized instruction, students make appointments with teachers and have individual sessions with them. Each session is 15 minutes and students need to make at least five appointments per week in order to complete five credit hours in one quarter. In this setting, there is no explicit Chinese writing instruction. In addition, most learners in the individual sessions are beginning-level learners. Therefore, I only collected data from the classroom setting.
In the classroom setting, the first-year Chinese class is regular track. After that, students have two options for the second-year Chinese class: regular track or intensive track. If students decide to take the regular track, they will learn four language skills in one class. The intensive track is a combined second- and third-year language study. It has two types of class: spoken and written language tracks. Students can choose both classes or take one class. Regular-class students spend two years to complete the one-year lessons of both spoken and written language intensive classes. Students who are majoring in Chinese often enroll in both intensive spoken and written track classes because they can get ten credit hours per quarter to fulfill their 30 credit hours requirement. The participants of this study were from the first-year Chinese class, intensive written language, and third-year regular class. Because learning Chinese is part of the students’ graduation requirement, some beginning-level and intermediate-level learners are less motivated to learn than other students who are studying Chinese because it is related to their majors (such as international business and international studies).

3.3 Pedagogical Theory behind the Chinese Program

The pedagogical theory behind this Chinese program is based on a performance theory that emphasizes communication (Walker 2000). Walker (2000) defined a communication event as consisting of five specified elements: place, time, script, participants, and audience. Based on this theory, teachers help learners analyze the context of the target patterns. The program places a heavy emphasis on performance in class. Learners are evaluated based on their daily performance in class and grades are
also posted on a daily basis. Learners are required to study and to master the vocabulary and patterns of expression before each class. They also have to memorize the dialogues in order to perform in class. Teachers provide the contexts based on memorized patterns in textbook dialogues. Most classes are conducted in Chinese except the review class, which takes place after each lesson is finished. The learners retrieve their weekly feedback and evaluation online from the teacher on their performance. However, students do not memorize characters or practice Chinese writing in the context in every class. Because the greater portion of their grade is based on spoken Chinese ability, students prioritize their learning and place their focus on speaking and listening.

It is the strong belief of this program that reading and writing need to be introduced after the learners develop some proficiency with the spoken language. During the first quarter of first-year Chinese, no reading or writing instructions are given. The first-year Chinese class allocates most of the instructional time to teaching how to communicate in (spoken) Chinese culture. The second and third quarters of the first-year Chinese class only have five reading and five writing classes per quarter (a quarter is approximately ten weeks). During the reading and writing class, teachers are not allowed to use English. Chinese characters are not introduced either during class hours because students are supposed to memorize the characters before they come to the class. Therefore, students need to study the characters by themselves. During the reading and writing class, a common practice is to ask students to read the textbook and then give students dictation tests.
3.3.1 Reading and Writing Textbooks

It is important to know what types of material Chinese participants used because they affect learners’ views of Chinese writing and their writing development. First-year Chinese textbooks are mainly written with Pinyin. Performance theory programs developed for first- and second-year Chinese textbooks focus mainly on spoken communication and neglect lessons with Chinese characters. The dialogues are written in Pinyin. For this reason, beginning-level learners often do not know how to read and write the words and patterns in Chinese. Moreover, there is no grammar or pattern explanation in the first-quarter Chinese textbook. Students have to listen to the CDs for any explanations. Therefore, many beginning-level learners have difficulty in identifying word boundaries and recognizing sentence structures. The second- and third-quarter textbooks are based on the same formats as the first-quarter textbook, but each textbook has one Chinese character lesson out of a total of ten lessons. From the second quarter of the first-year Chinese class, this program uses another set of textbooks for reading and writing. The contents of textbooks for the reading and writing class are not the same as the textbook for the spoken class. Thus, beginning-level learners often mention that studying these two sets of textbooks gives them too much burden.

When writing instructions are introduced in this program, traditional characters are taught to students first. When learners move on to the second-year class, they can decide to continue using traditional characters or switch to simplified characters. However, traditional characters are used for the textbooks of second-year written language intensive class except the last textbook. Despite the switching from traditional characters to simplified characters in their last textbook in intermediate-level class,
teachers did not explain the rules of simplifying Chinese characters. Therefore, learners struggled to draw their knowledge of traditional characters to identify and to write simplified Chinese characters. The contents and the genres of reading and writing textbooks vary; for example, textbooks include dialogues from daily life, Chinese folk stories, diary writing, and newspaper reading. However, the writing practice provided is limited to summarizing readings from textbook or to describing personal life circumstances. When participants were asked to write in other styles besides summary and personal essay, they often could not complete the writing task.

3.3.2 Teacher Training

In order to understand how participants of this study learn Chinese writing from the teacher, it is important to explain how teachers are trained in this department. The emphasis on oral communication in Chinese is also reflected in teacher-training classes. A unique feature of this program is that multiple teachers teach one class. For example, the first-year Chinese class is taught by four or five teachers taking turns so that the students can experience with all teachers with various voices and accents. However, this team-teaching needs good communication and similar teaching styles and grading standards among teachers. This is especially important because student grades are based on daily grading. Therefore, it is mandatory that all new instructors and graduate teaching assistants participate in the same teacher-training program. The training is held two weeks before every autumn quarter starts. During the two-week training, teachers attend lectures and learn general information of college teaching. They are also required to give teaching demonstrations, which are evaluated by multiple professors in this
department. Other trainee teachers observe these teaching demonstrations as well.

However, teaching demonstrations are only for teaching speaking and listening classes.

Thanks to this intensive training, after the autumn quarter, all teachers are familiar with the department grading system, which is illustrated below.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>Performance is fully culturally coherent, that is, would present no difficulty, discomfort, or puzzlement in interaction with a native. Repair (restating or correcting yourself, requesting clarification, etc.) is self-managed.</td>
</tr>
<tr>
<td>3.5</td>
<td>Performance is superior, for the most part culturally coherent. There is little about it to create difficulties, discomfort, or puzzlement in interaction with a native. However, there is some aspect of the performance to make interaction less than maximally coherent for a native. Most repair is self-managed.</td>
</tr>
<tr>
<td>3.0</td>
<td>Performance is good: few aspects of it create difficulties, discomfort, or puzzlement in communicating with a native. Self-managed repair alone, however, is not sufficient; you also require occasional repair/correction from another (= instructor, classmate, etc.).</td>
</tr>
<tr>
<td>2.5</td>
<td>Performance enables communication, but also presents several clear-cut sources of difficulty, discomfort, or puzzlement in communicating with a native. Repair is largely a matter of correcting problems, and correction comes mostly from others.</td>
</tr>
<tr>
<td>2.0</td>
<td>Performance creates definite obstacles to communication, which usually involve more than simple discomfort. Utterances would cause puzzlement that the native is at a loss to resolve (&quot;What is s/he trying to say?&quot;). Repair requires multiple, often repeated, correction and guidance from another.</td>
</tr>
<tr>
<td>1.5</td>
<td>Performance shows many problems that would create difficulties, discomfort, and puzzlement in communicating with a native. Communication is achieved only with repeated correction and guidance from another. Clearly not in control of assigned material.</td>
</tr>
<tr>
<td>1.0</td>
<td>Attended class, but either (1) chose not to participate (for this option, notify your instructor before class begins), or (2) failed to perform with any culturally viable degree of competence.</td>
</tr>
<tr>
<td>0</td>
<td>Absent</td>
</tr>
</tbody>
</table>

Table 1. Daily Performance Grade from the Department’s Website
Table 1 shows the detailed guideline that the Chinese department uses. However, it is often limited to grading oral communication skills. For example, the grading description in Table 1 measures such factors as “restating or correcting yourself, requesting clarification” and “Utterances would cause puzzlement that the native is at a loss to resolve,” refer to situations that usually happen in face-to-face communication. There are no guidelines for grading of reading and writing. There is no training for teaching Chinese reading and writing either. New Chinese teachers often struggle to prepare reading and writing classes and grade Chinese learners’ performances.

3.4 Participants

A total of 70 college students in beginning and intermediate Chinese classes participated in this study. Among them, 28 students further volunteered for individual writing sessions. I was their lecturer and taught them with other graduate teaching assistants. I taught each class for an average of three hours per week and I managed all other teachers’ grading and teaching schedules. The participants brought various linguistic and cultural backgrounds to the classes.

A total of 56 beginning-level learners participated in the survey study. Among them, 16 learners participated in individualized writing sessions. There were 17 female and 39 male students in this study. Five of them were heritage learners (whose home spoken language is not Mandarin Chinese but their family written language was based on Chinese characters). The others were Chinese as a Foreign Language learners. For Chinese as a Foreign Language learners, English was their first language except for one
Korean, one Indonesian, and two Vietnamese learners. For most participants, it was their first time to learn Chinese except for five learners who have had more than one and half years of Chinese education each. When asked for their reasons of taking Chinese class, 58% of the learners said they were taking it to complete their graduate requirement and to prepare for their future career. Among the participants, 42% of the learners answered that they were interested in Chinese culture or they wanted to know their heritage. All had used computers since their elementary school and 24 students had used computer technology to study foreign languages including Chinese.

<table>
<thead>
<tr>
<th></th>
<th>Beginning-level</th>
<th>Intermediate-level Written language intensive class</th>
<th>Intermediate-level Regular track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>58</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2. Participants in Winter Quarter 2009

<table>
<thead>
<tr>
<th></th>
<th>Beginning-level</th>
<th>Intermediate level Written language intensive class</th>
<th>Intermediate level Regular track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>58</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3. Participants in Spring Quarter 2009
Eight second-year intensive written language learners participated from the beginning of this study. After the second quarter of the intensive class, two learners switched to the regular track. All participants were Chinese as a Foreign Language learners. English was their first language for six learners who stayed in the intensive class. Their motivation for learning Chinese was that it relates to their research and career choice. All of them had foreign language learning experiences in high school and college.

All learners in the third-year regular track class participated in this study. Two Korean students were transferred from the written language intensive class. English was their first language for four Chinese learners. Three of them had studied Chinese in this program for three years. Those three students also went to China during the summer break to attend some Chinese language programs. One first-year student studied Chinese and learned simplified characters since her high school. Four of them answered that they studied Chinese for their future career and business.

3.5 Researcher

The quantitative paradigm assumes that the researchers have an objective view and a neutral position on the topic they investigate. Therefore, the quantitative paradigm does not take researchers’ backgrounds into consideration in data collection and data analysis. In contrast, researchers of qualitative study define that the reality consists of the experiences of researchers and their interaction with others (Bogdan & Biklen, 1992). Moreover, the interpretation of reality is based on the lenses of researchers’ language and
social class. Therefore, qualitative researchers assert that there is no objective observation (Denzin & Lincoln 2003). In order to achieve their goal, qualitative researchers are closely involved with the research groups as members or observers. They can also become either participant observers or non-participant observers. Furthermore, in the qualitative research paradigm, researchers developed theoretical sensibility through not only literature study but also professional and personal experiences (Strauss & Corbin 1990). Since the roles of researchers and their experience are important in qualitative methods, I describe my Chinese learning experience and my role as a researcher and a participant observer.

I studied Chinese at a large state university in the east coast of the United States. My first language is Korean. I studied English as my second language when I was in South Korea. The reason for me to study Chinese is that I like the pronunciation of Chinese language and I am fascinated by Chinese culture. Specifically, I was interested in learning Chinese characters. Before studying Chinese at college, I had learned Chinese characters in middle and high school in South Korea. The Chinese class was only once a week but the characters caught my full attention. I loved studying the origin of each character and the system of characters. For this reason, I decided to take Chinese as my foreign language requirement when I entered the university in the United States.

Due to the large Chinese American community in my area, all of my classmates were Chinese as heritage language learners. Their main goal was to learn how to write since they already had some oral proficiency. To assist the majority of students, teachers focused on Chinese writing and grammar pattern exercises. Most of my homework involved grammar exercises and Chinese compositions. I learned traditional characters in
the beginning level, the same as my participants learned traditional character in their first year Chinese class. After the first years of learning Chinese, my teacher told me that I could switch to simplified characters if I wanted. However, no formal introduction to simplified characters was offered so it was my responsibility to understand the simplified character system. I had difficulties in reading and writing simplified characters. Unlike my research site, I had to take two Chinese literature classes and two classical Chinese classes in order to complete my major in Chinese. In these classes, teachers emphasized the importance of reading and writing. My Chinese learning experience was therefore heavily involved with reading and writing activities.

When I was admitted to the Chinese graduate program at my current midwestern university, I was offered a graduate teaching assistantship. I received two weeks teaching training before I started teaching. I also took summer intensive teaching classes based on the performance pedagogy theory. Once I started teaching Chinese language classes, I liked the organization of each class. Unlike my undergraduate Chinese program, my students had to speak Chinese from the first day of class and they had lots of classroom activities in which they practiced speaking. On the other hand, I had a difficult time teaching Chinese writing. First, I did not receive any formal teacher training for Chinese writing. Second, I was not allowed to teach the origin of characters and the writing system because the purpose of reading and writing class is to test learners. Nevertheless, I believed that learners need consistent instructions of writing Chinese characters so that they can develop their own character learning strategies. As a Chinese learner, I had many difficulties in writing Chinese. If teachers did not teach me character learning strategies and did not emphasize writing, I might have given up on learning Chinese. I
felt sorry for my students but I had to strictly follow the departmental teaching policy, i.e., no English explanation of Chinese characters in class.

As a teacher, I tried to share my language learning experiences with my students as much as possible. I wanted to build the sense of a learning community with my students. I encouraged students to keep learning Chinese by telling how I overcame the same obstacles they were encountering. I also discussed how I utilized computer technology to study Chinese (e.g., word-processing program and online dictionary). I identified myself as a Chinese learner just like them and I asked them to suggest any new idea or information on learning Chinese, such as learning strategies and software. This was especially true with the third-year regular track Chinese learners, whom I had known for three years. I actively took their suggestions and made changes in my teaching accordingly. I also circulated questionnaires to acquire feedback from my students. Due to the similarity between us and my teaching style, my students and I developed a bond and I created a sense of a learning community with them. Additionally, I taught several general education classes, for instance, in the Korean language, Chinese language, and introductory level of East Asian humanities courses during my PhD study. These three courses are also major requirement classes or prerequisites for upper-level courses. Therefore, I had many chances to teach the same students in different classes. This helped me understand my students better in Chinese classes.
3.6 Data Collection

The data was collected during one academic year (Autumn 2008 to Spring 2009). I was teaching three courses (first-year, second-year intensive written language, and third-year regular track class) as a lecturer. The first phase of data collection occurred in Autumn Quarter 2008. During this period, I mainly observed my participants’ classroom performances and analyzed their homework and quizzes. I also reviewed the third-year regular track students’ writings and daily grades from their first-year Chinese classes. I witnessed the improvement of their Chinese during three years of learning. After Autumn Quarter 2008, I discovered emerging themes from the learners’ views on Chinese writing and from their actual writing practices. During the second phase of data collection, Winter and Spring Quarters 2009, I conducted initial and exit surveys on participants and collected their writing samples through individual writing sessions.

3.6.1 First Phase: Observation (Autumn Quarter 2008)

During the first phase of the data collection, I found that learners went through a very complicated thinking process to produce characters. This dynamic nature of learners’ Chinese writing, to the best of my knowledge, has not been investigated in previous studies. Figures 7 and 8 are two examples of learners’ writing errors. One student tried to write simplified characters 时 shí, which means “time,” and 起 qǐ, which means “to raise.” As Figure 7 shows, there is an additional dot on top of character 日. For character 起 shown in Figure 8, the learner failed to produce the radical portion of 走.
The learner who wrote this told me that she remembered the bottom part, “人,” in the character “起 qǐ.” However, she mismatched the part “人” with “是 shì,” which is the most frequently used character in her textbook. However, she even failed to produce the character “是 shì.” By observing students’ writing, I also found that students often did not follow the proper stroke-sequence. For instance, the student who wrote Figure 6 wrote the right part of the character “己 jǐ” first. Even students of the written language intensive class often did not follow the stroke-sequence but it seems that it did not deter them from producing correct characters. However, they could not use resources effectively because they did not know the stroke-sequence. Chinese dictionaries are organized according character radicals and stroke numbers. If students did not follow proper stroke-sequences, they would experience difficulty in counting the correct stroke number for a character. As such, they only used dictionaries based on the Pinyin index and preferred to use computer-based dictionaries.

Figure 7. Writing Error of Character 时 shí
Based on my initial observation, I found three emerging patterns in Chinese learners’ writing. First, I noticed that there is a relationship between the stroke-sequence and writing accuracy on paper-based writing of beginning-level learners. It seemed that beginning-level learners who followed the stroke-sequence order produced neat characters with fewer mistakes. Second, among the intermediate-level learners, I found that they relied heavily on computer-based references and dictionaries. They could not compose a short essay without looking up characters in the dictionary in both computer-based and paper-based modes. Third, learners’ personal learning experiences influenced their acquisition of Chinese writing. I noticed that some students’ attitudes changed after even one quarter of their Chinese learning. I decided to record their writing process in a natural setting to investigate the first and second patterns. To examine the third pattern, I designed survey questions. The survey results showed the overall tendency of the changes of learners’ attitudes.
3.6.2 Redefining Research Questions

Initially, I explored six research questions: 1) What is the learners’ definition of “Chinese-writing” based on the different modes (computer vs. paper) of writing? 2) Do learners’ attitudes toward Chinese writing change depending on whether it is computer-based writing or paper-based writing? And if so, how did their attitudes change? 3) How do learners’ computer-based writing errors differ from those produced by paper-based writing? 4) Are there distinct patterns of writing errors characteristic for each level (beginning-level and intermediate-level) of Chinese learners? 5) Are the error patterns influenced by the two different modes of writing (computer-based writing and paper-based writing)? 6) Does one mode of writing (computer-based or paper-based) aid Chinese learners to produce better writing in terms of clarity and organization? If so, which mode and why? However, each question was redefined and narrowed down to more specific questions.

For Research Question 1, I focused on how participants evaluate their own Chinese writing skills because Chinese learners often define the meaning and value of Chinese writing in relation to other language skills. In order to find the general understanding of computer-based and paper-based Chinese writing, I used a survey study. Research Question 2 explores attitudes changes toward two different writing modes. From the initial observation, I had noticed that a sense of negativity toward Chinese writing increased as their learning progressed. Furthermore, their evaluations about their own language skills influenced their views about important language skills. In addition, I also observed that their preferences for either computer-based writing or paper-based writing seemed to change during their Chinese learning. In order to find how their
evaluations on language skills and preference of writing modes changed, I decided to conduct two survey studies: one at the beginning and the other at the end of this study. I compared the initial and the exit survey questions on the participants’ self-evaluation of their four language skills and their choices of more and less important language skills.

Based on my initial observation, I revised my Research Question 4 and categorized character writing errors into five types. Type 1 character error is the Chinese learners’ use of homophone characters. Type 2 character error is the misuse of characters having similar shapes. Type 3 character error refers to characters missing strokes such as the radical or phonetic part of a character. Type 4 character error is mismatching different parts of other characters into one character. Type 5 character error is mixing simplified and traditional characters in one writing task.

For Research Question 5, the question about the influence of computer-based writing and paper-based writing, I focused on two behavior patterns in participants’ writing: the frequency of the participants’ revisions while writing a composition and the frequency of consulting references. I observed that participants often used online dictionaries and revised their writing when they wrote with a computer. The participants believed that computer-based Chinese writing allowed them to easily access online resources. Furthermore, they thought that they revised more frequently when they wrote Chinese with computers. For this reason, I examined if there were differences between the frequency of resources usage and the frequency of revision in computer-based writing and paper-based writing.

In Research Question 6, I evaluated participants’ writing in the following categories: a) speed of writing, b) length of writing, 3) clarity of writing, and 4)
organization of writing, to examine which mode of writing aids learners better. The scores of computer-based writing and paper-based writing in each category are analyzed by a paired t-test. Research Questions 5 and 6 mainly relied on a quantitative analysis to establish the overall different patterns between computer-based writing and paper-based writing.

3.6.3 Second Phase: Data collection (Winter and Spring Quarters 2009)

3.6.3.1 Survey Study

Based on the observations from Autumn Quarter 2008, I conducted survey studies on the beginning-level and intermediate-level learners. The initial survey was conducted on the first week of Winter Quarter 2009. All the students in the three classes agreed to participate in the survey study. The exit survey, which had the same survey questions, was conducted on the last week of Spring Quarter 2009. There is a twenty-week gap between the initial and exit surveys. I had to conduct the initial survey study in the second (i.e., winter) quarter because the beginning-level learners did not learn Chinese characters in Autumn Quarter 2008. Details of the questions of this survey will be discussed in the following chapter.

3.6.3.2 Individual Writing Sessions

Individual writing sessions were held during Winter and Spring Quarters 2009. In order to record the entire writing process, I arranged a one-hour writing session with each participant. The participants came to my office and they had to finish various writing
tasks. Originally, I designed a controlled writing experiment, which did not allow using any resource. This enabled me to study how learners behave differently when they perform computer-based writing and paper-based writing. I tried to recruit participants for the individual writing sessions. However, I could not find any volunteer even cash compensation was offered.

Later, the learners told me that they could not write Chinese composition without resources such as online, electronic, or paper dictionaries. They also explained that they only practiced Chinese writing for their classroom assignments. Their concern was that it would become too much of a burden for them to participate in the Chinese writing sessions, which were not related to their class work. Since one of my research goals is to capture the big picture of Chinese learners’ writing, especially writing composition in natural settings such as homework writing, I thus modified the rule and allowed learners to use resources during both computer-based writing and paper-based writing sessions.

The beginning-level learners had six writing tasks, three computer-based and three paper-based writing, as shown in Table 4.

<table>
<thead>
<tr>
<th>Task 1</th>
<th>Computer-based writing</th>
<th>Paper-based writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 2</td>
<td>Translation</td>
<td>Translation</td>
</tr>
<tr>
<td>Task 3</td>
<td>Email writing</td>
<td>Email writing</td>
</tr>
</tbody>
</table>

Table 4. Description of Beginning-level Writing Tasks
The vocabulary and patterns were taught at least two weeks prior to their writing sessions. The sentences for translation tasks were from the textbooks or classroom exercises. Writing task 3, i.e., email writing, was a familiar genre of writing for them because I often created reading and writing exercises using Chinese email messages. They had read simple email messages in class including topics such as selling used books and asking friends to join them for dinner.

The intermediate-level learners had four writing tasks, two computer-based writings and two paper-based writings as detailed in Table 5.

<table>
<thead>
<tr>
<th>Task</th>
<th>Computer-based writing</th>
<th>Paper-based writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1</td>
<td>Argumentative Writing: Women’s career choice after having a baby.</td>
<td>Argumentative Writing: Which is better pessimism or optimism?</td>
</tr>
<tr>
<td>Task 2</td>
<td>Essay: Introduce yourself</td>
<td>Essay: The love of parents</td>
</tr>
</tbody>
</table>

Table 5. Description of Intermediate-level Writing Tasks

For the intermediate-level writing tasks, I utilized the supplementary reading and writing exercises from their classes. During the individual writing session, they first re-read a text we had read in class and then wrote a composition. Since my participants did not engage in Chinese writing beyond class-related writing, I utilized similar genres and types of writing for their writing tasks. For example, they were asked in their homework
assignments to summarize or to write their opinions about their textbook reading. It would be interesting if I required them to write in a genre they had not encountered before but I wanted to investigate the process of their writing within familiar genres. If I knew how learners wrote homework assignments at home, it would help me design better writing assignments for class. Therefore, I selected the writing tasks from their classroom exercises.

3.6.3.3 Paper-based Writing (Using Smartpen)

The participants’ paper-based writing was recorded using a Smartpen and a digital camcorder. Smartpens became available in the market in June 2008 in the United States. It is a ballpoint pen with an infrared camera and digital audio recorder (Figure 9). It needs to be used with special dot paper (Figure 10). The key steps of using the Smartpen are as follows. First, the user turns on the power button on the top of the pen. Second, the user clicks the record button on the bottom of the dot paper to use the Smartpen. Third, the user starts to write on the dot paper as usual while the Smartpen records all the writing movements. The users can pause and stop recording anytime and then resume by clicking the corresponding buttons on the dot paper (see Figure 10).
Figure 9. Picture of the Smartpen (www.livescribe.com)

Figure 10. Dot Paper with Buttons for Smartpen
The recorded video and audio can be uploaded to a computer with USB docking devices. These files can be played on a computer as illustrated in Figure 11. With this tool, I was able to watch offline the entire stroke-sequences the learners had produced. A shortcoming of the Smartpen, however, is that the recording may skip some parts of the handwriting movement when participants wrote their Chinese characters in small sizes or held the infrared camera side of the Smartpen away from the dot paper. In order to record all the handwriting movements, participants must hold the pen in the correct way shown in Figure 9.

![Character wén](image)

Figure 11. Smartpen Video Playing of Handwriting of Character 文 wén: A sequence of still pictures (the stoke-sequence is shown using a more saturated green color)

Since the Smartpen is not perfect in terms of recording handwriting, I also used the digital camcorder to record the stroke-sequence. When participants wrote Chinese, I placed the digital camcorder next to them and zoomed in on the characters they were writing (Figure 12). The Smartpen and digital camcorder recordings were compared
against each other for analysis. For the intermediate-level learners’ writing, Smartpen recordings were also used for investigating their writing revisions.

![Handwritten Text]

Figure 12. Handwriting Recorded Using Digital Camcorder: A still picture

3.6.3.4 Computer-based Writing (Using Camtasia Studio)

The participants’ computer writings were recorded using Camtasia Studio version 5. Since the software can clearly capture the whole writing process, I did not need to use a digital camcorder to record the computer screen. The main steps of using Camtasia Studio are as follows. First, the user launches the program. Then, the user clicks the “make a record” button (Figure 13) and selects the screen he/she is going to use as shown in Figure 14. Once the recording starts, the four corners of the screen blink to provide hints (Figure 15). The user can pause and stop writing and then resume anytime during their writing. The program records all screen movements for example; it shows how the user types Pinyin and chooses the characters. Figure 16 shows how a learner typed Pinyin “shi” and how he went through the character panel to look up character 時 shí.
The program also records how a learner moves between lines to edit the contents. The recordings are saved on the computer as files and can be played later on during data analysis.

Figure 13. Screenshot of the Camtasia Studio Interface
Figure 14. Starting the Function of Recording in Camtasia Studio

Figure 15. Recording Movements on Computer Screen
3.6.3.5 Cross-examining Data with Participants

While I recorded participants’ writing, I also took notes on their writing errors and behaviors. At the end of each writing session, I conducted member-check\(^8\) with participants in order to cross-examine the data and my interpretation of their writing. For instance, I asked participants why they wrote and chose particular characters or grammar patterns. I also asked them if my interpretation of their writing errors was correct. The member checking was recorded by the Smartpen audio recorder. After students finished all of their individual writing sessions, I conducted final interviews with them asking about their experience of participating in this study, their future plans with Chinese language, and views on Chinese writing. After the final interview, participants received

---

\(^8\) In order to improve the accuracy, validity, and reliability of the study, researchers cross-examine their data analysis with participants. Member-check is often done during the interview process at the end of study. (Janesick 2000)
cash compensation. During data collection, I also analyzed the data and was able to identify similarities among participants. Accordingly, I divided participants into several groups and selected one participant from each group to report the characteristics of the group. I closely examined their classroom performance, homework assignments, and grades from other teachers in the team.

3.7 Data Analysis

The data analysis of this study intended to reveal the patterns of learners’ Chinese writing development from character writing to composition. As such, the data was collected from beginning-level and intermediate-level learners. During data analysis, I consistently compared multiple data sources to strengthen the validity of my study. In order to understand how the participants’ learning environment influenced their concepts of Chinese writing, I utilized a PASW Statistics 18 program to run the paired t-test. The paired t-test result was used to understand the changes of the participants’ views about Chinese writing. I also compared this result with the paired t-test results of three other language skills (listening, speaking, and reading).

There are two types of errors in writing at the character level. The first type is character error, i.e., participants produce wrong choice of characters. Scores for character error are computed as the ratio between the total number of character errors and the total number of characters they wrote in one writing task.
The total number of character errors \[ \begin{array}{c}
\frac{\text{The total number of character errors}}{\text{The total number of characters in one writing task}} \times 100
\end{array} \]

Figure 17. Score of Character Errors

The second type is character stroke-sequence error: participants produced correct characters but they did not follow the correct stroke-sequences. The score is computed as the ratio between the total number of character stroke-sequence errors and the total number of characters they wrote in one writing task.

\[ \begin{array}{c}
\frac{\text{The total number of character stroke-sequence errors}}{\text{The total number of characters in one writing task}} \times 100
\end{array} \]

Figure 18. Score of Character Stroke-sequence Errors

In order to validate this study, two graders evaluated the clarity and organization of the writing. I was the teacher of these participants. I had been teaching some of them for two years and I was well aware of the error patterns in their writings. So, I was able to understand their writing even if it contained many errors. As a comparison, I also asked two of my colleagues to act as graders and evaluate the participants’ writings. My colleagues were two male graduate students studying Chinese linguistics in this department. Both are native speakers of Chinese. One is from the northern part of China.
and taught Chinese for five years in this department. The other is from the southern part of China and taught Chinese for three years. Neither of them taught Chinese writing to my participants. Therefore, it was assumed that they could grade the writing samples objectively.

The graders were asked to evaluate the clarity and organization on a ten-point scale. Since they were trained to teach in the same department, their grading scores were very consistent. I explained to them the purpose of my study and the definition of clarity (learners’ correct usage of character, words, and sentence structures) and organization (learners’ ability to complete the given writing task and to follow the style of particular genres of writing).

<table>
<thead>
<tr>
<th>Clarity:</th>
<th>Character error</th>
<th>Vocabulary error</th>
<th>Grammar error</th>
<th>Poor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization:</td>
<td>Complete the task</td>
<td>Genre (style of writing)</td>
<td>Use of linking words</td>
<td>Poor</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 6. Grading Criteria for Clarity and Organization of Chinese Writing

The score of each participant was computed as the average of the grade he/she received from both graders. After this process, I used the paired t-test to examine the difference between computer-based writing and paper-based writing.
3.8 Summary

In this chapter, I explained the research methods, research site, participants, and the process of data collection and data analysis. I modified the exploratory designs of Creswell and Plano-Clark (2006) using a mixed approach of quantitative and qualitative methods. During the first phase of data collection, I observed participants’ classes, their performances, and their attitudes toward learning Chinese writing. Based on my observation, I discovered emerging themes and designed survey questions and writing tasks for the individual writing sessions. I used a Smartpen, a digital camcorder, and the Camtasia Studio program to record the writings. I also took notes while participants wrote Chinese and did member-checking right after each writing session. To strengthen the validity of this study, I used the writing scores graded by the two Chinese teaching assistants. I also made use of multiple sources (classroom observation, interview, and survey) to analyze the data. In the following results chapter, I report on the statistic results from the survey and the writing error analysis.
Chapter 4

Results: Demographic information of participants and their computer-based writing and paper-based writing

In this chapter, I report on the demographic information of the participants from the survey data. This information helps us understand the answers to Research Question 1, which asks about the participants’ self-evaluation of their Chinese writing and their preference of writing modes (computer-based writing or paper-based writing). This question also explores how the participants view their Chinese writing and provides background information for Research Question 2 that explores changes in attitudes toward writing in Chinese. After revealing the demographic information of the participants, I report on the results of the statistical analyses in response to the study’s research questions. I also provide my interpretation of the findings after each result of statistical analysis. Furthermore, in order to provide contextual meaning to the statistical analysis, I selected eight participants from my research site as representative of the Chinese learners: two beginning-level learners who were Chinese as a Heritage Language students, two beginning-level learners who were Chinese as a Foreign Language students, and four intermediate-level Chinese as a Foreign Language learners.
The research took place at the site of one of the largest state universities in the United States. The Chinese class drew from a diverse pool of students. Based on their home languages and their different levels of Chinese language proficiency, I categorized my participants into four groups: Chinese beginning-level heritage learners, beginning-level Chinese as foreign language learners, intermediate-level Chinese as foreign language learners, and intermediate-level Chinese as foreign language learners whose first language is not English. Each group displayed different attitudes and patterns of behaviors while they wrote Chinese. Even those participants categorized within the same group showed some differences in their writing process due to their respective perspectives on Chinese writing. Therefore, it is important to report my observation and the interview data with example writings of the participants.

4.1 Demographic Information of Participants

4.1.1 Demographic Information of Beginning-level Participants

Scholars agreed that knowledge of learners’ first language influences their foreign language acquisition. In other words, learners often transfer their first-language linguistic knowledge when their foreign language knowledge is not fully developed (Gass & Selinker 1983; Genesee, Geva, Dressler & Kamil 2006; Krashen 1983). The degree of structural difference between the writing systems of the first language and the foreign language also influences the foreign language reading and writing acquisition (Koda 1993; Muljani, Koda & Montes 1998; Wang, Koda & Perfetti 2003). Therefore, it is
important to report on each learner’s first language as well as his or her foreign language learning experience.

A total of 58 beginning-level learners participated in this study. The initial survey was conducted during Winter Quarter 2009 and the exit survey was conducted in the last week of Spring Quarter 2009. The average age of the participants was 20. Most participants’ first language was English, except for seven participants whose first languages were Korean, Cantonese, Shanghainese, Indonesian, and Vietnamese. Four of them were Chinese as a foreign language learners and three were Chinese as heritage language learners. None of them used Mandarin Chinese at home. Those students reported that their parents used Cantonese or Shanghainese at home but they themselves were encouraged to speak English. Ten participants already had studied Chinese at other institutions for an average of 18 months before participating in the initial survey. However, their language proficiency level was the same as other beginning-level participants as judged by their placement test scores. This survey result showed that when beginning-level participants started learning Chinese writing, most of them have the same level of proficiency of Mandarin Chinese.

Beginning-level participants had similar foreign language learning experiences. Most of them had studied other foreign languages except five participants. Some of them had studied more than two languages. As Table 7 shows, Spanish was the most popular language among the participants and the second most popular foreign language was French. International and immigrant students also participated in this study. They indicated that they learned English as their second language. The reason for examining the participants’ foreign language learning experience was to find if they had already
studied Chinese characters in other languages such as Cantonese, Korean, and Japanese. Except for six participants, none had learned how to write Chinese characters before enrolling in a Chinese class. This confirms that the majority of Chinese participants had no prior knowledge about the Chinese writing system.

<table>
<thead>
<tr>
<th>Language</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish</td>
<td>27</td>
</tr>
<tr>
<td>French</td>
<td>9</td>
</tr>
<tr>
<td>Latin</td>
<td>8</td>
</tr>
<tr>
<td>German</td>
<td>7</td>
</tr>
<tr>
<td>English</td>
<td>4</td>
</tr>
<tr>
<td>Arabic</td>
<td>2</td>
</tr>
<tr>
<td>Cantonese</td>
<td>2</td>
</tr>
<tr>
<td>Hebrew</td>
<td>2</td>
</tr>
<tr>
<td>Japanese</td>
<td>1</td>
</tr>
<tr>
<td>Korean</td>
<td>1</td>
</tr>
<tr>
<td>Russian</td>
<td>1</td>
</tr>
<tr>
<td>Shanghainese</td>
<td>1</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 7. Prior Foreign Languages Studied by Beginning-level Participants

I also investigated the relationship between participants’ majors and their reasons of studying Chinese. Norton (2000) indicated that learners make meaningful connections between their desires to learn a language and their relationship with that target language. Depending on their desire or motivation, learners focus on some particular language skill over the others. I asked about their majors, in order to understand how their future
studies relate to their purposes for learning Chinese. As Table 8 shows, approximately 50% of participants answered that their majors were business/economics and social science, and all of which either require or recommend studying foreign languages.

<table>
<thead>
<tr>
<th>Major</th>
<th>Initial survey</th>
<th>Exit survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Business/Economics</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Humanities/Foreign language</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Social Science</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>Science/Engineering</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Undecided</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 8. Majors of Beginning-level Participants

Table 8 shows that the number of participants majoring in Chinese and other subjects related to humanities and social science increased after the initial survey. For example, only nine participants reported Chinese as their major in the initial survey, yet an increase to 15 participants majoring in Chinese in the exit survey. In addition, I examined the reasons for participants to take a Chinese class using an open-ended question format in both the initial and exit surveys. According to the investment theory of Norton (2000), when participants change majors, these changes should be reflected in their reasons for studying Chinese. I encoded their answers and categorized them into six areas: future career, personal interest in Chinese culture, both career and interests in Chinese culture, heritage, general education course (GEC) requirements, and no answer. Figure 19 shows
an interesting change in reasons given for studying Chinese from the initial survey to the exit survey.

Figure 19. Reasons for Studying Chinese: Beginning-level participants

In their initial surveys, participants stated they decided to study Chinese either for career purposes or due to the GEC\textsuperscript{9} requirements; however, by the time of their exit surveys, they indicated that they wanted to know about the Chinese culture. For instance, 27

\textsuperscript{9} Participants were required to take four quarters of foreign languages to graduate from this university.
participants answered that they were studying Chinese for their future career in the initial survey. However, only 18 participants in the exit survey listed “future career” as the reason for taking Chinese. Looking at the other three categories (career and cultural interest, heritage, and no answer), 23 participants in the exit survey indicated that they studied Chinese because they were interested in the Chinese culture. It seems that, in the case of the beginning-level participants, they were first attracted to study Chinese due to the usefulness of Chinese language in their future career. However, later on their interests in Chinese culture became the main reason for them to study Chinese and related subjects.

In summary, beginning-level participants had no or limited knowledge of Chinese writing system. Their main reason of studying Chinese was to know Chinese culture and to gain some advantage in their future career. After learning two quarters of Chinese, more than half of them were majoring in Chinese (language and society) related subjects. For this reason, I anticipated that they were eager to learn Chinese writing as well.

4.1.2 Demographic Information of Intermediate-level Participants

Twelve intermediate-level learners participated in this survey study, with the average age of 21. All participants were studying Chinese as foreign language learners, but their first language backgrounds varied. Nine of the participants’ first language was English and two of the participants’ first language was Korean. One participant stated that her first language was both English and Panjabi. However, as Table 9 shows, intermediate-level Chinese learners had studied Chinese for very different lengths. In the initial survey they answered that they had studied Chinese for an average of 25 months.
<table>
<thead>
<tr>
<th>Months</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>3</td>
</tr>
<tr>
<td>60</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 9. Length of Prior Chinese Language Study: Intermediate-level participants

For example, one participant, who had five months of learning Chinese, just finished a summer of an intensive first-year Chinese class. Another participant, who studied Chinese for 60 months, started learning Chinese in her high school. Moreover, nine participants had been to Chinese-speaking countries to study Chinese language or culture. These experiences led to different levels of Chinese proficiency. Yet, as Table 10 shows, they all had experience with learning foreign languages (based on an alphabetical writing system) other than Chinese except one participant who had learned Chinese in high school.

<table>
<thead>
<tr>
<th>Foreign Languages</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>French</td>
<td>5</td>
</tr>
<tr>
<td>Latin</td>
<td>3</td>
</tr>
<tr>
<td>Spanish</td>
<td>3</td>
</tr>
<tr>
<td>Hebrew</td>
<td>2</td>
</tr>
<tr>
<td>English</td>
<td>2</td>
</tr>
<tr>
<td>German</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 10. Foreign Languages Studied by Intermediate-level Participants
Two Korean students had studied more than one foreign language. One student who had transferred in from a university in South Korea answered that she had studied Chinese characters in her high school. The other Korean participant had not attended high school in South Korea and had no intensive knowledge of Chinese characters.

Seven participants studied Chinese as their major. However, five of them also had other majors such as economics and international studies which focused on Chinese speaking countries and regions. As Table 11 shows, there were two graduate students, for instance, who studied East Asian Studies with a focus on China.

<table>
<thead>
<tr>
<th>Major</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>2</td>
</tr>
<tr>
<td>Chinese and Economics</td>
<td>1</td>
</tr>
<tr>
<td>Chinese and International studies</td>
<td>4</td>
</tr>
<tr>
<td>East Asian Studies (Graduate Program)</td>
<td>2</td>
</tr>
<tr>
<td>Finance</td>
<td>1</td>
</tr>
<tr>
<td>International business</td>
<td>2</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 11. Majors of Intermediate-level Participants

Overall, the participants studied Chinese for three main reasons: future career, interest in Chinese culture, or both career and cultural interest. Many of intermediate-level participants continued to study Chinese for specific career-related purposes. For instance, two graduate students needed to study Chinese, particularly written Chinese, for their
research. As shown in Figure 20, other participants planned to study abroad and were applying for graduate schools to study Chinese.

![Diagram showing reasons for studying Chinese, with reasons ranked from highest to lowest: career, Chinese culture, and career/Chinese culture.]

**Figure 20.** Reasons for Studying Chinese: Intermediate-level participants

Unlike beginning-level participants, more intermediate-level participants changed their reasons for studying Chinese from learning Chinese culture to preparing for a better career. One possible reason for this change was that half of the intermediate-level participants were going to graduate within a year so they may have been more job-oriented than the beginning-level participants.

The intermediate-level participants had similar foreign language experiences as the beginning-level participants. Before they learned Chinese, they had limited knowledge on Chinese writing system except two Korean participants. They were
studying Chinese for their future career. Considering their lengths and reasons of studying Chinese, I expected that they understood the importance of acquiring Chinese writing skills for their future job and research.

4.2 Participants’ Self-evaluation of Their Chinese Writing and Their Attitudes toward Computer-based Writing and Paper-based Writing

In this section, I present the findings that answer Research Question 1 (concerning the participants’ evaluation of their own Chinese writing and how they defined computer-based writing and paper-based Chinese writing) and Research Question 2 (about their change in attitudes toward Chinese writing and toward writing on paper or computer). The results were collected from the answers from both the initial and exit survey questions that asked about 1) the first time they started using computers, 2) the number of hours of computer use per day, and 3) the participants’ first language and their preference of Chinese writing (paper or computer), 4) the participants’ evaluation of the four language skills (listening, speaking, reading, and writing), and 5) the participants’ ranking of these language skills in order of their importance. These answers allowed me to identify any change of their attitudes toward Chinese writing.

4.2.1 Chinese Writing and Beginning-level Participants

Recent studies on Chinese character learning strategies indicate that learners’ use of e-learning and computer technology influence their strategies for learning Chinese. Because I was investigating their writing preference, it was important to understand how
familiar my participants were with computer technology such as online tools and programs for language writing. All participants had been using computers since their elementary school years. Eleven participants mentioned that they could not remember when they started using a computer because they were so young at that time. I also asked how many hours the participants used computers on a daily basis. Due to intensive computer use throughout their lives, 11 participants could only reply with vague comments like “hours” or “all the time.” They further explained that their computers were turned on all the time so they could not figure out exactly how many hours they used the computers per day. The remaining 47 participants used computers for an average of 2.7 hours per day. These results clearly show that my participants were familiar with computers on a daily basis. I also asked if they used computers to study other foreign languages. Figure 21 displays beginning-level participants’ use of language learning software programs, such as Rosetta Stone.
In the initial survey, only half answered that they used some language learning software program to study foreign languages. The low number showed that participants had not been actively seeking computer technology to learn foreign languages. Interestingly, 12 participants had utilized computer software including online programs (e.g., online dictionaries, online character learning websites) to study Chinese. A possible explanation for this difference is that those students who had previously studied Chinese at other institutions may have been required to listen to audio files along with the textbook, but their teachers did not teach computer-based writing.

Writing habits developed in the first-language exert influence on the habits of newly acquired Chinese writing. I investigated the participants’ computer use and their preference for either computer-based writing or paper-based writing in both their first languages and in Chinese. In the case of their first language, 32 beginning-level...
participants in the initial survey preferred using computers for writing their first language. However, 45 students answered they preferred using computers for their first language in their exit surveys as shown in Figure 22. Two participants answered no preference for either computer-based writing or paper-based writing. Because these first-year students were required to compose papers and reports on computers at this university, they quickly became proficient computer users after three quarters. This probably explains the jump for 32 to 45 students indicating their preference of using computers.

As for writing in Chinese, results from the initial survey showed that 43 participants did not type in Chinese before the second quarter of their first year, while 15
had typed Chinese previously. Three learned how to type Chinese from their high school Chinese teachers. Twelve participants had taught themselves through online resources and had tried Chinese input methods using computers. Beginning-level participants indicated that they favored paper-based Chinese writing in the initial survey. Two participants even stated that they did not know how to type Chinese with the computer. However, in the exit survey, more answered that they preferred computer-based Chinese writing over paper (Figure 23). This shows that students can quickly learn Chinese typing within only a few instructional hours (I had a total of four hours of computer-writing classes in one academic year). Because the Chinese input method I introduced was based on Pinyin, learners did not need special memorization of the QWERY keyboard. (See Section 2.3 for a discussion of input methods.)

![Figure 23. Beginning-level Participants’ Preference of Chinese Writing Modes](image-url)
More than half of beginning-level participants did not have prior experience with computer-based foreign language programs. Before I introduced computer-based Chinese writing, most participants did not know how to type Chinese using computer. However, in the case of their first language writing, they preferred to use the computer. Since they were comfortable with computer typing, they quickly learned *Pinyin*-based Chinese typing. Moreover, they preferred Chinese computer-based writing over paper-based writing.

In order to investigate the participants’ evaluation of Chinese writing, I asked them to evaluate their own ability in each of the four language skills (speaking, listening, reading, and writing) on a scale of 1 to 10. When asked to explain the value placed on one skill of Chinese writing, the participants could not explain it without comparing to the other three language skills. Moreover, self-evaluations of the four language skills reveal not only their abilities in these skills but also their reactions to learning Chinese writing. The scores indicate whether the learners view these language skills negatively or positively. After a self-evaluation of the four language skills, the participants were asked to rate their importance and give reasons for their choices.

Figure 24 shows that participants evaluated their speaking skills higher than the other three language skills. However, the average scores for writing skills were the lowest in both the initial and exit surveys. In addition, when I compared the data between their initial and exit surveys, it became clear that participants evaluated all their language skills lower in the exit survey. I performed paired t-tests at $\alpha=.05$ to find if there is a significant statistical difference between the scores of self-evaluation from the initial and exit surveys.
Figure 24. Self-evaluation of the Four Language Skills: Beginning-level participants

The results in Table 12 demonstrate that the paired t-tests rejected the null hypothesis and show that there is a significant difference between the language skill evaluation of the initial and exit surveys.
<table>
<thead>
<tr>
<th></th>
<th>Paired Differences</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Std. Error Mean</td>
<td>95% Confidence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Interval of the</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Difference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listening 1*</td>
<td>1.13793</td>
<td>1.61624</td>
<td>.21222</td>
<td>.71296</td>
<td>1.56290</td>
<td>5.362</td>
<td>57</td>
</tr>
<tr>
<td>Listening 2*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speaking 1</td>
<td>1.20690</td>
<td>1.74475</td>
<td>.22910</td>
<td>.74814</td>
<td>1.66566</td>
<td>5.268</td>
<td>57</td>
</tr>
<tr>
<td>Speaking 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading 1</td>
<td>1.74138</td>
<td>2.39561</td>
<td>.31456</td>
<td>1.11149</td>
<td>2.37127</td>
<td>5.536</td>
<td>57</td>
</tr>
<tr>
<td>Reading 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing 1</td>
<td>2.12069</td>
<td>2.30999</td>
<td>.30332</td>
<td>1.51331</td>
<td>2.72807</td>
<td>6.992</td>
<td>57</td>
</tr>
<tr>
<td>Writing 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 refers to the data from the initial survey and 2 refers to the data from the exit survey.

Table 12. Paired T-test Results of Initial and Exit Surveys: Self-evaluation of the four language skills

Table 12 shows that learners evaluated their own four language skills as poorer than before after studying Chinese for two quarters. They thought that their Chinese had not improved as much as they had expected. Furthermore, their writing skills received the lowest scores among the four language skills in both surveys. This indicates a negative view of Chinese writing. It is probably also the reason that they hesitated to participate in the individual writing sessions in my subsequent study. Those who had participated in individual writing sessions also answered that their Chinese skills were the weakest among the four language skills.

In both surveys, participants reported that speaking and listening were the most important skills. They stated that speaking and listening were most useful for their future.
Table 13 shows that 47 participants named speaking and/or listening as more important language skills in the initial survey. In the exit survey, 48 participants indicated speaking and/or listening were more important skills. There is no significant change statistically in participants’ answers between the initial and exit surveys.

<table>
<thead>
<tr>
<th></th>
<th>Initial survey</th>
<th>Exit survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking and listening</td>
<td>38</td>
<td>32</td>
</tr>
<tr>
<td>Speaking</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Listening</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Speaking, listening and reading</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Listening and reading</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Reading and writing</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Reading</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Writing</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>All four skills</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>58</td>
</tr>
</tbody>
</table>

Table 13. More Important Language Skills: Beginning-level participants

On the other hand, the least important language skills reported were reading and/or writing in both surveys (Table 14). Again, there is no significant difference between the initial and the exit surveys. The participants’ view of Chinese writing (the least important language skill) did not change during the two quarters of learning. We can infer that the students’ learning experiences influenced their attitudes toward Chinese writing. As a free response, the participants were asked to provide comments based on
their language skills. However, no dramatic changes in comments were collected from the initial and exit surveys.

<table>
<thead>
<tr>
<th></th>
<th>Initial survey</th>
<th>Exit survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading and Writing</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Reading</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Writing</td>
<td>23</td>
<td>35</td>
</tr>
<tr>
<td>N/A</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Listening and speaking</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>58</td>
</tr>
</tbody>
</table>

Table 14. Less Important Language Skills: Beginning-level participants

Overall, most participants explained that listening and speaking were useful for business and are key skills for communicating in Chinese. One participant even stated that “business requires speaking and listening.” Based on these comments, I concluded that they tended to define Chinese communication primarily as oral communication. They also considered that reading and writing skills are not as useful nor as critical for them to acquire. One participant stated “I don’t think I will ever be required to write in Chinese.”

In the exit survey, the participants’ attitudes toward writing became even more negative. They made comments such as “less opportunity to develop this [writing] skill,” “rarely see characters in class,” “too hard,” “not practical,” “when will I need to write Chinese?” and “it [writing] is useless.” From these comments, I inferred that oral communication instruction was central in the Chinese classroom which led to their negative views about
Chinese writing. Due to frequent classroom speaking exercises, their speaking and listening abilities became better than their reading and writing. This gave them a positive attitude toward learning listening and speaking. The emphasis on learning, speaking, and listening Chinese skills also led them downgrade Chinese writing to the lowest priority in the learning process. They might even think that Chinese writing is useless for them. Their negative attitudes toward Chinese writing prompted them to avoid Chinese writing exercises. Sometimes, they purposefully skipped the writing classes. As a result, they performed poorly during the individual writing sessions in my study.

4.2.2 Chinese Writing and Intermediate-level Participants

The intermediate-level participants indicated that they had used computers since kindergarten and have been using computers for an average of 2.25 hours per day. Ten out of 12 participants reported in the initial survey that they preferred computer-based writing for their first language. In the exit survey, all participants preferred to use computers for writing in their first language as shown in Figure 25.
In the initial survey, half of the participants (six) reported favoring computer-based writing for Chinese. However, in the exit survey, nine participants preferred to use computer-based writing, while only two students still preferred using paper-based writing. One participant indicated that she felt comfortable using both modes of writing.

Contrary to the beginning-level participants, the intermediate-level participants actively used computers to learn Chinese. During the initial survey, four participants reported using a computer-based Chinese learning program; whereas in the exit survey, eight participants were actively using computer-based Chinese learning programs, especially online dictionaries and Chinese reference websites (Table 15). It is possible that this preference for using computers to write Chinese increased only after the students first learned to appreciate the benefits of computer-based or online-based dictionaries and other related resources.
<table>
<thead>
<tr>
<th>Number of intermediate-level Chinese learners</th>
<th>Computer use for foreign language learning</th>
<th>Computer-based resources for Chinese writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

Table 15. Intermediate-level Participants’ Use of Computer Resources for Chinese Language Learning in Exit Survey

During interviews with participants of individual writing sessions, the students explained that computer-based writing allowed them to write faster than paper-based writing. Additionally, because they now used computer-based dictionaries and other online resources, it became easier to simply copy and paste words directly into their electronic Chinese compositions rather than switch back and forth from computer to paper. Their preference for composing using computer became a matter of expediency and speed after they were used to utilize the various online resources available for writing in Chinese.

The results for self-evaluation of the four language skills are shown in Figure 26. The intermediate-level learners rated their listening and reading skills higher in both surveys. Writing skills continued to be rated the lowest in both surveys.
While beginning-level participants showed changes in their self-evaluation, no noticeable changes occurred between the initial and exit surveys for the intermediate-level participants (Figure 26). Paired t-tests comparing the initial and exit surveys showed no statistical difference between them. The results indicate that intermediate-level learners had fixed perceptions of their language skills. Even though I recognized some students’ writing skills had improved, they still considered their writing skills as the poorest among the four language skills. This reveals that participants viewed the writing skill as the most difficult skill to acquire. They also ranked writing as the least important language skill.

Table 16 lists the answers from the intermediate-level participants about the importance of the four language skills. Most participants did not rank writing as important in either survey. An exception is with a student who had studied Chinese for
60 months in high school. She told me that her high school teachers put an equal emphasis on learning all four language skills. It would seem that her different learning background influenced her attitude toward Chinese writing. Two participants answered that reading was important. These were Asian Studies graduate students who were required to read Chinese for their research, which may explain their difference from other undergraduate participants. Except for these three participants, all other participants stated that speaking and/or listening are the most important skills in Chinese learning.

<table>
<thead>
<tr>
<th></th>
<th>Initial Survey</th>
<th>Exit survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Speaking</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Listening and speaking</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Listening and reading</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Listening, speaking and reading</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Speaking and writing</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Reading</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Reading and writing</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>All four skills</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

Table 16. More Important Language Skills: Intermediate-level participants

In gauging the least important language skill, more than half the participants selected writing in both surveys. Participants who answered “not applicable” explained that they could comparatively select important language skills but could not choose the least important skill as shown in Table 17.
<table>
<thead>
<tr>
<th></th>
<th>Initial survey</th>
<th>Exit survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking and writing</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Reading</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Reading and listening</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Reading and writing</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Writing</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>N/A</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 17. Less Important Language Skills: Intermediate-level participants

Similar to the beginning-level participants, the intermediate-level participants also believed writing was the least important skill. Comments about their Chinese writing helped me analyze their survey answers. At the end of initial and exit surveys, they were asked to comment on the four language skills. Table 18 shows their comments about writing in Chinese.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I can use the computer.</td>
</tr>
<tr>
<td>2</td>
<td>Even native speakers do not know [how to write] Chinese. Communication is important.</td>
</tr>
<tr>
<td>6</td>
<td>I can type it.</td>
</tr>
<tr>
<td>7</td>
<td>Communication does not need writing.</td>
</tr>
<tr>
<td>10</td>
<td>Communication is important and you can still get by in writing.</td>
</tr>
<tr>
<td>12</td>
<td>I can type [Chinese], reading is important.</td>
</tr>
</tbody>
</table>

Table 18. Comments in Initial and Exit Surveys: Intermediate-level participants
As seen in Table 18, the comments from three of the participants about computer typing vs. handwriting indicate that these students tend to define “writing” as handwriting with pen and paper only. They did not think of writing as composition. Handwritten Chinese was not important to them. Two possible reasons for this attitude relates either to their teachers’ view toward Chinese writing or to their own preexisting view about Chinese writing and Chinese culture. The Chinese program at this university did not introduce computer-based Chinese writing, especially at the beginning-level. Teachers in this program seemed to think that if Chinese learners used computers to write characters they would not learn to read or handwrite the characters. This thinking may influence the participants’ views. Additionally, the participants themselves may connect the simple handwriting of language to the cultural art of calligraphy. By no means they thought writing as composing or communication by text.

These participants did not seem to view computer-based Chinese writing as a legitimate Chinese writing. They considered computer-based Chinese writing as an extension of Chinese speaking. They stated that the important Chinese language skills were listening and speaking. Perhaps because they received good grades mainly based on their oral performance in class, they concluded that writing was less significant. In addition, they could easily access electronic devices such as smartphones, netbooks, and electronic dictionaries, which use Pinyin-based input methods. Participants could easily search characters and handcopy characters from those devices. Perhaps Pinyin intervened with the computer writing process, they did not treat computer typing as Chinese writing.
The beginning-level and intermediate-level participants shared many similarities. Most of them did not have prior knowledge of the Chinese writing system before they studied Chinese. They considered Chinese writing as a less important language skill for them and treated it as “handwritten Chinese characters.” Their impression on Chinese writing make them think that it is not a part of Chinese communication. In terms of preference of writing mode, they preferred using computer for their first language and Chinese writing as well.

There are two differences between the beginning-level and intermediate-level participants. The first is the reason of studying Chinese. Beginning-level participants studied Chinese because of their interests in Chinese culture and their future career. However, intermediate-level participants answered that they studied Chinese only for their career. The second difference is that intermediate-level participants thought that computer-based Chinese writing could substitute paper-based Chinese writing (handwriting of Chinese characters).

4.3 Summary of Findings of Participants’ Self-evaluation and Their Views on Chinese Writing

In this section, I compared the survey findings from the beginning-level and intermediate-level participants to answers of Research Question 1 (participants’ self-evaluation of the four Chinese language skills) and Research Question 2 (participants’ views on computer-based writing and paper-based writing).
4.3.1 Participants’ Self-evaluation of the Four Chinese Language Skills

Beginning-level and intermediate-level students consistently evaluated their writing skill as the lowest among the four language skills (listening, speaking, writing, and reading) while they evaluated the speaking skill as the highest in both the initial and exit surveys. These participants not only rated Chinese writing as the least important language skill but also disregarded Chinese handwriting as a form of communication at all. The result of self-evaluation of the four language skills showed that they had most difficulties in acquiring the writing skill. To make it worse, they did not have enough time to learn Chinese writing. Especially for the beginning-level participants, there was a significant difference of self-evaluation of their writing between the initial and exit surveys. It indicated that the participants thought that their Chinese writing skills did not improve as they had expected at the exit survey. I think that their learning environment is the main cause that led to this result. In this program, they have only five hours of writing per quarter. Furthermore, the program puts emphasis on Chinese oral communication in the first-year Chinese classes. Thus, they may form the opinion that Chinese as a Foreign Language learners only need to learn listening and speaking, which is their definition of Chinese communication. Such a definition was influenced by their learning experiences at this university. Their comments such as “conversation is more effective so writing is less important,” “business requires listening, speaking, and reading,” and “writing is not interactive” reflect this attitude. The program reinforced the notion that listening and speaking were important skills to them. A few beginning-level participants even acknowledged that writing skills can be substituted by computer writing.
The tendency to separate Chinese computer writing from Chinese handwriting was even more predominant among the intermediate-level learners. Most of them viewed Chinese writing as not useful because they could write Chinese with computers. Some of the participants who enrolled in summer language programs in China had experienced Chinese texting, email, and online messaging systems. They realized that computer-based Chinese writing was easier and faster than handwriting. The computer-based writing was related not to school work but to their leisure activities such as searching for popular Chinese songs and movie clips. Therefore, they did not include computer-based Chinese writing as a part of Chinese writing. Writing may be more useful and meaningful when viewed as paper-based writing instead of character writing.

4.3.2 Participants’ Views on the Two Writing Modes

As mentioned above, beginning-level and intermediate-level participants evaluated their writing skill as the least important among the four language skills. However, there was no statistical difference among the scores of the four language skills in intermediate-level participants’ initial and exit surveys. At the same time, the number of participants who answered that Chinese writing was the least important skill increased in the exit survey. However, when beginning-level participants started learning Chinese characters, they encountered difficulties in character writing. Some of them failed to overcome it. In the self-evaluation of the four language skills in their initial survey, they provided an average of 6.6 points for their listening skill and 5.5 points for their writing skill. However, in the exit survey, while they gave an average of 5.7 points for their listening skill, they reported only an average of 3.6 points for writing. The beginning-
level participants had realized that learning Chinese (especially Chinese writing) was not as easy as what they had thought during their second quarter of learning. The gap between their goals and their learned Chinese ability made them prioritize certain language skills. This Chinese program also emphasized oral communication so that more beginning-level participants stated that Chinese writing was less important.

The beginning-level participants’ attitudes reflected their preference of Chinese writing modes. In their initial survey, only eight participants preferred computer-based writing. However, the number of participants who preferred computer-based Chinese writing increased to 48 in the exit survey. Since their Chinese input is based on Pinyin, they could transfer their speaking and reading ability to their computer-based writing. For this reason, they stated that computer-based Chinese writing was easier than paper-based writing.

Intermediate-level participants stated that Chinese writing was a less important skill for them. However, there is no significant difference between their self-evaluation scores from the initial and exit surveys. This indicates that their focus of learning Chinese was still on listening and speaking. Intermediate-level learners also mentioned that their Chinese “handwriting” could be replaced with computer-based writing. Based on the findings of beginning-level and intermediate-level participants, I concluded that these learners’ view of Chinese writing as less important was formed during their early stages of Chinese learning. Once formed, it became difficult to change their view on Chinese writing. Once Chinese learners got used to using the computer-based Chinese writing method based on Pinyin, they favored computer-based Chinese writing.
4.4 Differences between Computer-based Writing and Paper-based Writing in Terms of Writing Errors

In this section, I report on Chinese writing data from individual sessions to determine if there are any differences in quality or quantity between computer-based writing and paper-based writing. One significant difference between them is that computer-based writing requires knowledge of Pinyin in order to produce the characters, whereas paper-based writing requires memorization of stroke-shapes and stroke-sequences. Therefore, I analyzed the participants’ character production and character errors.

Sixteen beginning-level and twelve intermediate-level learners participated in individual writing sessions. I collected six writing samples from the beginning-level participants but only used their sentences from dictation writing for statistical analysis of character level errors. This is because they had only a few Chinese writing classes to that point and therefore, there was a wide variation in beginning-level learners’ writing. Some participants failed to complete the writing tasks due to limited knowledge about Chinese language in terms of grammar and vocabulary. However, most of them were able to complete the dictation writing tasks. So I only utilized their sentence dictation writings for the statistical analysis. For analyzing the intermediate-level participants’ writing errors, I utilized their writing of two essays.

Intermediate-level learners were familiar with essay writing, especially on topics such as introducing themselves and their families, which they had already practiced in
class. In order to minimize other influences such as unfamiliar genres of writing on their production of Chinese characters, I used these two topics for their essay writing.

4.4.1 Character Errors

The character error analysis was based only on the final outcomes of the participants’ Chinese writing in one session. The participants were allowed to revise their writing during the writing session, and I only considered the final results of their characters and composition because I was not interested in how they edited and corrected their writing. My sample also does not include the errors beyond the character level such as incorrect and inappropriate uses of words or wrong grammar patterns. Furthermore, I was not interested in the difference between simplified and traditional characters. The participants could choose either writing system. However, if they mixed two writing systems in one writing task, I counted those characters as character errors. As I explained in the previous chapter, the character error scores were calculated using the following formula:

\[
\frac{\text{The total number of correct characters}}{\text{The total number of characters in one writing task}} \times 100
\]

A high score indicates that the participants produced fewer errors in one writing session. In order to examine the difference between computer-based writing and paper-based writing, a paired t-test was conducted at \( \alpha = .05 \) after the scores were calculated for both computer-based writing and paper-based writing samples.
4.4.1.1 Character Errors: Beginning-level participants

Six participants used simplified characters and ten participants used traditional characters. I used two sets of dictation writing for this analysis. For the paper-based writing, participants produced 30 characters. For the computer-based writing, they produced 35 characters. The mean of the character error of paper-based writing was 68.81, which means the participants produced only 68.81% correct characters for dictation writing. The mean of character error of computer-based writing was 85.37%. I conducted a paired t-test to compare the two means (Table 19).

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
</table>

*CEP: Character Error of Paper-based writing
**CEC: Character Error of Computer-based writing

Table 19. Paired T-test Result of Character Errors in Computer-based Writing and Paper-based Writing

As shown in Table 19, the paired t-test indicated that the difference between the character error of paper-based writing and that of computer-based writing was statistically significant (t= -3.445 and p<.05). This means that beginning-level participants produced
fewer character errors when writing Chinese using computer. This result was anticipated because computer-based writing requires recognition of Chinese characters while paper-based writing requires participants’ knowledge of stroke-shape and stroke-sequence of characters. However, the other benefit of computer-based writing, such as the speed of writing, still needs to be tested. The questions of effectiveness of computer-based Chinese writing will be answered in Section 4.7.

4.4.1.2 Character Errors: Intermediate-level participants

Writing samples for the character error analysis were drawn from the participants’ two essay writings. For the paper-based writing, intermediate-level participants produced an average of 232 characters. For the computer-based writing, they produced an average of 266 characters. During the writing sessions, they were allowed to use resources, such as online dictionaries. The mean of character error scores of paper-based writing was 96.58%. The mean of character error scores of computer-based writing was 99.08%. This means that intermediate-level participants seldom made character errors when they performed the two writing tasks. The paired t-test result showed no difference between the two writing modes in terms of character error. I could have different results if I had included a dictation test for intermediate-level learners’ writing sessions. However, my classroom observation and the dictation test scores from their writing class demonstrated no difference between the two writing modes. Therefore, I concluded that there was no difference in terms of writing characters between the two writing modes by intermediate-level participants. Moreover, it is possible that the intermediate-level participants were “good” students compared with other intermediate-level learners.
There was no significant difference between the mean of character error scores for computer-based writing and that of paper-based writing of intermediate-level participants. However, the beginning-level participants performed better in computer-based writing. An interesting finding is that the beginning-level participants who received high scores in computer-based writing also performed well in paper-based writing. I compared the beginning-level participants’ computer-based writing and paper-based writing character error scores. As shown in Table 20, the participants numbered 14, 4, 15, and 7, who received high scores in computer-based writing ranked the first, second, fifth, and sixth, respectively, in their paper-based writing. The result indicated that the beginning-level participants who made fewer character errors with paper-based writing had fewer character errors with computer-based writing. However, there were some participants who showed inconsistencies in their scores.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Paper-based writing of character error score</th>
<th>Computer-based writing of character error score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>93 (15*)</td>
<td>100 (14)</td>
</tr>
<tr>
<td>2</td>
<td>93 (4)</td>
<td>100 (4)</td>
</tr>
<tr>
<td>3</td>
<td>90 (9)</td>
<td>91 (15)</td>
</tr>
<tr>
<td>4</td>
<td>86 (16)</td>
<td>91 (7)</td>
</tr>
<tr>
<td>5</td>
<td>83 (7)</td>
<td>90 (2)</td>
</tr>
<tr>
<td>6</td>
<td>80 (14)</td>
<td>89 (13)</td>
</tr>
<tr>
<td>7</td>
<td>77 (3)</td>
<td>89 (8)</td>
</tr>
<tr>
<td>8</td>
<td>73 (8)</td>
<td>88 (5)</td>
</tr>
<tr>
<td>9</td>
<td>73 (5)</td>
<td>86 (9)</td>
</tr>
<tr>
<td>10</td>
<td>67 (6)</td>
<td>86 (10)</td>
</tr>
<tr>
<td>11</td>
<td>63 (10)</td>
<td>80 (12)</td>
</tr>
<tr>
<td>12</td>
<td>60 (13)</td>
<td>80 (3)</td>
</tr>
<tr>
<td>13</td>
<td>53 (11)</td>
<td>80 (1)</td>
</tr>
<tr>
<td>14</td>
<td>40 (2)</td>
<td>77 (6)</td>
</tr>
<tr>
<td>15</td>
<td>37 (1)</td>
<td>74 (11)</td>
</tr>
<tr>
<td>16</td>
<td>33 (12)</td>
<td>65 (16)</td>
</tr>
</tbody>
</table>

*the number in parenthesis is the number assigned to each participant

Table 20. Beginning-level Participants’ Character Error Scores in Ascending Order

For example, participant 16 ranked fourth in the paper-based writing while he received the lowest character error score in the computer-based writing. A possible reason for this discrepancy was that he seldom used computers to write Chinese so he did not know how to use the Chinese word-processing program correctly. The participants who performed well in both writing modes, often used a computer to type Chinese. They knew how to select the characters from the panel that displays characters. However, even the participants who received high scores also struggled to type correct Pinyin similar to participant 16. Therefore, the limited knowledge of using a Chinese word-processing
program may potentially lead to low scores in the computer-based writing. The detail patterns of paper-based Chinese character writing errors will be discusses in Section 4.5.

4.4.2 Stroke-sequence Errors

I had observed that Chinese learners who follow correct stroke-sequences made fewer character errors. In order to test my hypothesis, I used the Pearson’s correlation to examine the correlation between the character error and stroke-sequence error. The stroke-sequence error is a paper-based writing error in which participants do not follow the correct stroke-sequence. I watched recordings by the camcorder and Smartpen and counted the characters produced with wrong sequences of strokes. The score of stroke-sequence error was calculated using the following equation:

\[
\frac{\text{The total number of characters with correct sequence}}{\text{The total number of characters in one writing task}} \times 100
\]

A higher score of stroke-sequence error means that the participants made fewer stroke-sequence errors when writing on paper.

4.4.2.1. Stroke-sequence Errors: Beginning-level participants

The mean of stroke-sequence error for beginning-level participants was 59.75%. It indicates that more than half of the participants did not follow the correct stroke order. Also, they did not follow the proper directions of stroke. Chinese strokes are usually written in the top-down or left-right direction. However, most beginning-level participants did not follow the directions and sequences of characters. I investigated the correlation between character errors and stroke-sequence errors (Table 21).
<table>
<thead>
<tr>
<th></th>
<th>CEP</th>
<th>SSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEP*</td>
<td>Pearson Correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>16</td>
</tr>
<tr>
<td>SSE**</td>
<td>Pearson Correlation</td>
<td>.668**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>16</td>
</tr>
</tbody>
</table>

*CEP: Character Error Paper-based writing
**SSE: Stroke-Sequence Error Paper-based writing

Table 21. Pearson’s Correlation Result of CEP and SSE: Beginning-level participants

The Pearson’s correlation between these two scores was 0.668 and the correlation was significant at the 0.01 level (2-tailed). In other words, beginning-level participants who followed the correct stroke-sequence made fewer character errors (Table 21).

**4.4.2.2 Stroke-sequence Errors: Intermediate-level participants**

Most intermediate-level participants followed the stroke-sequence correctly. The mean of their scores was 96.41%. The score indicated that intermediate-level participants rarely made stroke-sequence errors. The Pearson’s correlation result showed that the correlation between stroke-sequence error and character error is significant at the 0.01 level (2-tailed), which is shown Table 22.
<table>
<thead>
<tr>
<th></th>
<th>SSE</th>
<th>CEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSE</td>
<td>Pearson</td>
<td>1.000**</td>
</tr>
<tr>
<td></td>
<td>Correlation</td>
<td>1.000**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>CEP</td>
<td>Pearson</td>
<td>1.000**</td>
</tr>
<tr>
<td></td>
<td>Correlation</td>
<td>1.000**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 22. Pearson’s Correlation Result of CEP and SSE: Intermediate-level participants

I have noticed that those intermediate-level participants who wrote characters in the wrong stroke-sequences consistently wrote those particular characters with the same wrong stroke-sequences. I also discovered that intermediate-level stroke-sequence errors did not affect them to make character errors such as missing strokes or wrong shapes of strokes.

By comparing the scores of stroke-sequence errors of beginning-level and intermediate-level participants, I found that it takes about one academic year for beginning-level learners to learn the correct stroke-sequences. While most intermediate-level participants learned to follow the general rules of stroke-sequence, some developed their own stroke-sequences without paying attention to the rules, producing what are known as fossilized stroke-sequence errors. These intermediate-level participants did not think stroke-sequence was important. However, by calculating the length of time it took for beginning-level learners to write characters from dictation writing samples, I can identify if there is a correlation between the stroke-sequence score and the speed of
writing. Specifically, I first measured how long it took them to write a character. The
duration of their paper-based dictation writing was then divided by the total number of
characters produced. The Pearson’s correlation showed a negative correlation between
the speed of paper-based writing and stroke-sequence errors. The correlation was
significant at the 0.05 level (2-tailed) as shown in Table 23.

<table>
<thead>
<tr>
<th>SSE</th>
<th>Pearson Correlation</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-.575*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.020</td>
</tr>
<tr>
<td>N</td>
<td>16</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed</th>
<th>Pearson Correlation</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-.575*</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.020</td>
</tr>
<tr>
<td>N</td>
<td>16</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 23. Pearson’s Correlation Result of Speed of Chinese Writing and the Stroke-
sequence Errors

The results shown in Table 23 means that intermediate-level participants with few stroke-
sequence errors spent less time writing characters. Sometimes, intermediate-level
participants ignored the stroke-sequence order but still managed to write correct Chinese
characters. My participants mentioned that in their opinion, the stroke-sequence was not
important as long as they produce correct characters. However, this result showed the
importance of stroke-sequence in writing Chinese characters. It indicates that the
fossilized stroke-sequence errors of intermediate-level learners should be corrected so that they can handwriting Chinese characters faster.

4.5 Differences between Beginning-level and Intermediate-level Participants in Terms of Writing Errors

In previous sections, the statistical analysis revealed that beginning-level participants performed better in their Chinese writing with computer-based writing than paper-based writing. However, the paired t-test showed no significant difference between these two writing modes. It also revealed that the stroke-sequence is important for writing correct Chinese characters. However, the statistical analysis cannot explain the causes or patterns of writing errors in the two writing modes. In this section, I discuss possible reasons of character errors and stroke-sequence errors. I explain first the types of character errors and then the types of stroke-sequence errors.

4.5.1 Types of Character Errors

As I mentioned in Chapter 3, I was able to categorize the participants’ character errors into five types:

Type 1: homophone errors,
Type 2: wrong characters with similar shapes,
Type 3: missing strokes,
Type 4: mismatching different parts of characters into one character, and
Type 5: mixing simplified and traditional characters in one writing.
In the beginning-level participants, I found all five types of errors. The most frequent errors were types 1, 3, and 5. However, the most frequent character errors of intermediate-level learners were types 3 and 5. In the case of computer-based writing, two types of character errors occurred most frequently: *Pinyin* errors and character recognition errors. Both errors were found to be equally likely in beginning-level participants’ writing. However, character recognition errors were the main cause of character errors among the intermediate-level participants.

4.5.1.1 Character Errors of Beginning-level Participants: Paper-based writing

The first type of paper-based character error is the writer’s misuse of homophone characters. For example, as illustrated in Table 24, participants who were asked to write 現在, *xiàngàn* (now) and 還, *huán* (to return), wrote 先*xiān* instead of 現*xiàn* and 歡*huān* instead of 還*huán*. 先*xiān*/現*xiàn* and 歡*huān*/還*huán* are minimal pairs. 先*xiān* is with high level tone (Tone 1) and 現*xiàn* is with high falling tone (Tone 4). 歡*huān* is with high level tone (Tone 1) and 還*huán* is with rising tone (Tone 2).
<table>
<thead>
<tr>
<th>Dictation questions</th>
<th>Participants’ answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>現在, xiànzài (now)</td>
<td>先在 xiān (earlier) zài (preposition at)</td>
</tr>
<tr>
<td>還, huán (to return)</td>
<td>歡 huān (happy)</td>
</tr>
</tbody>
</table>

Table 24. Examples of Type 1 Paper-based Character Errors

The beginning-level participants still struggled to distinguish the four different tones of Chinese when they participated in this study. They also had not fully mastered the meaning of these four characters. Therefore, when they listened to the sounds 現 xiàn and 還 huán, they often associated only the sounds and not the tones with the characters 先 xiān and 歡 huān, resulting in type 1 errors.

The type 2 character error refers to the misuse of characters with similar shapes. In the dictation task, participants had to write 再見 zàijiàn (good bye). However, some participants wrote the following:
<table>
<thead>
<tr>
<th>Dictation question</th>
<th>Participants’ answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>再見 zàijiàn (good bye)</td>
<td>再貝 zài (again) bēi (shell)  再見 zà (again) jiàn (to see)  再見 zà (again) jiàn (to see)</td>
</tr>
</tbody>
</table>

Table 25. Examples of Type 2 Paper-based Character Errors

Right after the dictation, I asked the participants why they wrote 貝 bēi instead of 見 jiàn and 周 zhōu instead of 再 zài. At first, they did not realize that they had made a character error. They then attributed the errors to the confusion by the similarities of the outlines of these characters.

Type 3 character errors refer to characters with missing strokes such as the radical or phonetic part of characters. This is one of the most frequent character errors among beginning-level participants. In Table 26, for the example 三點 sāndiǎn (3 o’clock), the participant omitted 四四 under 四。 For the character 吃 chī (to eat), the participant forgot to write 口。Participants who were not sure about the character they needed to write tended to first write a certain part of character that they could remember then tried to complete the character. During this process, some participants failed to complete the remaining part.
Type 4 character error occurs when mismatching different parts of other characters into one character. As I mentioned in Chapter 2, 82% of modern Chinese characters are standard compound characters (Shu & Anderson 1999). The participants were aware of this fact and they seemed to use it to determine their character writing strategies (Table 27).

<table>
<thead>
<tr>
<th>Dictation question</th>
<th>Participants’ answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>三點 sāndiǎn (3 o’clock)</td>
<td>三点 三立 三立</td>
</tr>
<tr>
<td>吃 chī (to eat)</td>
<td>气</td>
</tr>
</tbody>
</table>

Table 26. Examples of Type 3 Paper-based Character Errors

<table>
<thead>
<tr>
<th>Dictation question</th>
<th>Participants’ answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>點 diǎn (o’clock)</td>
<td>点</td>
</tr>
<tr>
<td>到 dào (to go)</td>
<td>刑</td>
</tr>
</tbody>
</table>

Table 27. Examples of Type 4 Paper-based Character Errors
The two characters above, written by participants, are not Chinese characters. However, both incorrect characters contain parts of 占 zān and 亻, as Table 27 shows. This suggests that the participants were aware of the principle of Chinese characters such as semantic and phonetic parts of compound characters, but they could not fully apply this principle when they wrote characters.

Type 5 character error occurs when simplified and traditional characters are both used in one writing task. Beginning-level participants had learned traditional characters in their reading and writing class. However, they could choose to write with either traditional or simplified characters in class and in this study. Six participants used simplified characters to complete the writing tasks. Before the individual writing sessions, I told them not to mix traditional and simplified characters in one writing. However, due to the unfamiliarity with simplified characters and lack of practice in the classroom, they still mixed traditional and simplified characters in one writing task. For example, a beginning-level participant often used one traditional character with other simplified characters (Table 28).

| Participant’s writing | 现在三点
| Simplified characters | 现在三点 xiànzǎi sāndiǎn (It is three o’clock now.) |
| Traditional characters | 现在三點 xiànzǎi sāndiǎn (It is three o’clock now.) |

Table 28. An Example of Type 5 Paper-based Character Error
For example, the participant who wrote the sentence in Table 28 wrote three characters (现 xiàn, 在 zài, and 三 sān) in the simplified character system but wrote the last character, 點 diǎn in the traditional character system. The participant told me that she thought that 點 diǎn was a simplified character.

4.5.1.2 Character Errors of Intermediate-level Participants: Paper-based writing

Four types of character errors were found in intermediate-level learners’ paper-based writing: types 1, 2, 3, and 5. The most frequent error types among the intermediate-level participants’ writings were type 1 (homophone errors) and type 3 (missing strokes). An interesting finding is that type 1 error was found mainly in their first individual writing sessions. Intermediate-level participants’ writing samples were collected during two quarters and by the end of that time, type 1 errors were no longer as frequent because their writing had improved. Type 1 error is more common among beginning-level participants.

The most frequent mistake for the intermediate-level participants was observed for the word 州立大学 zhōulì dàxué (state university). Many participants wrote it as 州里大学 zhōulǐ dàxué as shown in Table 29. They wrote 里 lǐ (inside) instead of 立 lì (to establish). It might be that the participants learned the character 里 lǐ (inside) in the second quarter of their first-year Chinese class so that they were familiar with that character. This may explain why the error occurred.

Type 2 character error, wrong characters with similar shapes, was found only in some particular participants who had tried to switch their Chinese writing from traditional
characters to simplified characters. Type 3 character errors (missing strokes) could also be found occasionally in their writing samples. Contrary to beginning-level participants, intermediate-level participants were able to correct the errors as soon as I pointed out their mistakes. I asked why they had forgotten to write strokes and they explained that they were focusing on the content of the writing and dictionary lookup so that they did not pay enough attention to the actual characters.

Type 5 character errors were found among those participants who decided to use simplified characters after they participated in my study. They had practiced writing in simplified characters for less than two months. For example, in Table 29, the participant wrote the first character 國 guó in traditional character and 际 jì in simplified character. When I analyzed her writing, I could not find any pattern for her type 5 character errors. She produced correct simplified words in one line but in the next line she mixed traditional characters with simplified characters together. Due to the short period of practicing simplified character, she randomly mixed simplified and traditional characters.
<table>
<thead>
<tr>
<th>Type of Character error</th>
<th>Examples</th>
</tr>
</thead>
</table>
| **Type 1: homophone error** | 心里学 xīnlǐxué  
Correction: 心理学 xīnlǐxué  
州立大学 Zhōulì dàxué  
Correction: 州立大学 Zhōulì dàxué (state university) |
| **Type 2: wrong characters with similar shapes** | 今年 lǐnnián  
Correction: 今年 jīnnián (this year)  
貿易 màoyáng  
Correction: 貿易 màoyì (trade) |
| **Type 3: missing strokes** | 除非 bùjǐ (not only)  
喜欢 xǐhuan (to like) |
| **Type 5: mixing simplified and traditional characters in one writing task** | 国际 guójì (international)  
学习 xuéxí (to study) |

Table 29. Intermediate-level Participants’ Character Errors: Paper-based writing
4.5.1.3 Character Errors: Computer-based writing

Two types of character errors were observed in computer-based writing. The first type stems from limited knowledge about the Pinyin system. The second type of errors is character recognition errors. Character errors caused by limited Pinyin knowledge were mainly found in beginning-level learners’ writing. Examples of the most common errors occur when students are confused by words such as 學校 xuéxiào (school) and 七歲 qīsuì (seven year old), which are shown in Table 30.

<table>
<thead>
<tr>
<th>Dictation question</th>
<th>Character error</th>
</tr>
</thead>
<tbody>
<tr>
<td>學校 xuéxiào (school)</td>
<td>睡覺 shuìjiào (to sleep)</td>
</tr>
<tr>
<td></td>
<td>水宵 shuǐxiāo (water, night)</td>
</tr>
<tr>
<td>七歲 qīsuì (seven year old)</td>
<td>汽水 qìshuǐ (soda drink)</td>
</tr>
<tr>
<td></td>
<td>奇水 qíshuǐ (strange, water)</td>
</tr>
</tbody>
</table>

Table 30. Computer-based Character Errors due to Limited Pinyin Knowledge

In order to type 學校 xuéxiào (school), participants first had to type “xuexiao” (without diacritics) and then selected the correct character from the character panel. However, the participant who wrote 睡覺 shuìjiào (to sleep) in Table 30 typed “shuijiao” instead of “xuexiao.” She explained that she had understood the meaning of the word when she...
heard it but did not type the correct *Pinyin*. Therefore, she was not able to write 學校 *xuéxiào* (school). The other example in Table 30, 七歲 *qīsuì* (seven years old), was the dictation item with which many participants had difficulties. They could not distinguish the sounds between “sui” and “shui,” so they would type “shui” and looked for the character 歲 *suì*. When they could not locate the character 歲 *suì* from the character panel, they would choose the character they had already studied 水 *shuǐ*, which means water. They told me that they knew the meaning of 七歲 *qīsuì* (seven years old) in the sentence. However, when they could not locate the character 歲 *suì*, they were not sure of the meaning of the sentence and chose to select another character they had learned instead.

The other type of character errors in computer-based writing is character recognition errors. Chinese computer typing involves both *Pinyin* typing and character recognition. This error happens when participants fail to select the correct characters. The beginning-level participants spent more time typing characters due to the lack of experience in Chinese writing using computer. Some participants made more character errors on computer-based writing than on paper-based writing because they would forget to click on the character in the character panel. However, intermediate-level participants were more familiar with Chinese computer writing. Table 31 shows character errors of computer-based writing from the beginning-level participants.
### Correct character | Character error
--- | ---
直 zhí (straight) | 只 zhī (only), 枝 zhī (branch)
往 wǎng (to) | 望 wàng (hope), 王 wáng (king)
離 lí (be far away from) | 裏 lǐ (inside)
公共汽車 gōnggòngqìchē (bus) | 公公汽車 gōnggōng qìchē (husband’s father, car)
再見 zàijiàn (good bye) | 在見 zàijiàn (at, to see)
到 dào (arrive) | 道 dào (road)

Table 31. Character Errors: Failure of recognizing correct characters

As we can see, participants had typed the correct *Pinyin*. For example, in order to write 直 zhí (straight), the participants typed “zhì” but they did not remember the character shape of 直 zhí (straight). So they chose the characters from the panel that they had already learned such as 只 zhī (only) and 枝 zhī (branch). A similar tendency can be observed for the character error type 1 (homophone errors) in paper-based writing. In paper-based writing, students wrote homophone characters either consciously or unconsciously. When I asked the participants why they selected the homophone characters, they explained that they wrote the characters that first came to their mind. For example, they thought that the meaning of 只 zhī (only) was 直 zhí (straight).
4.5.2 Comparison of Beginning-level and Intermediate-level Participants’ Stroke-sequence Errors

When I watched the video records of participants’ writing, I not only counted the number of characters with stroke-sequence errors, but also categorized the types of errors. Although intermediate-level participants committed fossilized stroke-sequence errors, these errors did not hinder them from writing the correct characters. However, beginning-level participants’ character errors did correlate with stroke-sequence errors. In addition, writing simplified characters did not necessarily imply fewer stroke-sequence errors. In the beginning of this study, beginning-level participants believed that writing simplified characters might be easier for them. In Chinese character recognition studies, scholars have also claimed that the number of strokes affected the reading reaction time of Chinese native speakers (Qian et al. 1994). When characters contained fewer strokes, native Chinese responded to the characters faster. This implies that simplified characters might be more efficient for recognition. However, my participants’ writing errors demonstrated that simplified characters were also difficult to write. Before they learned how to write simplified characters, all students, especially beginning-level participants, assumed they would prefer to write traditional characters. However, once they started writing with simplified characters, they felt that writing traditional characters was easier. The change of preference for beginning-level learners is shown in Table 32.
In my initial and exit surveys, I asked participants about their preferences over simplified and traditional characters. In the initial survey, 22 participants answered that they preferred simplified characters. Only 12 participants indicated that they preferred simplified characters in the exit survey. Beginning-level participants explained that they had already learned traditional characters in Chinese classes so they felt more comfortable with traditional characters. It seemed that beginning-level participants thought that simplified characters were easier to write because most simplified characters have a less number of strokes per character. During the initial survey, beginning-level learners did not have many chances to write simplified characters. They thus forgot that simplified characters also require them to memorize the shapes and sequences of stroke. For example, I mentioned in Chapter 2, “to buy” is written as 買 mǎi (traditional character) and 买 mǎi (simplified character). The stroke-shapes of 買 mǎi and 买 mǎi are different. The stroke-sequence of traditional character 買 mǎi is as follows:

<table>
<thead>
<tr>
<th>Participants</th>
<th>Character sets</th>
<th>Initial survey</th>
<th>Exit survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning-level participants</td>
<td>Traditional characters</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Simplified characters</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Intermediate-level</td>
<td>Traditional characters</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>participants</td>
<td>Simplified characters</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 32. Participants’ Preference of Chinese Character Sets
(12 strokes). However, the sequence of simplified character 买 mǎi is as follows: 

\[ \begin{array}{c}
\text{买} \\
\text{mǎi}
\end{array} \]

(six strokes). Despite the less number of stroke in simplified character 买 mǎi, beginning-level participants had to memorize new shapes of character components such as 头 which they did not encounter before when they wrote traditional characters. When the beginning-level participants answered the exit survey, they realized that they had to re-learn the characters which they had studied in traditional characters in order to write correctly in simplified characters. Many beginning-level participants (46 participants) answered that they preferred to use traditional characters which they studied in the first year of their Chinese class.

Unlike beginning-level participants, six intermediate-level participants had learned Chinese in other programs so some of them preferred to use simplified characters. However, there was no significant relationship between the use of different character systems and stroke-sequence errors. This indicates that stroke-sequence errors are not due to either traditional or simplified characters. Intermediate-level participants had studied Chinese characters at least two years so that they had accumulated basic knowledge of stroke-shapes and stroke-sequences. This allowed them to transfer their previous knowledge of one writing system to another writing system. Six intermediate-level participants stated that they need to learn simplified Chinese characters for their future job and study, which motivated them to switch from traditional characters to simplified characters.
Table 3 lists common stroke-sequence errors made by the participants. The beginning-level participants had difficulties with all eight examples shown in Table 3. However, intermediate-level participants made stroke-sequence errors primarily when writing vertical hooks (see number 8 in Table 3). They would either omit the hook or write a vertical stroke instead of the vertical hook. For example, some participants overused vertical hooks for vertical strokes. Some of the participants did not know the difference between \( \| \) (vertical stroke) and \( \downarrow \) (vertical hook).
<table>
<thead>
<tr>
<th>Correct stroke-sequence and shape in red box</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 到 dào</td>
<td><img src="image1" alt="Correct Stroke-Sequence and Shape" /> <img src="image2" alt="Error" /></td>
</tr>
<tr>
<td>2. 是 shì</td>
<td><img src="image3" alt="Correct Stroke-Sequence and Shape" /> <img src="image4" alt="Error" /></td>
</tr>
<tr>
<td>3. 弟 dì</td>
<td><img src="image5" alt="Correct Stroke-Sequence and Shape" /> <img src="image6" alt="Error" /></td>
</tr>
<tr>
<td>4. 飯 fàn</td>
<td><img src="image7" alt="Correct Stroke-Sequence and Shape" /> <img src="image8" alt="Error" /></td>
</tr>
<tr>
<td>5. 從 cōng</td>
<td><img src="image9" alt="Correct Stroke-Sequence and Shape" /> <img src="image10" alt="Error" /></td>
</tr>
<tr>
<td>6. 书 shū</td>
<td><img src="image11" alt="Correct Stroke-Sequence and Shape" /> <img src="image12" alt="Error" /></td>
</tr>
</tbody>
</table>

Table 33. Character Errors: Wrong stroke-shape and stroke-sequence

In Table 33, examples 1, 3, and 4 have horizontal bend-shape strokes. The beginning-level participants did not know how to write bend-shape strokes. They would take two or three strokes to write the bend-shape stroke, which should actually take only one stroke.

For example 3, one participant used one stroke to write the bend-shape 𠲍. However, it
actually consists of one horizontal (一) and one bend-shape stroke (彎). Due to the similarity among bend-shape strokes, participants would write 彎 in one stroke.

Beginning-level participants exhibited problems with the character 是 shì (example 2 in Table 33), which is a top-bottom sequence character with a downward right shape stroke 下. Some participants first wrote the bottom part of character 上 or 下. They explained that they could not remember the top part of the character so they chose to write the part which they could recall first. This example indicated that reversing stroke-sequences often led participants to produce wrong stroke-sequence orders and character errors.

This section explains the causes of character-level writing errors. There were five types of character errors in paper-based writing and two types of character errors in computer-based writing. As expected, beginning-level participants made more types of writing errors than intermediate-level participants. These results show that during the developmental stages of learning to write characters on paper, errors are mainly due to missing strokes, mistaking similar character shapes, and mixing simplified and traditional characters. However, only beginning-level participants had the mistake of mismatching different parts of characters into one character. In addition, homophone errors were rare among intermediate-level learners in their paper-based writing.

There were two types of character errors in computer-based writing: incorrect Pinyin and incorrect character recognition. Character errors caused by limited Pinyin knowledge were found only in beginning-level learners’ writing. Intermediate-level participants, who were more familiar with typing Chinese characters using Pinyin, did not
make this type of character errors. However, both beginning-level and intermediate-level participants failed to recognize the proper character from the character panel.

4.6 Influences of the Two Writing Modes on Participants’ Chinese Writing

In this section, I report on how the participants’ writing was influenced by either computer-based writing or paper-based writing. Previous writing studies argued that computer-based writing allowed writers to easily revise and frequently access references (Chun 2001; Van Waes 1992). However, the languages in those studies were based on the alphabet writing system. Computer typing in the alphabet writing systems is easier than for Chinese character writing. As noted earlier, Chinese character typing requires three steps to complete for every character. Beginning-level learners would often complain about the difficulty of typing in Chinese. There is also no study on how computer-based writing influences Chinese learners’ writing. Based on previous foreign language writing studies (Chun 2001; Van Waes 1992), I examined the differences between the frequency of revision and the use of resources in computer-based writing and paper-based writing.

4.6.1 Participants’ Revision in Computer-based Writing and Paper-based Writing

In my study, I found that beginning-level participants seldom revised their writing in either computer-based or paper-based writing sessions. However, intermediate-level participants made some revisions in both modes. I watched the recordings of computer-based writing and paper-based writing and counted the number of times participants
revised their writing in one writing task. To examine the difference between the two writing modes, a paired t-test was conducted at $\alpha=.05$. The mean number of revisions for paper-based writing was 1.7 and that of computer-based writing was 3.04. Table 34 shows that the paired t-tests failed to reject the null hypothesis of no difference between the means of revisions in computer-based writing and paper-based writing ($t=-1.90$ and $p=.069$).

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-revision*</td>
<td>1.333</td>
<td>3.42201</td>
<td>0.6985</td>
<td>-2.778 - .11165</td>
<td>-1.90</td>
<td>23</td>
<td>.069</td>
</tr>
<tr>
<td>C-revision**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P-revision: The number of revision in paper-based writing
**C-revision: The number of revision in computer-based writing

Table 34. Paired T-test Result: Number of revisions in computer-based writing and paper-based writing

The results of the paired t-test confirmed that there is no difference between computer-based writing and paper-based writing with respect to the number of revisions made in one writing task. It is possible that intermediate-level participants were not concerned about the quality of their writing because it was not part of their classroom activities. Participants were not used to revising their papers without teachers’ feedback. During
the interview, participants stated that they rarely revised once they had written in the paper. However, after receiving feedback from teachers, they made corrections.

4.6.2 Participants’ Use of Resources in Computer-based Writing and Paper-based Writing

Beginning-level participants did not use resources such as online dictionaries for translation and email writing tasks. They mentioned that they did not know how to use either online or hard-copy dictionaries. Therefore, I only examined the writings of intermediate-level participants. All of the intermediate-level participants used computer-based resources except one student. They explained that although they knew how to look up characters in paper-based dictionaries, they were not good at using paper-based dictionaries because computer-based resources were much easier and faster to use than paper-based dictionaries. In addition, online dictionaries were free of charge. Moreover, they could just copy and paste the Chinese characters from online dictionaries to their computer-based Chinese composition without typing.

In order to locate a character in a paper-based dictionary, learners must be able to identify the radical part of the character and count the correct number of strokes for the radical part and for the rest of the character. For example, if learners need to locate the character 洋 yáng (ocean), they first need to identify the radical part氵 of the character. Second, they need to count the number of stroke (3) in that radical氵 and look up the radical chart to find氵. Third, learners have to go to the corresponding page number indicated in the radical chart and locate the character 洋 yáng. In the radical section for
The characters are listed by their increasing numbers of strokes. For example, in the section, the character 江 jiāng (river) is listed before the character 洋 yáng (ocean) because 工 gōng has three strokes while 羊 yáng has six strokes. Due to this multiple-step process, consulting paper-based Chinese dictionary is very complicated for Chinese learners.

As I reported in the previous section, learners often did not follow the proper stroke-sequences, which means they were not able to correctly count the number of strokes. Therefore, participants preferred to use computer-based dictionaries, which are not based on counting the number of strokes. In one individual writing session, an intermediate-level participant brought his paper-based English-Chinese dictionary. However, he did not know how to look up characters using the number of strokes and the radical characters, so he only used the Pinyin-based method or the English words to look up the Chinese characters. For the next three writing sessions, he relied solely on computer-based resources. I hypothesized that intermediate-level participants would use resources more frequently when writing with computers. Because they were using computers to write Chinese anyway, it would be easier for them to check computer-based resources. A paired t-test was conducted to test this hypothesis.

The mean frequency of using dictionaries and English-Chinese translation computer programs was 15.1 times per paper-based writing. In the case of computer-based writing, the mean frequency of using resources was 9.97 times. A paired t-test was conducted to compare the frequency of using resources at α=.05. The null hypothesis, i.e., there would be no significant difference between computer-based writing and paper-
based writing in the case of the frequency of using resources, was tested. As shown in Table 35, the paired t-test rejected the null hypothesis (t=2.159 and p<.05).

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P- resources *</td>
<td>5.25</td>
<td>11.9136</td>
<td>2.4318</td>
<td>.21931 to 10.2806</td>
<td>2.15</td>
<td>23</td>
<td>.042</td>
</tr>
<tr>
<td>C- resources **</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*P- resources: The frequency of resource use in paper-based writing  
**C- resources: The frequency of resource use in computer-based writing

Table 35. Frequency of Using Resources: Computer-based writing and paper-based writing

This paired t-test confirmed that there is a statistically significant difference between the means of frequency of resource use in computer-based writing and paper-based writing. Intermediate-level participants are more likely to consult references when writing on paper than writing on computer. A possible explanation is that participants have to know the characters beforehand in order to handwrite them in the paper. Therefore, they looked up more often online dictionaries, electronic dictionaries, and computer software dictionaries. The participants said that they often consulted the resources for their paper-based homework in order to reduce the number of mistakes.
This finding differs from that of Chun (2001) who also conducted a test of how often her German language students consulted online dictionaries during online reading. Chun’s students were asked to perform two tasks. The first was to read a German text from a computer screen where they had access to a built-in dictionary function by clicking on the hyperlinked words. They were then asked to read another German text using computer without built-in dictionary support. Students with access to the built-in dictionary tended to look up more vocabulary, even for words which they had little doubt.

However, in my study, participants used dictionaries more often for their paper-based writing than computer-based writing. When my participants used computers to write Chinese, they had easier access to online dictionaries and computer-based dictionaries. Chun’s study (2001) showed that the easy accessibility to the dictionary led her participants to use the dictionary more. The difference between her study and mine is that Chun (2001) focused on German reading while this study investigates Chinese writing. Another reason is that computer-based Chinese writing itself contains a certain degree of reference functions. For instance, some participants utilized word-processing programs during the individual paper-based writing sessions and typed the characters they were not sure. Once they typed the Pinyin and recognized the character, they could immediately copy them into their paper. Therefore, compared with paper-based writing, participants did not need to frequently consult the resources during computer-based Chinese writing.
4.7 The Two Writing Modes and Their Aids in Participants’ Writing

In this section, I report on the results related to Research Question 6 that concerns whether writing on the paper or writing with the computer produces better writing. In this study, writing quality is defined in terms of speed, length, clarity, and organization of writing. Beginning-level participants had six individual writing sessions. However, only a few of them were able to complete all the translation and email writing tasks. It is possible that too few hours of Chinese writing in class made beginning-level participants perform poorly on the translation and email writing sessions. Due to this poor preparation, it is difficult to compare their computer-based writing and paper-based writing. Therefore, I only examined the speed of writing for the beginning-level participants.

The intermediate-level participants had four writing tasks. I selected two genres of writing for this study. One was essay writing and the other was argumentative writing. The participants were familiar with essay genres. From the beginning of their Chinese writing class, they had practiced essay topics such as writing about themselves and writing about their thoughts after reading the textbook. The participants were not familiar with argumentative writing in Chinese. They had not read many argumentative writings in their textbook and occasionally were asked to write about their opinions about some particular topic. Since one of the goals of this study was to understand how learners develop as writers, I also included argumentative writing in the study even though they were unfamiliar with it.

Except for the first writing session, intermediate-level participants had to first read a short article and an essay before writing a composition in Chinese. Their first
writing session was paper-based writing and their task was to introduce themselves to a new Chinese teacher. The second writing session was a computer-based argumentative writing and their task was to answer the question, “do you think the phenomenon that women quit jobs after they have children is an improvement of women’s right?” The third writing session was a paper-based argumentative writing and the task was to write about their opinion on the question “which one do you think is better, pessimism or optimism?” The last writing session was a computer-based writing and the task was writing about the moment you realized your parents’ love. The participants all went over reading materials related to those questions during the individual writing session in their class. During their reading and writing classes, the participants and I also discussed the contents of each reading sample and they shared their ideas in Chinese and English.

4.7.1 Speed of Writing

Scholars and Chinese teachers assumed that computer-based Chinese writing allows learners to write faster than paper-based Chinese writing. As I reported at the beginning of this chapter, participants had two different definitions of Chinese writing. For them, Chinese writing refers to paper-based Chinese character writing, and Chinese computer-based writing refers to Chinese composition writing. Because more than half of beginning-level learners could not complete the translation and email writing tasks, I compared their dictation writings in both modes for the speed of writing only. For the intermediate-level learners, I examined their speed of writing when they wrote compositions. The findings are detailed in the following two subsections.
4.7.1.1 Speed of Writing: Beginning-level participants

A paired t-test was performed at $\alpha=.05$ in order to compare the means of speed of computer-based writing and paper-based writing. I counted the number of characters in the participants’ dictation writing and measured how much time the participants spent writing the characters. Then, I divided the numbers of characters by the total duration of dictation. The mean of paper-based writing was 7.97 seconds per character and that of computer-based writing was 6.88 seconds per character. The paired t-test result indicated that there is no significant difference between the means of computer-based writing and paper-based writing ($t=1.517$ and $p=.150$). Beginning-level participants were not familiar with computer-based Chinese writing and they had not fully mastered the Pinyin system. For this reason, some of participants mentioned that they did not like to use the computer because it took more time to write a character. This shows that computer-based writing does not help beginning-level participants in terms of speed of writing.

4.7.1.2 Speed of Writing: Intermediate-level participants

In order to compare the speed of Chinese in computer-based writing and paper-based writing, a paired t-test were performed at $\alpha=.05$. First, I calculated how many characters the participants wrote in a minute. I counted the total number of characters in one writing task, and divided that number by the total duration of writing. The mean of computer-based writing was 7.84 seconds per character and that of paper-based writing was 10.61 seconds per character. As shown in Table 36, the paired t-test rejected the null hypothesis ($t=-2.79$ and $p<.05$).
### Paired Differences

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>-2.77</td>
<td>4.874</td>
<td>.99497</td>
<td>-4.834 to -.71800</td>
<td>-2.79</td>
<td>23</td>
<td>.010</td>
</tr>
<tr>
<td>Computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 36. Speed of Writing of Intermediate-level Participants: Computer-based writing and paper-based writing

As shown in Table 36, the paired t-test rejects the null hypothesis and show that there is a significant statistical difference between the means of the speed of computer-based writing and paper-based writing. It means that intermediate-level participants wrote Chinese characters faster in computer-based writing. This confirmed the previous assumption made by scholars and Chinese teachers that Chinese computer-based writing allows learners to write faster than paper-based writing.

#### 4.7.2 Length of Writing

Another common assumption among my participants and previous Chinese writing studies such as (Xu & Jen 2005) is that computer-based writing helps learners produce longer Chinese writing (composition). In my study, the length of writing means the number of characters which were used in one writing task. I performed the paired t-test at $\alpha=.05$. I counted the total number of characters in one writing task. The mean of paper-based writing was 204.20 characters per writing task and that of computer-based
writing was 244.08 characters per writing task. The null hypothesis is that there is no difference between the length of computer-based writing and paper-based Chinese writing. As shown in Table 37, the paired t-test rejects the null hypothesis (t=-2.26 and p<.05).

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>-39.8</td>
<td>86.33</td>
<td>17.62</td>
<td>-76.32 -3.4207</td>
<td>-2.26</td>
<td>23</td>
<td>.033</td>
</tr>
<tr>
<td>Computer</td>
<td>-39.8</td>
<td>86.33</td>
<td>17.62</td>
<td>-76.32 -3.4207</td>
<td>-2.26</td>
<td>23</td>
<td>.033</td>
</tr>
</tbody>
</table>

Table 37. Length of Writing of Intermediate-level Participants: Computer-based writing and paper-based writing

There is a significant statistical difference between the means of length of computer-based writing and paper-based writing. This confirmed the previous assumption which states that computer-based writing allows Chinese learners to write longer Chinese compositions. However, when I counted the number of characters in each participants’ writing, I found that the length of the two essay writing tasks were about the same. I further performed a paired t-test at α=.05 and compared the length of Chinese computer-based writing and paper-based writing based on two different genres: essay writing and argumentative writing. In the personal essay writing of self-introduction, the mean of
paper-based writing was 232.25 characters and that of computer-based writing was 242.91 characters. In the argumentative writing, the mean of paper-based writing was 176.16 characters and that of computer-based writing was 245.24 characters. As shown in Table 38, the paired t-test result revealed that there is no significant difference between the means of the length of computer-based writing and paper-based writing in essay writing.

<table>
<thead>
<tr>
<th>Genres</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>232.25</td>
<td>12</td>
<td>110.71</td>
<td>31.95</td>
</tr>
<tr>
<td>Computer</td>
<td>242.91</td>
<td>12</td>
<td>87.20</td>
<td>25.17</td>
</tr>
<tr>
<td>Argumentative writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>176.16</td>
<td>12</td>
<td>59.27</td>
<td>17.11</td>
</tr>
<tr>
<td>Computer</td>
<td>245.25</td>
<td>12</td>
<td>72.37</td>
<td>20.89</td>
</tr>
</tbody>
</table>

Table 38. Descriptive Statistical Analysis of Length of Writing Based on Different Genres

However, there was a significant difference between the means of computer-based writing and paper-based writing in argumentative writing. Table 39 showed the result of paired t-test on the lengths of writing of two different genres.
<table>
<thead>
<tr>
<th></th>
<th>Paired Differences</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Std. Error Mean</td>
<td>95% Confidence Interval of the Difference</td>
<td>t</td>
<td>df</td>
</tr>
<tr>
<td>Paper 1*</td>
<td>-10.6</td>
<td>80.26</td>
<td>23.17</td>
<td>-61.66</td>
<td>40.33</td>
<td>-.460</td>
</tr>
<tr>
<td>Computer 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper 2**</td>
<td>-69.08</td>
<td>85.32</td>
<td>24.63</td>
<td>-123.2</td>
<td>-14.87</td>
<td>-2.80</td>
</tr>
<tr>
<td>Computer 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 is essay writing

** 2 is argumentative writing

Table 39. Paired T-test Result of Length of Writing: The two different genres

Table 39 indicates that when participants wrote in familiar writing genres (essay writing), the two different modes of writing did not have influence on the length of the composition. However, when they wrote in unfamiliar genres, such as argumentative writing, computer-based writing allowed them to write longer than paper-based writing.

4.7.3 Clarity of Writing

Two graduate teaching assistants evaluated the writings of the intermediate-level participants. Clarity of writing is defined as the correct use of vocabulary and grammar. As I explained in Chapter 3 (Table 6), they evaluated the participants’ writing on the ten-point scale. Ten point means there is no vocabulary and grammar errors. One point means that the composition is not understandable due to the present of many vocabulary and grammar mistakes. I used the mean of their scores for one writing and performed a paired t-test at α=.05 to compare the clarity of writing on computer and on paper. The
mean of paper-based writing was 7.04 points out of ten points and that of computer-based writing was 6.12 points. The null hypothesis is that there is no difference between the clarity of computer-based and that of paper-based writing. As shown in Table 40, the paired t-test rejects the null hypothesis (t=4.412 and p<.05).

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Std. Error</td>
<td>Mean</td>
<td>Lower</td>
</tr>
<tr>
<td>Paper</td>
<td>.9166</td>
<td>.20779</td>
<td>.48682</td>
<td>1.3465</td>
</tr>
<tr>
<td>Computer</td>
<td>1.01795</td>
<td>.58979</td>
<td>.53017</td>
<td></td>
</tr>
</tbody>
</table>

Table 40. Paired T-test Result of Clarity of Writing: The two writing modes

Table 40 explains that participants performed better with paper-based writing in terms of clarity of writing. I further analyzed the clarity of writing based on the genres. As shown in Table 41, the mean of paper-based essay writing was 7.37 points out of ten points and that of computer-based writing was 6.04 points. The mean of paper-based argumentative writing was 6.70 points and that of computer-based writing was 6.20 points.
The paired t-test was performed at $\alpha = .05$ and the result showed a significant difference between the mean of paper-based essay writing and that of computer-based writing ($t = 5.06$ and $p < .05$). However, as shown in Table 42, there is no difference between the means of paper-based argumentative writing and that of computer-based writing.

Table 42. Paired T-test Result of Clarity of Writing: Genre and writing modes
Table 42 indicates that for familiar genres of writing, paper-based writing helped participants write better with correct vocabulary and grammar. However, when participants wrote unfamiliar genres of writing, neither writing mode aided them to write better. This result suggests that computer-based writing do not help Chinese participants produce grammatically correct sentences. On the other hand, my intermediate-level participants had less vocabulary and grammatical errors when they used paper-based writing.

4.7.4 Organization of Writing

Two graders examined the coherence, content, and style of writing for the organization of writing. They evaluated how the paragraphs were connected and how well they followed the Chinese essay and argumentative writing style. They evaluated the participants’ organization of writing on a ten-point scale. For the organization of writing, I examined the influence of computer-based writing and paper-based writing in the familiar personal essay writing genre as well as the unfamiliar argumentative writing genre. A paired t-test was performed at α=.05. As shown in Table 43, the mean of paper-based essay writing was 8.04 points and that of computer-based essay writing was 6.83 points. The mean of organization score of paper-based argumentative writing was 6.7 points and that of computer-based argumentative writing was 7.20 points.
<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>8.04</td>
<td>12</td>
<td>.72169</td>
<td>.20833</td>
</tr>
<tr>
<td>Computer</td>
<td>6.83</td>
<td>12</td>
<td>.96138</td>
<td>.27753</td>
</tr>
<tr>
<td>Argumentative writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>6.70</td>
<td>12</td>
<td>1.157</td>
<td>.33404</td>
</tr>
<tr>
<td>Computer</td>
<td>7.20</td>
<td>12</td>
<td>.78214</td>
<td>.22578</td>
</tr>
</tbody>
</table>

Table 43. Descriptive Statistical Analysis of Organization of Writing Based on Different Genres

As shown in Table 44, the paired t-test result revealed a significant difference between the mean of paper-based essay writing and that of computer-based essay writing ($t=4.57$ and $p<0.05$). This means that participants produced well organized essays with paper-based writing. However, there is no significant difference between the mean of paper-based writing and computer-based writing.

Table 44. Paired T-test Result of Organization of Writing: Genres and writing modes

<table>
<thead>
<tr>
<th></th>
<th>Paired Differences</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Std. Error Mean</td>
<td>95% Confidence Interval of the Difference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper 1*</td>
<td>1.208</td>
<td>.91598</td>
<td>.26442</td>
<td>.62635</td>
<td>.79032</td>
<td>4.57</td>
<td>11</td>
</tr>
<tr>
<td>Computer 1*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper 2**</td>
<td>-.500</td>
<td>1.08711</td>
<td>.31382</td>
<td>-1.190</td>
<td>.190</td>
<td>.190</td>
<td>11</td>
</tr>
<tr>
<td>Computer**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 1 is essay writing
** 2 is argumentative writing
based argumentative writing and that of computer-based argumentative writing (t=0.19 and p=0.139). This result indicated that neither writing mode influences the participants’ organization of writing when they write in unfamiliar genres. It implies that computer-based writing does not assist Chinese participants in producing well organized compositions. It is possible that my intermediate-level participants spent more time with paper-based Chinese writing than computer-based writing (Table 36). For example, they might use online resources to organize and develop their thoughts.

4.7.5 Correlation among Use of Resources, Length, Clarity, and Organization of Writing

I tested the correlation among the use of resources (dictionary and website), length, clarity, and organization of writing. I tested whether participants were more likely to produce longer writings if they used more resources. I also tested the relationship among resource use, scores of clarity of writing, and scores of organization of writing. For this test, the Pearson’s correlation was performed at α=.05. The participants heavily relied on resources when they composed their writing. Interview data showed that the participants believed that computer-based resources (dictionary programs and online dictionaries) help them produce longer papers because they could look up the vocabulary. Furthermore, certain websites and online dictionaries have the English-Chinese translation function. They said that these features helped them correct sentences.

The Pearson’s correlation was performed to examine the relationship between the use of resources and the length of writing (Table 45).
Table 45. Pearson’s Correlation Result of Use of Resources and Length of Writing

<table>
<thead>
<tr>
<th></th>
<th>Paper length</th>
<th>Paper resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper length</td>
<td>Pearson’s Correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.005</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>24</td>
</tr>
<tr>
<td>Paper resources</td>
<td>Pearson’s Correlation</td>
<td>.552**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.005</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>24</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.001 level (2-tailed)

Table 45 showed that there is a correlation between the number of resource use and the length of writing in paper-based writing \((r=0.552 \text{ and } p=0.005)\). However, there is no correlation between the number of resource use and the length of writing in computer-based writing \((r=0.218 \text{ and } p=0.307)\).

The Pearson’s correlation results showed that there is no correlation between the number of resource use and the clarity of writing in paper-based writing \((r=0.176 \text{ and } p=0.411)\). There was no correlation between the number resource use and the clarity of writing in computer-based writing either \((r=-0.48 \text{ and } p=0.825)\). This confirms that there is no correlation between the frequency of using resources and the clarity of writing in both modes. The result suggests that my intermediate-level participants’ belief on the relationship between resource use and the clarity of writing is wrong. Actually, they did not use those resources correctly. Their use of resources, especially English-Chinese translation functions in online dictionaries, led to more sentences errors in both computer-based writing and paper-based writing. In the following section, the detail
example of resource misuse will be discussed when I report the writing examples of one of the intermediate-level participants, Xiao Li.

As shown in Table 46, there was a correlation between the frequency of using resources and the score of organization in paper-based writing ($r=0.418$ and $p=0.042$).

<table>
<thead>
<tr>
<th></th>
<th>Paper resources</th>
<th>Paper organization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pearson’s Correlation</strong></td>
<td>1</td>
<td>.418*</td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td></td>
<td>.042</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2 tailed)

Table 46. Pearson’s Correlation Result of Use of Resources and Organization of Writing

However, there is no correlation between the frequency of using resources and the score of organization of writing in computer-based writing ($r=0.206$ and $p=0.334$). These correlation results showed that there were correlations among the frequency of using resources, the length of writing, and the organization of writing in paper-based writing. There were no correlation between the frequency of using resources and the score of clarity of writing in both modes.

I have reported the demographic information of beginning-level and intermediate-level participants. Both groups had similar reasons of studying Chinese, i.e., for their interests of Chinese culture and their future career. However, the majority of beginning-
level participants studied Chinese because they wanted to learn Chinese culture while most of intermediate-level participants studied Chinese for their career. Both groups did not have prior knowledge of the Chinese writing system. All participants thought that Chinese writing was the least important language skill compared with speaking, reading, and listening. One of the reasons I found from the interview data is that participants considered Chinese writing as “handwritten character writing.” The beginning-level participants did not think that Chinese writing could benefit their future. The intermediate-level participants thought that computer-based writing can substitute “handwriting of Chinese characters.” Both groups answered that they prefer to use computer to write in their first language and Chinese.

As anticipated, both beginning-level and intermediate-level participants produced less character errors with computer-based Chinese writing. However, for other aspects of Chinese writing such as clarity and organization of writing, computer-based writing did not help. Table 47 shows a summary of paired t-test results of intermediate-level participants’ computer-based and paper-based Chinese writing. In Table 47, “+” sign indicates that the participants performed better and “–” sign means that participants did not perform well with either computer-based writing or paper-based writing.
<table>
<thead>
<tr>
<th></th>
<th>Computer-based</th>
<th>Paper-based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed of writing</td>
<td>Essay</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Argumentative</td>
<td>-</td>
</tr>
<tr>
<td>Clarity</td>
<td>Essay</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Argumentative</td>
<td>-</td>
</tr>
<tr>
<td>Organization</td>
<td>Essay</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Argumentative</td>
<td>-</td>
</tr>
<tr>
<td>Length</td>
<td>Essay</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Argumentative</td>
<td>+</td>
</tr>
<tr>
<td>Revision</td>
<td>Essay and</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Argumentative</td>
<td>N/A</td>
</tr>
<tr>
<td>Frequency of using resources</td>
<td>Essay and</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Argumentative</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 47. Summary of Paired T-test Results of Intermediate-level Participants’ Computer-based Writing and Paper-based Chinese Writing

As Table 47 shows, computer-based Chinese writing did not assist the intermediate-level participants in producing better Chinese compositions in terms of sentence clarity and writing organization. The only benefit of computer-based writing was that the intermediate-level participants were able to compose Chinese writing faster.

Based on the interview data and my observation, this study found that intermediate-level participants had two assumptions on their Chinese writing. The first is
that participants thought that they wrote Chinese better with the computer. The second is that they thought that the words and sentences which they searched in computer-based resources were always correct. Based on their assumption, they would perform better with computers and frequent use of resources. To examine their assumptions, I performed the Pearson’s correlation study. Table 48 shows the summary of the results where “+” sign means that there is a correlation and “−” sign means no correlation between the two variables.

<table>
<thead>
<tr>
<th></th>
<th>Computer-based writing</th>
<th>Paper-based writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources &amp; length of writing</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Resources &amp; clarity of writing</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Resources &amp; organization</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 48. Summary of Pearson’s Correlation Results: Resources, Length, Clarity, and Organization of Writing

The results of Pearson’s correlation show that both assumptions made by intermediate-level participants are not correct. The frequent use of resources did not help their computer-based writing in terms of length, clarity, and organization. Interestingly, in paper-based Chinese writing, there were positive correlation between resource use and length of writing, and resource use and organization of writing. This is due to the fact that intermediate-level participants misused computer-based dictionaries. When they
wrote sentences, they often imposed their first language structure onto Chinese sentences. Some participants also utilized the English-Chinese translation functions in computer-based dictionaries and copied those phrases and sentences into their writing. The following section will explain how each individual participant wrote Chinese with computers and pen-paper by reporting eight representative participants in my study.

4.8 Characteristics of Chinese Learners and Their Chinese Writing

Based on the statistical analysis, I reported results related to the six research questions. The survey study revealed that participants had two definitions of Chinese writing. One definition treated Chinese writing as handwriting of Chinese characters writing and another definition treated Chinese computer-based writing as Chinese composition writing. Toward the end of this study the participants preferred to use computer-based writing. However, computer-based writing did not help them produce longer papers, use correct vocabulary and sentence structure, or organize better Chinese compositions than using paper. Furthermore, their writing quality was influenced both by the modes of writing and the genres of writing.

In this section, I report findings from my observations and interviews with participants to provide some context for my statistical analysis. I first share my observation of two beginning-level Chinese as a Heritage Language learners. Their parents’ first language was Cantonese but their attitudes toward Mandarin Chinese were different. Their different attitudes influenced their writing as well. Second, I report on two beginning-level Chinese as a Foreign Language learners. Both participants showed
typical patterns of writing errors and writing strategies. Third, I report on an intermediate-level participant who believed that Chinese writing was unnecessary for him. Fourth, I share an interesting finding about an intermediate-level learner who was a good test taker but had problems with her writing. Last, I compared two Korean participants and reported how their different motivations influenced their Chinese writing. The names used in this study are pseudonyms.

4.8.1 Chinese as a Heritage Language Beginning-level Learners: Xiao Huang and Xiao Zhao

In this section, I explain how two heritage language learners, Xiao Huang and Xiao Zhao, chose Chinese writing systems (traditional and simplified characters) and how their different motivations and heritage language proficiency influenced their Chinese writing. Cantonese was their parents’ language. Xiao Huang treated Cantonese mainly as his heritage language while Xiao Zhao viewed Mandarin Chinese as part of her heritage language. Their parents spoke Cantonese at home. However, their attitudes toward Mandarin Chinese were different. While Xiao Huang showed some resistance to Mandarin, Xiao Zhao was enthusiastic about learning Mandarin.

Xiao Huang had lived in Hong Kong for eight years and he indicated that his first language was Cantonese. In his initial survey, he explained that he studied Mandarin Chinese to fulfill his general education courses (GEC) requirement. Later, in his exit survey, he changed his answer by stating that he did not know Mandarin so he decided to study Mandarin Chinese. During the interview, I asked him again why he wanted to learn Mandarin Chinese. He felt that he needed to learn it since he spoke Cantonese. He
further elaborated that there was no Cantonese class and taking the Mandarin Chinese class was the only way for him to maintain his Chinese heritage. This view of Mandarin Chinese was also evident in his survey answers. Contrary to other participants, he indicated that reading was the most important skill for him because he could maintain and update his Cantonese culture by reading Chinese.

It seemed that Xiao Huang considered Cantonese as his main heritage and Mandarin Chinese as his secondary heritage. He displayed a very strong Cantonese identity in the class. He always related to other Cantonese speakers in the class. Basically he viewed Mandarin Chinese as a tool for maintaining his Cantonese language. He often compared Mandarin Chinese with Cantonese. For instance, when we practiced kinship terms, he constantly asked questions about terms for extended family members such as a second cousin and a third cousin. I first thought that he wanted to delay my class by asking an unreasonable amount of questions. Later, I realized he wanted to talk about his extended family members in both Cantonese and Mandarin Chinese. However, he was not sure about the family terms in Cantonese. For this reason, he used the family terms of Mandarin Chinese to study the counterparts in Cantonese. However, his Cantonese-centered view of Chinese language learning sometimes hindered him from learning Mandarin Chinese.

One problem caused by his Cantonese-centered view was that he produced Mandarin pronunciation errors. Overall, he was a good student. He always prepared to perform the dialogue memorization and often volunteered to answer questions in class. However, he persistently made the same pronunciation mistakes despite feedback given by the teacher. I asked him to pay attention to the feedback and practice pronunciation. I
especially pointed out his fossilized pronunciation errors such as “hao vs. hou” and “you vs. yao” in class. He told me that he knew that his pronunciation was not good but it was good enough for him to communicate with native Chinese speakers. He further explained that Mandarin pronunciation sounds silly for him compared with Cantonese.

Xiao Huang’s lack of interests in improving his Mandarin Chinese was reflected in his computer-based and paper-based Chinese writing. When he did not remember the Mandarin vocabulary, he complained that Mandarin Chinese did not make sense to him. Figure 26 shows Xiao Huang’s use of Cantonese vocabulary in his Mandarin Chinese writing. In this writing task, he was asked to explain how to go to McDonald by reading the map provided. He tried to use the Cantonese word for bus, 巴士 bāshì, instead of Mandarin Chinese,公共汽车 gōngqìchē. Additionally, he made a character error and wrote 土 tǔ instead of 士 shì. He wrote the top horizontal stroke shorter than the bottom horizontal stroke as shown in the circled portion in Figure 27. After the individual writing session, I asked him about his character errors “巴士 bātū”. He admitted that he did not know that he made the character error for 士 shì.

Figure 27. Use of a Cantonese Lexical Item in Xiao Huang’s Paper-based Writing
However, he explained that he purposely tried to write the Cantonese word for bus. He said that the Mandarin word for the transportation felt very “unnatural.” He wrote and showed me the Cantonese word for taxi (的士 díshì) and bicycle (單車 dāncē). By comparing with the Mandarin Chinese words for taxi (出租汽車 chūzūqìchē) and bicycle (自行車 zìxíngchē), he said the Cantonese words sounded better and were shorter than Mandarin Chinese.

Xiao Huang’s computer-based writing was also influenced by his lack of interest in correcting his pronunciation. He often spent more time on computer-based writing due to his lack of knowledge of the Pinyin system. In one of his writing sessions, he needed to write a sentence “when do you have time (你什麼時候有時間, nǐ shénme shíhou yǒu shíjiān)?” He kept typing “hao” instead of “候 hou.” He always had a problem with pronunciation “ou” and pronounced “ou” as “ao.” Because he typed “hao” in Pinyin, the character 好 hǎo showed up on the screen as shown in Figure 28.

Figure 28. Character Writing Errors of 候 hou: Xiao Huang
He went through all the characters in the character panel in order to find 候 hou. First he did not realize that he was typing the wrong Pinyin. He typed “hao” again in order to find “候 hou” from the character panel. He assumed that his previous characters such as 什麼時候 shénme shíhou must have been wrong in order to explain why he could not find the character. So he even retyped the characters. It took him about 50 seconds to realize that he was actually typing the wrong Pinyin.

![Typing Process of the Character 候 hou: Xiao Huang](image)

He tried various Pinyin spelling combinations and finally typed “hou” as shown in Figure 29. As soon as he typed “hou”, the character “候 hou” appeared on the screen. He said “It [Chinese computer writing] is so stupid.” However, when I compared his computer-based writing with paper-based writing, he produced fewer character errors in computer-based writing. It is possible that because he wrote faster with paper-based writing, he thought that he performed better with paper-based writing. In addition, the value he placed on the Cantonese language also influenced his choice of Chinese writing system. He believed that traditional characters were a more “legitimate” writing system. He also
said that simplified character looked ugly. For this reason, he preferred to read and write in traditional characters for both computer-based writing and paper-based writing.

While Xiao Huang viewed learning Mandarin Chinese as a tool for maintaining his Cantonese, Xiao Zhao thought Mandarin Chinese as her heritage language. She stated that she was studying Chinese because she wanted to learn her parents’ language. However, her parents did not speak Mandarin Chinese. It seemed that she believed that any Chinese language would help her understand her parents and her heritage. The difference between Xiao Huang and Xiao Zhao might be due to their different levels of Cantonese language proficiency. Unlike Xiao Huang, Xiao Zhao only had been to Hong Kong for two weeks. She also believed that speaking the Chinese language would be beneficial for her future career. Therefore, she emphasized her speaking and listening abilities. In the exit survey, she even commented that she did not plan to read and write in Chinese in the future.

Xiao Zhao’s practical view of the Chinese language in her future workplace also made her practice simplified Chinese characters. This was not common among beginning-level learners. The traditional Chinese characters were used in the reading and writing textbooks in the first year. Therefore, in order to study simplified characters, students needed to spend additional efforts to look up references at the end of the textbooks. In their exit survey as I reported in the previous chapter, 82% of beginning-level participants indicated that they preferred to use traditional characters. Moreover, most heritage language learners whose home language was Cantonese practiced their writing with traditional characters. However, Xiao Zhao explained that simplified characters was more useful and easier to use.
Despite her emphasis on learning speaking and listening skills, she always received good grades on her reading and writing. She paid attention to both character writing and also the genre of writing.

Figure 30. A Sample of Paper-based Email Writing: Xiao Zhao

Figure 30 shows one of the writing samples by Xiao Zhao. In this writing task, she was asked to write an email to ask a friend to have dinner together. Despite her character errors, she managed to complete the task. In Figure 30, she wrote “I want to treat you (for meal). What do you like? Do you have time on May 28th? When can you come? I would like to have a dinner. What is your cell phone number?” Interestingly, she ended her email with “881,” which means “bye bye” in Chinese online language. When I taught Chinese email writing, I also introduced some Chinese online chatting language and “881” was one of them. In Chinese, the number eight is pronounced as bā and number one as yī. Thus 881 is read as “bā bā yī” in Chinese and the sound is similar to the English pronunciation “bye bye.” As such, Chinese online users have been using 881 to mean
bye bye. I first thought that she forgot to write “再见 zài jiàn (good bye)” in Chinese. However, she told me that she knew how to write good bye in Chinese but thought that it would be better to use the Chinese online words since she was writing an email. Using Chinese online words in email writing might be unacceptable for some teachers. However, I considered her use of online language as a sign of her awareness of different genres of Chinese writing since she did not write “881” in other writing tasks.

In this section, I compared two Chinese heritage language learners. Due to the different levels of Cantonese language proficiency and their different experiences with Chinese culture, Xiao Huang and Xiao Zhao had different motivations on learning Mandarin Chinese. Xiao Zhao, who studied Chinese for her career and her heritage, spoke Mandarin Chinese better than Xiao Huang, who learned Chinese for maintaining his heritage culture. Xiao Huang wanted to learn how to read Chinese so that he could read Cantonese-related materials. Because of their different motivations of learning Mandarin Chinese, Xiao Huang preferred traditional characters and Xiao Zhao preferred simplified characters. Furthermore, their different Mandarin speaking proficiency influenced their preference of writing modes. There was no difference between the character error scores of Xiao Huang’s computer-based writing and paper-based writing. However, Xiao Huang considered that computer-based writing slowed down his Chinese writing due to his Pinyin and he believed that he could perform better with paper-based writing. Xiao Huang and Xiao Zhao’s examples also revealed that heritage learners’ Chinese writing was influenced by various factors such as their motivation and heritage language proficiency.
4.8.2 Chinese as a Foreign Language Beginning-level Learners: Xiao Shi and Xiao Bai

In this section, I compared Chinese as a Foreign Language for beginning-level learners who had different reasons to study Chinese. I report on how they evaluated their language skills in the initial and exit surveys and what their most common writing strategies were. The first language of Xiao Shi and Xiao Bai was English and they did not learn Chinese before they entered college. Xiao Shi answered that he was studying Chinese to fulfill his GEC requirement. Xiao Bai was studying Chinese because she was interested in Chinese culture. Furthermore, she thought that learning Chinese benefits her. Xiao Shi was one of the best students in his class and teachers asked him questions that other students could not answer. He also received an A in his Chinese classes. However, he did not answer questions unless he was asked to.

Xiao Bai was in the ROTC program so she was receiving a scholarship for taking Chinese classes. Unlike other students, she first took a class that introduced Chinese culture and history and then decided to study Chinese. She said that she tried to use her Chinese with her Chinese friends. Xiao Shi rarely practiced Chinese outside of the class. Xiao Bai was very active in her Chinese class. She was not afraid of making mistakes and always tried to answer the teacher’s questions. If I only compared Xiao Shi to Xiao Bai’s class performance and daily grades, Xiao Shi would received a higher score than Xiao Bai. For the dictation writing in the individualized writing session, the score for Xiao Shi’s character errors is higher than that of Xiao Bai. He made fewer character errors and stroke-sequence errors than Xiao Bai. However, Xiao Shi did not think his
four language skills had improved. As shown in Table 49, Xiao Shi evaluated his four language skills higher in his initial survey.

<table>
<thead>
<tr>
<th></th>
<th>Listening</th>
<th>Speaking</th>
<th>Reading</th>
<th>Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial*</td>
<td>Exit*</td>
<td>Initial</td>
<td>Exit</td>
</tr>
<tr>
<td>Xiao Shi</td>
<td>10</td>
<td>4</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Xiao Bai</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

*Initial means the initial survey. Exit means the exit survey.

Table 49. Self-evaluation of the Four Language Skills for Xiao Shi and Xiao Bai

However, in his exit survey, Xiao Shi gave himself half of the points as in his initial survey for his four language skills. He only gave himself three points for his writing although both his computer-based writing and paper-based writing improved. His writing errors were usually character errors due to homophone confusion. Interestingly, Xiao Bai viewed her four language skills better after two quarters. She gave herself higher scores for all four skills in her exit survey. However, when I examined her daily scores and the comments from other teachers, I found that she was actually receiving lower scores in her third quarter of the first-year Chinese class.

One reason that made Xiao Bai think that her Chinese has improved was that she practiced her Chinese outside of class while Xiao Shi only practiced Chinese in class. Xiao Bai told me that she always tried to talk to her Chinese friends in Chinese. She told
me that her Chinese friends were very impressed that she could speak Chinese during the interview. She had been receiving positive feedback from her friends. I believed the positive comments from native speakers made her believe that her Chinese had improved. Another reason is that she believed that she can use computer-based Chinese writing to replace paper-based writing.

Both Xiao Shi and Xiao Bai preferred to use computers for their Chinese writing. They both indicated that computer-based Chinese writing was easier for them. However, Xiao Shi’s computer-based writing and paper-based writing were better than Xiao Bai’s, possibly due to their different processes of Chinese writing. Xiao Bai always relied on Pinyin to write Chinese but Xiao Shi rarely used Pinyin in his paper-based writing. Figure 30 includes the sentences from Xiao Shi’s dictation writing and Figure 31 shows the sentences from Xiao Bai’s dictation writing.

1. 我比他高——
2. 好久不见
3. 我到图书馆看书

Figure 31. A Sample of Paper-based Dictation Writing: Xiao Shi

Xiao Shi wrote the sentences as I read over them. However, Xiao Bai wrote all the sentences in Pinyin and added some Chinese characters as shown in Figure 32.
Other beginning-level participants only wrote *Pinyin* for the characters they did not know. Thus, the speed of Xiao Bai’s paper-based writing was very slow. I encouraged Xiao Bai not to rely on the *Pinyin* when she wrote Chinese characters. She told me that she needed to use *Pinyin* to construct the sentences in order to write characters because it helped her recall the characters. She also mentioned that writing *Pinyin* also helped her pronunciation and computer-based writing as well. Furthermore, she believed that she could substitute paper-based writing with computer-based writing. Therefore, she might think that her writing improved because she knew how to write *Pinyin*.

In this subsection, I compared two Chinese as a Foreign Language learners. Xiao Shi, who did not practice Chinese outside of the classroom setting, believed that his Chinese did not improve after one year of Chinese learning despite his good grades. Xiao Bai, who actively used Chinese outside of the classroom setting, thought that her Chinese had improved. However, their perceptions about their Chinese language ability did not match with their actual performances.
4.8.3 Intermediate-level Chinese Learner: Xiao Kong

Some of the participants in this study performed well in their Chinese writing tasks but they thought that their Chinese writing was very poor. Furthermore, they considered that Chinese writing skill was not useful for their learning. Xiao Kong was one of the participants who believed that Chinese writing, especially paper-based writing was not necessary for Chinese learners. Because of his strong belief, he did not realize that his writing skill was equally good as his speaking ability. I still vividly remember the first time I taught Xiao Kong in his first-year Chinese class. Xiao Kong was a student who was not afraid to express his feeling toward the Chinese class. He often said “写汉字不好 xiě hànzi bùhǎo, 没有意思 méiyǒu yìsi (writing Chinese characters is not good and boring)” in his first-year writing class. When I taught the third-year regular track Chinese class, I still received similar comments from him, such as “we don’t need writing.” He also suggested to me that he and his classmates only needed to practice listening and speaking in the class. I never had a student who openly expressed his dislike of Chinese writing like this before.

Despite his negative attitude toward Chinese writing, he received good grades from his previous Chinese classes. He also went to China to study Chinese and had an internship at a television broadcasting company. He was so proud of his internship experience. He told me that his main responsibility was helping coworkers translate Beijing Olympic commercials into English. He explained that his internship did not require any Chinese writing. He believed that computer-based writing helped him produce well-organized and accurate sentences. When I had the Chinese class at the computer lab, he told me that he liked taking quizzes with computers. I found that he
was receiving good grades for his writing (both computer-based writing and paper-based writing) from the teaching assistants. When I examined Xiao Kong’s writing scores from the two graders, I also found that there was no significant difference between his computer-based writing and paper-based writing (Table 50).

<table>
<thead>
<tr>
<th></th>
<th>Computer-based writing</th>
<th>Paper-based writing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clarity</td>
<td>Organization</td>
</tr>
<tr>
<td>Essay</td>
<td>6</td>
<td>7.5</td>
</tr>
<tr>
<td>Argumentative writing</td>
<td>6.5</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 50. Writing Scores of Xiao Kong

Table 50 showed that Xiao Kong received better grades for his paper-base Chinese writing despite his negative view on paper-based writing. Overall, he had problems with producing correct sentences so that his clarity scores were lower than his organization scores. Two graders stated that his writing style was based on the spoken style. His sentences were short and he sometimes used subordinate clauses as sentences. One reason for his low scores on writing clarity is that he might not develop an ability to complete full sentences due to his focus on casual Chinese speaking. The experience of Xiao Kong showed that how learners’ perception on Chinese writing prevented them from identifying their strengths and weaknesses in their writing.
4.8.4 Intermediate-level Chinese Learner: Xiao Li

Intermediate-level Chinese learners used various computer-based resources such as online dictionaries and websites when they wrote both computer-based writing and paper-based writing. However, there is no studies about the influence of Chinese learners’ use of resources on their writing. I used Xiao Li’s writing as an example to explain how Chinese learners who did not fully acquire the Chinese syntax structure utilized computer-based resources in their writing. Xiao Li was a student who knew how to follow teachers’ instructions. She was good at taking examinations and quizzes. She was in my third-year regular track class. She was Xiao Kong’s classmate since their first-year of Chinese class. She also went to China for one summer break to study Chinese. She also thought that listening and speaking were important language skills for her. However, she indicated that reading and writing were also important language skills. Similar to other intermediate-level participants, she preferred to write with computers. She planned to study international studies focusing on China in graduate school so she decided to use simplified characters. She started using simplified characters after participating in my study.

Xiao Li was one of the participants who relied heavily on online dictionaries. She often used translation functions in online dictionaries. Other participants used dictionaries by typing English words, Pinyin, and characters. Xiao Li tended to type English phrases or sentences in translation functions. Figure 32 shows the screen capture of Xiao Li’s use of online dictionary. In this writing task, she was asked to answer the question, “which is better, pessimism or optimism?” She typed a sentence “an example
of an optimistic person being unhappy is when there is a death in the family” in the translation box as shown in Figure 33.

Once she typed the English sentence, she clicked the “English => Chinese” button. The translation result appeared in the text box: 一个乐观的人的例子不快乐的是有在家庭的死亡 (shì yíge lèguān de rén de lìzi bù kuàilè de shì yǒu zài jiātíng de sǐwáng). The online dictionary that she used showed the definition of each word as well. The Chinese translation was not a meaningful sentence. It was simply the list of Chinese words. She examined the translation results and copied a few words such as 乐观的人 lèguān de rén
(optimistic person) and 例子 lìzi (example). She told me that she knew that the sentence did not make sense so she decided not to use the result directly.

When I saw how she utilized online dictionary, I instantly remembered the sentences she wrote for her homework. When I evaluated her papers, I often questioned what caused her to make sentence errors involving the imposition\(^\text{10}\) of English syntax in Chinese writing. I thought that her poor knowledge of Chinese syntax made her impose her English syntax in the writing. However, after I observed her writing process, I found that her use of translation functions in the online dictionaries also led to sentence errors.

The example of her English imposition in her Chinese writing is as follows:

**Writing error:** 这天是最好的日的我的生活。

*Zhè tiān shì zuì hǎo de rì de wǒ de shēnghuó.*

**Word-for-word translation:** This day to be the most good day of my life.

**Correction:** 这天是我生活里最好的日子。

*Zhè tiān shì wǒ shēnghuó lǐ zuì hǎo de rìzi.*

**Word-for-word translation** This day to be I life in the most good of day.

**Translation** This day was the best day of my life.

She imposed her English syntax structure, “This day was the best day of my life” in her Chinese writing. I was able to find this type of sentence errors in her homework and writing samples. As I reported in Chapter 4, there was no correlation between the number of resource use and clarity of writing. Xiao Li was not the only participant who

---

\(^{10}\) Imposition occurs when language learners transfer their dominant language (first language) into a recipient language (foreign language). It is referred to as “transfer” in the second language acquisition field (Winford 2005).
used the translation function in dictionaries. I also found many English imposition errors in those participants’ writing.

Xiao Li had good vocabulary knowledge. She was always well prepared for her vocabulary quizzes and she was good at recognizing characters. However, she was not able to use her vocabulary knowledge in sentences. Therefore, she used translation function of dictionaries in order to find the sentence structures. She did not realize that Chinese online dictionaries and translation websites such as Google translator were designed for word-for-word translation only. As a result, her Chinese sentences often had English syntax imposition.

Xiao Kong and Xiao Li had different views on Chinese writing. Xiao Kong believed that Chinese writing was not useful but his Chinese writing score was better than Xiao Li. Based on his oral proficiency, he was able to produce well organized Chinese compositions. However, Xiao Li often used translation functions to produce her sentences. Her lack of Chinese syntax knowledge and misuse of translation function led to many English imposition errors in her writing. This is another example of how learners’ perceptions of Chinese writing prevent them from evaluating their writing ability correctly.

4.8.5 Intermediate-level Chinese Learner: Xiao Mei and Xiao Zheng

Most intermediate-level participants were studying Chinese because they anticipated that the Chinese language skill would help their future job search. However, each individual focuses on developing different Chinese language skills. In the case of Xiao Kong, he viewed that listening and speaking were important for his future career.
However, another participant, Xiao Mei understood the importance of Chinese writing skill in her future job. In this subsection, I compared these two participants to explain in general how Chinese learners who valued Chinese writing skill developed their Chinese writing. Xiao Mei and Xiao Zheng were Korean international students. Xiao Mei was a transfer student from a Korean university. Xiao Zheng came to the United States as a high school student. Xiao Mei was studying Chinese in order to find a better job in South Korea and Xiao Zheng was studying Chinese because she liked Chinese pop culture. Both of them studied Chinese characters when they were in South Korea so that they were good at writing traditional characters. When Xiao Mei participated in my study, she was a graduating senior so that she was very motivated to improve her Chinese. Xiao Mei’s major was international business. She believed if she learned Chinese, it would make her more competitive in the job market. Due to the large amount of economic trade between the P.R.C. and South Korea, many Korean companies use the HSK (汉语水平考试 Hányǔ Shuǐpíng Kǎoshì) scores as their reference. Just like the TOEFL, the HSK is a standardized test of Chinese proficiency. In order to demonstrate her Chinese ability, Xiao Mei had to take the HSK. Since the HSK adopts simplified characters, she decided to switch to simplified characters in my class. However, Xiao Zheng studied Chinese in order to interact with her Chinese-speaking friends. Therefore, she did not think it was necessary to switch to simplified characters.

Both of them consulted references in their individual writing sessions. While other participants used online or computer-based references, they brought their electronic dictionaries. They had purchased these dictionaries in South Korea and it had English, Korean, Chinese, and Japanese dictionary functions. During their first and second
writing sessions, they mainly relied on their electronic dictionaries. When they consulted
the electronic dictionary, they used Korean to look up Chinese words. Figure 34 is a still
picture of Xiao Mei’s use of electronic dictionary in her first writing session. She wanted
to write “I transferred from a university in South Korea to the university.” but she did not
know the word “to transfer.”

Figure 34. Use of a Korean-Chinese Electronic Dictionary: Xiao Mei

She typed the Korean word 전학 jeonhak (to transfer school) in the electronic dictionary
as shown in Figure 34. After she found the character 轉学 zhuānxué, she added the
characters into the sentence. Figure 35 is a screen capture of her paper-based writing.
She wrote the sentence 我从韩国大学到 OOOOO 大学转学了 Wǒ cóng hánguó dàxué
dào OOOOO dàxué zhuānxué le\textsuperscript{11}.

\textsuperscript{11} I erased the name of the university to follow the IRB protocol.
She imposed her Korean syntax into this sentence.

Writing error: 我从韩国大学到OOOOO大学转学了。

Wǒ cóng hánguó dàxué dào OOOOO dàxué zhuǎnxué le.

Word-for-word translation: I from Korea university to OOOOO university to transfer. aspect

Correction: 我从韩国大学转学到OOOOO大学。

Word-for-word translation: I from Korea university to transfer to OOOOO (name of state)

Translation: I transferred from a Korean University to OOOOO university.

She did not use any translation function of the dictionary in this sentence. However, her limited knowledge of Chinese syntax made her impose Korean sentence structures onto the Chinese sentences. Unlike other participants, Xiao Mei studied one year of individualized instruction class and took second-year intensive reading and writing class. Therefore, at the beginning of this research, her writing showed many Korean imposition errors such as the use of Sino-Korean words and Korean syntax structures. In addition, she started to use simplified characters and mixed traditional characters with simplified characters, as shown in Figure 35.
After two writing sessions, Xiao Mei used online dictionaries. However, she did not use an English-Chinese online dictionary. She used Korean-Chinese online dictionary but there was no difference in terms of frequency of consulting dictionaries. After one year of her intermediate-level Chinese class, her writing had improved. Figure 36 is Xiao Mei’s paper-based argumentative writing which was her last writing task for this study.

In this paper, she explained why she preferred to be an optimist. This writing received 9 points for the clarity and 9.5 points for the organization of writing from the two graders. One grader told me that he could give her 10 points for the clarity of writing but she had some character errors so he could not give her the full score. She was one of the few
participants who could organize their thoughts into paragraphs. Most intermediate-level participants did not use paragraphs to organize their papers. However, as shown in Figure 35, Xiao Mei used three paragraphs to express her idea. She wrote her main idea in her first paragraph and a supporting example in the second paragraph. In the third paragraph, she concluded her paper by rephrasing her main idea expressed in the first paragraph.

Xiao Mei’s writing improved during this study but Xiao Zheng’s writing did not show improvement. For example, the writing for which Xiao Zheng received the highest score was her first writing task in this study. During the spring quarter, I noticed that she missed some classes and her performance was not as good as her previous quarters. When she came to my office to make up her missing classes, I asked her if she would continue taking Chinese class in the coming quarters. She told me that her major was pharmacy and it became very demanding. She also told me that she did not expect to use her Chinese in her future career. So she might not be able to continue studying Chinese. I accepted her reasons and the lack of studying Chinese prevented her from improving her writing.

One interesting finding was that Xiao Zheng also used her electronic dictionary for her first and second writing sessions. However, in the later two sessions, she only used online dictionaries. Unlike Xiao Mei, she used both Korean-Chinese and English-Chinese dictionaries in her third and fourth writing sessions. Figures 36 and 37 show screen captures during one writing session.
Figure 37. Use of an English-Chinese Online Dictionary: Xiao Zheng

1. I’m not usually so late.
2. We usually meet at six o’clock in the afternoon.
3. The service on food in a restaurant is usually at least 15%.

Chinese dictionary: 번갈아서 (take turn)

Figure 38. Use of a Korean-Chinese Online Dictionary: Xiao Zheng
Xiao Zheng told me that it was easier to use online dictionaries especially when she did computer-based writing. I asked her reason of using both Korean-English and English-Chinese online dictionaries. She could not explain clearly why she did that. Nevertheless, she told me that the instructional language for her Chinese class was English so that she sometimes made Chinese sentences based on English sentence structures. In this case, she used an English-Chinese dictionary. However, she also needed to use Korean to think. As a result, she used both online dictionaries in one writing. For Xiao Zheng’s writing, there were not many Korean syntax imposition errors in her Chinese writing. There were a few Korean lexicon item imposition errors.

Xiao Mei and Xizo Zheng have many similarity in terms of their first language and the cause of writing errors (Korean language imposition in Chinese writing). However, there are still a few differences between them. One is that their reasons for studying Chinese were different. Xiao Mei studied Chinese for finding a job in South Korea. Xiao Zheng studied Chinese in order to know Chinese culture. Xiao Mei decided to use simplified characters because she would take the HSK examination. Another reason is that Xiao Mei only used Korean-Chinese dictionary while Xiao Zheng utilized both Korean-Chinese and English-Chinese dictionaries. These differences influenced their writing development. Xiao Mei’s scores on the first writing session were lower than Xiao Zheng’s. At the end of this study, Xiao Mei actually received the highest scores among all the participants.

In this section, I reported on eight participants’ motivations for studying Chinese. I also reported on how they produced writings in individual writing sessions in order to provide the context for the statistical analysis. Each participant utilized different writing...
strategies and consulted computer-based resources in different ways. My observation of their Chinese writing practice also revealed that the participants’ wrong perception of their writing ability sometimes prevented them from accurately evaluating their own Chinese writing. It further hindered them from practicing Chinese writing. My participants believed that it is difficult to acquire the Chinese writing skill so they did not practice it unless they were required to do so. Moreover, they may abuse computer-based resources. Some intermediate-level participants not only used the resources for the words they did not know, but also generated Chinese sentences by utilizing translation functions in computer-based resources. They also imposed their English syntax structures onto their Chinese writing. As a result, the Chinese sentences they produced from the translation functions in online dictionaries often had English syntax structures in those sentences. Without the analysis of participants’ writing process, it would be difficult to find the causes of Chinese learners’ writing errors. In the following chapter, I will summarize the findings from statistical analysis based on the six research questions. I will also address the limitations of this study and suggest the pedagogical implications for Chinese writing.
Chapter 5

Discussions and Implications

The goal of this study is to investigate the developmental stages of Chinese writing of beginning-level and intermediate-level learners by comparing types of their writing errors. This study specifically focused on the processes involved with computer-based writing and paper-based writing and how these two different writing modes influence Chinese learners’ writing. In order to analyze the nature of their writing errors, I recorded the entire writing process to reveal each step of character formation while writing compositions in Chinese.

In contrast to previous Chinese writing studies, I used mixed methods, a combination of qualitative and quantitative methods, to identify general writing error patterns and to discover whether the students’ writing modes influenced their writing development. These mixed research methods allowed me to determine whether the learners’ preference for writing tools, i.e., computer vs. paper, played any important role in the development of beginning-level and intermediate-level learners. Statistical analyses indicate that there is a correlation between the quality of their writing and their choice of writing modes in certain situations. In this chapter, I first summarize the characteristics of participants and their Chinese learning environments. I also describe
how these two factors influence their attitudes toward Chinese computer-based writing and paper-based writing. Second, I explain Chinese learners’ writing development by comparing beginning-level and intermediate-level participants’ writing errors. Third, I compare the statistical analysis of participants’ quality of computer-based and paper-based Chinese writing and provide interpretation of these results. Finally, I suggest teaching implications for Chinese writing and point out the limitations of this study. Possible directions for future Chinese writing study are also suggested.

5.1 Characteristics of Chinese Participants and Their Chinese Class

A total of 70 Chinese learners participated in this study: 58 participants were beginning-level learners and 12 participants were intermediate-level learners. Most of them were Chinese as a Foreign Language learners except three heritage language learners. Participants were exposed to a Chinese learning environment centered on oral communication. For instance, the beginning-level learners did not learn to write in Chinese until their second quarter of Chinese learning, and even then they were given only five writing classes per quarter. This led the participants to believe that writing was not as important as speaking, reading, and listening. Their Chinese curriculum introduced traditional characters first so most beginning-level learners preferred traditional characters. However, half of the intermediate-level participants switched to simplified characters because they felt simplified characters would better benefit their future career. Interestingly, the number of beginning-level participants who preferred to use simplified characters went down in the exit survey. Those participants answered that
because they had studied traditional characters first they would continue to use traditional characters.

This finding contradicts an assumption held by some teachers and learners that Chinese learners would prefer learning simplified rather than traditional characters because simplified characters are easier to learn. In Chinese character recognition studies, scholars claimed that the number of strokes affected the reading reaction time of Chinese native speakers (Qian et al. 1994). Therefore, Qian et al. (1994) suggested that teaching simplified characters to Chinese learners would make character recognition more efficient. However, in this study, the majority of beginning-level participants expressed their preference for traditional characters. Moreover, when I compared the participants’ stroke-sequence errors, there was no difference in terms of accuracy between traditional and simplified characters. Participants mentioned that because they had already learned traditional characters before simplified characters so that writing in either system was easy for them. Furthermore, intermediate-level learners who had begun to switching from traditional characters to simplified characters during this study mentioned that using simplified characters did not make their Chinese writing easier. Their explanation is that although writing in simplified characters might be faster, they still needed to remember the characters anyway. In summary, both traditional and simplified characters are equally difficult for the learners.

From survey data, interview data, and my observation, I found that participants’ perceptions on their Chinese writing influenced their attitudes toward Chinese writing. However, their perceptions often did not match with their actual writing ability. Most beginning-level and intermediate-level participants indicated that reading and writing
were less important language skills. Survey data showed that participants also believed that their writing skill was not as good as the other three language skills (listening, speaking, and reading). These views about Chinese writing were due to their learning environments and their difficulties of learning Chinese characters. According to Dörnyei (1990), language learners’ motivation is associated with achievement in their language learning and their learning environment. Specifically, foreign language learners did not have enough contact with their target language communities. Therefore, their learning environment played an important role in forming learners’ motivation. Because their Chinese program did not emphasize the writing skill from the first year of their Chinese class, the participants assumed that writing was not necessary for them. In addition, they had great difficulty in learning Chinese writing system. For most participants, their first language was English and they experienced huge orthographic difference between Chinese and their first language. For example, they could not easily transfer their first language orthographic knowledge compared with other language skills. As a result, they evaluated their writing skill as the lowest among other language skills.

5.2 Development of Chinese Learners’ Computer-based Writing and Paper-based Writing

In this section, I summarize the findings of statistical analysis and provide my analysis of those findings.
5.2.1 Chinese Learners’ Definition of Chinese Writing

The process of computer-based Chinese writing is different from computer writing of languages that use alphabetic scripts. The computer input method used in this study is based on Pinyin typing. It requires three steps, Pinyin typing, character recognition, and character selection. So, if learners can recognize characters and know the Pinyin, they can write Chinese characters. Computer-based writing does not require the learners’ knowledge of stroke-sequences or stroke-shapes. Therefore, learners did not treat computer-based Chinese writing as the writing they have in mind.

The participants defined Chinese writing as handwriting of characters. They did not expand their concept of writing from character writing to composition. For instance, when intermediate-level participants wrote their personal essays and argumentative writings, they often apologized for not remembering the characters they learned in class. Not many of the participants talked about the content of their writing. On the other hand, the participants did not define computer-based writing as Chinese writing. They said because it involved Pinyin typing and character recognition, it was not “real” Chinese writing. They often called computer-based Chinese writing as computer typing. However, when I asked them about English writing, they did not distinguish paper-based writing from computer-based writing. Because of the different nature of the Chinese writing system from their first language writing, they did realize that computer-based Chinese writing also requires a similar understanding of such writing skills (including syntax and genre knowledge) as in paper-based writing.

Furthermore, the participants did not think that computer-based writing could help them improve their Chinese writing. They thought that computer-based Chinese writing
could only help them write faster. For instance, computer-based writing saved writing
time because the word-processing program showed the characters as they typed the
Pinyin. This view of Chinese character writing may have prevented them from
understanding the whole picture of Chinese writing as a means of communication. It is
possible that the ways teachers introduced Chinese writing in this program should be at
least partially responsible for these students’ attitude. Despite endorsing a performance
approach to Chinese oral communication, when teachers gave writing classes, students
had few opportunities to practice writing in a meaningful context. In addition, teachers
valued and thus requested the beginning-level and intermediate-level students to write
paper-based Chinese. All these contribute to the participants defining Chinese writing as
paper-based Chinese character writing.

5.2.2 Chinese Learners’ Attitudes toward Chinese Computer-based Writing and
Paper-based Writing

The participants considered Chinese paper-based writing not to be useful for them.
All the participants evaluated their writing skill as lower than the other three language
skills in their initial and exit surveys. However, when I compared their classroom
performance writing scores with their self-evaluation scores, these two scores did not
match. For instance, the Chinese writing of some of participants improved but their
perceptions of Chinese writing prevented them from evaluating their writing skill
accurately. This attitude was more apparent among beginning-level learners. The results
of paired t-tests of their self-evaluation revealed a more negative view about Chinese
writing.
On the other hand, over the course of the year, the participants started developing positive views about computer-based Chinese writing. They thought that the computer-based writing was useful and it could serve as a substitute for their handwriting of Chinese characters. The beginning-level participants, who started practicing Chinese writing with computers, showed more positive attitudes toward computer-based writing. They no longer just defined it as Chinese writing but started to view it as useful as the other three language skills. Intermediate-level participants especially came to regard computer-based Chinese writing as practical. Furthermore, their paper-based Chinese writing was actually a hybrid of computer-based and paper-based writings because they could not compose Chinese writing without the computer and online references. For their paper-based Chinese writing, intermediate-level participants used a word-processing program to look up the words. This study revealed that participants were practicing Chinese writing in a hybrid nature when they prepared for their Chinese class.

5.2.3 Chinese Character Errors of the Computer-based Writing and Paper-based Writing

As expected, the beginning-level participants performed better with computer-based writing than paper-based writing. This finding agrees with the finding of Xu and Jen (2005). However, there was no difference in character errors between computer-based writing and paper-based writing for intermediate-level participants. The possible reason is that intermediate-level participants have acquired basic stroke-shapes and stroke-sequences. Therefore, there is no difference between the two writing modes in terms of the number of character errors for intermediate-level participants. Furthermore,
I analyzed character errors and character sequence errors in this study. I calculated the scores of character errors and performed paired t-tests. Paired t-tests revealed that beginning-level participants produced fewer character errors with computer-based writing.

I also conducted the Pearson’s correlation between character errors and stroke-sequence errors. Table 51 shows that participants who followed proper stroke-sequences made fewer character errors, especially among the beginning-level participants. In the table, “+” sign means that there is a correlation and “-“ sign means that no correlation between the two variables.

<table>
<thead>
<tr>
<th></th>
<th>Beginning-level</th>
<th>Intermediate-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke-sequence &amp; Character error</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Stroke-sequence &amp; Speed of writing</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 51. Summary of Pearson’s Correlation: Stroke-sequence errors, character errors, and speed of writing

Correlation results indicate that both beginning-level and intermediate-level participants who followed proper character stroke-sequences wrote the characters faster. However, there was no correlation between character errors and stroke-sequence errors among intermediate-level participants. These tests indicated that proper stroke-sequences played
an important role in beginning-level learners’ Chinese character writing. The finding also indicated that it takes about a year for students to develop automaticity in their writing. It is difficult to generalize the role of stroke-sequence due to the unique learning situation in the research site. The role of stroke-sequence in Chinese character writing had also been investigated in Chinese children’s writing (Law et al. 1998). Similar to what Law et al. (1998) claimed in their study, the findings of my study also revealed that stroke-sequences played an important role in the Chinese learners’ character writing in terms of character accuracy and writing speed.

5.2.4. Patterns of Character Writing Errors of Beginning-level and Intermediate-level Participants

As mentioned in Chapter 4, there were five types of errors for character-level paper-based writing:

Type 1: homophone characters,
Type 2: wrong characters with similar shapes,
Type 3: missing strokes,
Type 4: mismatching different parts of characters into one character, and
Type 5: mixing simplified and traditional characters in one writing.
<table>
<thead>
<tr>
<th></th>
<th>Beginning-level</th>
<th>Intermediate-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Type 3</td>
<td>Type 1</td>
</tr>
<tr>
<td>2</td>
<td>Type 4</td>
<td>Type 3</td>
</tr>
<tr>
<td>3</td>
<td>Type 1</td>
<td>Type 5</td>
</tr>
<tr>
<td>4</td>
<td>Type 2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Type 5</td>
<td></td>
</tr>
</tbody>
</table>

Table 52. Different Patterns of Paper-based Writing Errors: Beginning-level and intermediate-level participants

In the case of paper-based Chinese character writing, types 1 (homophone error), 3 (missing strokes), and 5 (mixing simplified and traditional characters) were the most common errors among beginning-level participants. However, type 5 errors were only produced by two participants. On the other hand, type 3 (missing strokes) was the most common error among intermediate-level learners. Table 52 shows the developmental stage of Chinese learners’ writing acquisition. Due to the very limited time (a few hours) allocated to Chinese writing class for beginning-level participants, it is difficult to predict precisely the time when beginning-level learners start not to produce type 2 and type 4 errors. However, I can infer the stage of Chinese character writing acquisition based on the error analysis.
Table 53. Stages of Chinese Character Writing Acquisition in Beginning-level and Intermediate-level Chinese Learners

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pinyin</em> writing</td>
<td>Acquisition of stroke-shapes and rules of compound characters</td>
<td>Matching pronunciation with characters</td>
</tr>
</tbody>
</table>

The first stage is inserting *Pinyin* in paper-based Chinese writing. The second stage is acquiring stroke-shapes (type 2 error) and rules of compound characters (type 4 error). The third stage is to associate the pronunciation of characters with the meaning and shape (type 1). Intermediate-level participants acquired a large number of Chinese characters within one academic year so that they did not fully internalize those characters they learned. For this reason, intermediate-level participants produced more type 1 errors.

In the case of computer-based writing, two error patterns of character writing were most prominent: errors caused by the misspelling of *Pinyin* and character recognition errors. The beginning-level participants made two types of errors in computer-based writing that intermediate-level participants seldom made. For instance, intermediate-level learners seldom made character recognition errors and chose wrong characters when using computers. The analysis of character errors revealed that Chinese learners tend to use the sounds of characters to assist their paper writing. However, as Hayes (1988) found in his Chinese character recognition study, participants had difficulties associating pronunciation with character. However, my finding suggested
that when beginning-level participants attain an intermediate level of Chinese proficiency; they have less trouble in associating the pronunciation of characters with their shapes.

Before this research, the learners’ character stroke-sequence writing had not been studied by scholars. The results of this study reveal that beginning-level participants had difficulties in writing the bend-shape and vertical hook-shape strokes. Beginning-level participants also had difficulties with top-bottom sequence characters.

5.2.5 Influence of the Two Writing Modes on Writing Errors

In order to answer whether the choice of writing mode plays any role in causing or preventing writing errors, I investigated how many times intermediate-level participants revised their writing in one writing session and how often they consulted references. Contrary to previous studies on computer-based writing such as Van Waes (1992), I found no difference between computer-based writing and paper-based writing with respect to the number of revisions in one writing task. Participants seldom revised their writing in either writing mode. As I mentioned in Chapter 4, the participants were not concerned with the content of their writing, but focused instead on writing correct characters. The only revision they made was correcting their characters. In terms of the frequency of using resources, intermediate-level participants consulted references more often when writing in the paper-based mode. A possible reason is that learners did not have confidence when handwriting the characters and therefore, they always checked the characters using online resources.
5. 2.6 Influence of the Two Writing Modes on Clarity of Writing and Organization of Writing

The only existing Chinese computer-writing study (Xu & Jen 2005) claimed that beginning-level learners practiced their writing with a Chinese word-processing program performed better in terms of character accuracy and length of writing than other learners who did not. Due to their research method and design, their participants performed better with computers than paper-and-pen. In order to test the effectiveness of computer-based Chinese writing in learners’ writing acquisition, I defined the quality of writing as speed, length, clarity, and organization of writing in order to compare computer-based writing with paper-based writing. Because of the design of the first-level Chinese class, only a few beginning-level participants were able to finish writing tasks. For this reason, I only investigated beginning-level learners’ speed of writing.

The paired t-test result indicated no significant difference in speed among beginning-level learners between computer-based writing and paper-based writing. The reason was that some beginning-level participants were not familiar with computer-based writing. Some participants had pronunciation problems and had not fully mastered the Pinyin system. So they spent more time with computer-based writing. However, among intermediate-level learners, there was a significant statistical difference in speed between computer-based writing and paper-based writing. Intermediate-level participants produced longer writings with computer-based writing. This was true especially when they wrote in unfamiliar genres.
In this study, I defined the clarity of writing as correct use of vocabulary and grammar. I also investigated how writing genres influenced the writing. The result of paired t-test revealed that participants performed better with computer-based writing when they wrote with the familiar genre of personal essay writing. However, when their task was argumentative writing, there was no difference between computer-based writing and paper-based writing. The organization of writing was evaluated based on the coherence, content, and style of their writing. When participants wrote in familiar genres, they performed better with paper-based writing. However, when they wrote in unfamiliar genres, such as argumentative writing, there was no difference between computer-based writing and paper-based writing.

I also examined how the use of resources might influence the quality of writing. The test revealed a correlation between the number of resources consulted and the length in paper-based writing. However, there was no correlation between resource use and the length in computer-based writing. In the case of clarity of writing, there was no correlation between the frequency of resource use and clarity of writing in either computer-based writing or paper-based writing. There was a correlation between resource use and organization in paper-based writing. However, there was no correlation between resource use and organization in computer-based writing.

As I explained using the writing samples of eight participants, the analysis of writing process revealed why a more frequent use of resources did not help the participants’ writing with computers. Some participants used translation functions in their online dictionaries and references, which give word-for-word translation. When they use these translation programs, the students tended to impose their first language
syntax and lexicon knowledge onto their Chinese writing. This tendency was also found in other foreign language writing studies (Bland et al. 1990). For instance, in the case of French, Bland et al. (1990) suggested that if learners had examined the example sentences in the dictionaries more carefully, they were less likely to impose their first language syntax onto French. In my study, the participants omitted the example sentences and usage of words. If the participants knew how to make more effective use of online dictionaries and references, the results might be different.

5.3 Implications

In this section, I focus on the four major findings from this study and suggest their implications to Chinese writing in teaching and research.

5.3.1 Chinese Writing as Social Interaction

Teachers need to be aware of how their teaching philosophies and program design shape a learners’ view about writing in Chinese. The Chinese learners who participated in this study were studying Chinese in a program that emphasized oral communication over written communication. During the first year of their Chinese learning, students had only ten hours of Chinese writing class. It is possible that such a learning environment affected their views about Chinese writing. Due to less emphasis on Chinese writing compared to the other three language skills, participants started thinking that Chinese writing is not important for them. Most participants were not able to improve their writing skill and finally decided not to continue to study Chinese. Moreover, the
participants who were enrolled in the written language intensive class did not understand the importance of writing. Therefore, it is important to investigate how Chinese teaching styles influence the learners’ writing. Rampton (2002), a teacher of German as a foreign language, also argued that teachers’ attitudes affect the learners’ motivation. British students in his study had downgraded the German language to only useful in a class context due to the teaching style.

Norton’s study (2000) showed that learners’ motivation played an important role in the second language learning. Her participants carefully analyzed their language learning environments and invested their time in learning English. Chinese teachers and researchers need to consider how the learners’ views will be influenced by learners’ classroom setting and their interaction with native Chinese. In order to improve the students’ writing in Chinese, teachers not only need to provide solid writing instructions but also convey a positive attitude toward Chinese writing. For example, teachers need to remind learners that Chinese writing is a part of Chinese communication which is useful for their future career. Teachers must also know the learners’ perspective of Chinese writing and how it has changed during the course of learning. Finally, teachers need to explain to learners how their writing has progressed so that they know the strengths and weaknesses of their writing.

### 5.3.2 Suggestions for Chinese Writing Instructions

This study revealed the role of stroke-sequences in character writing. Although the participants in this study were required to write Chinese characters by following the correct stroke-sequences, they often had to study Chinese character writing by reading a
character textbook. Teachers of Chinese already know stroke-sequences intuitively, so they may not realize the importance of introducing it to their students. However, teachers need to reinforce writing techniques periodically because learners often forget or ignore the proper character stroke-sequences. There are many free learning software programs available to Chinese learners, and teachers should inform their students about them. The results of this study revealed that writing with the proper stroke-sequences helped beginning-level Chinese learners produce fewer character errors and write characters faster. The results also showed that although intermediate-level learners who write fossilized strokes may still produce correct characters but their writing is much slower. Therefore, teachers need to explain to students the principles of stroke-sequences from the very beginning.

The analysis of Chinese character sequence errors indicated that there were particular shapes of Chinese strokes which learners had most difficulties. Teachers and researchers need to identify these stroke-shapes and teach their students the correct stroke-shapes and how to avoid different kinds of stroke-shapes errors. Furthermore, researchers need to develop an effective way to give feedback to Chinese learners on their character writing. The current methods such as showing the stroke-sequences in a static manner do not seem to be effective for my participants. It is necessary to find new means of feedback, such as showing a side-by-side comparison of correct stroke-sequences and students’ incorrect stroke-sequences via video or animation for highlighting the differences. This method will allow Chinese learners to watch their writing process in conjunction with the correct version, so that they can clearly see where their mistakes lie.
The results of this study also indicated that intermediate-level learners’ writing is influenced by writing genres. Although the students started practicing personal essay writing during their second year of Chinese learning, their textbooks tend to include writing exercises that dealt with text summary or simple writing about their lives. Textbook readings are limited to one or two genres such as descriptive writing or short stories. In addition, Chinese language teachers at the institution in this study often focused on the use of vocabulary and grammar patterns rather than the organization of writing. It is important to include various genres of writing in their reading and writing class so that learners can develop analytical skills on Chinese reading and writing.

5.3.3 Suggestions for Chinese Dictionary Usage

This study reported on Chinese learners relying heavily on computer-based resources when they write Chinese compositions. However, it seems that teachers and researchers do not know what kind of resources learners use and how they use them for their writing (including how to use Chinese dictionaries). Based on my Chinese learning and teaching experience, Chinese learners should learn how to use resources by themselves since teachers do not usually teach how to use those resources in class. As I explained in this study, Chinese paper-based dictionaries require multiple steps to look up a character. For convenience, Chinese learners might only use online English-Chinese dictionaries. Another complication is that they do not know how to properly use words that they look up in a dictionary. For example, they might simply read the Chinese lexical item in the dictionary and then impose their first language knowledge onto their Chinese writing without the actual understanding of the context.
Previous foreign language writing studies (Bland 1990; East 2008) indicate that using references correctly for writing benefits learners, but it can also hinder learners’ writing when used incorrectly. So, teachers need to allocate some classroom hours to explain how to look up the dictionaries and retrieve appropriate words for use. Furthermore, teachers should also teach learners how to use online searches and translation functions correctly. That is, learners need to be trained to read the example sentences from dictionaries or website searches and to analyze whether the results can be applied to their sentences. In addition, Chinese teachers and researchers can compile sentences based on the Chinese learners’ level to develop corpora so that learners can search for words there. Since they will search for words within sentences, they will be less likely to impose their first language sentence structures onto Chinese writing.

5.3.4 Importance of Using Computer-based Writing and Paper-based Chinese Writing

Chinese teachers and learners have questioned the role of computer-based Chinese writing in Chinese language learning. When I conducted this study, other teachers also expressed their concerns about using computers in the beginning-level class. However, there is no perfect writing mode for acquiring Chinese writing skills. My study results showed that each writing mode has its own strengths and weaknesses. In the case of beginning-level participants, computer-based Chinese writing assisted participants to associate the characters with their Pinyin Romanization. Furthermore, it aided participants to review and further familiarize themselves with the Pinyin Romanization system and their associated pronunciation. Intermediate-level Chinese learners wrote
faster and longer papers with computer-based writing. Computer-based writing also helped intermediate-level learners complete their paper-based writing. The Chinese learners were also using computer word-processing programs as a reference tool. Some participants in my study always started their writing with computer-based writing and copied their writing from computer screen to paper when they were asked to write with paper and pen. Computer-based writing might also make the participants feel that they could manage to compose Chinese writing. Paper-based writing helped intermediate-level participants produce well-organized and well-written essays (correct words and patterns). Teachers need to utilize the strengths of both writing modes to encourage Chinese learners to practice writing. For example, teachers can use computer-based writing as a way to practice Pinyin training and character recognition exercises for beginning-level learners. Computer-based writing can be used in vocabulary practices and grammar pattern exercises for intermediate-level learners. It can also help learners practice revising their writing.

5.4 Limitations

This study investigated how Chinese learners’ writing was influenced by two different writing modes, computer-based writing and paper-based writing. Intermediate-level participants were asked to compose Chinese writing as usual (i.e., writing Chinese as they would write their homework assignments). All participants stated that they could not write Chinese composition without consulting references. Thus, I had to modify my research design and let intermediate-level learners use resources for their writing.
As a result, the use of resources became part of the study as well. This modification can be seen as a shortcoming but the goal of this study was to understand Chinese learners’ writing development and their writing processes in natural settings (i.e., writing in a way that replicates how one normally proceeds with his/her Chinese writing). For this reason, the results of this study will help scholars understand how Chinese learners actually practice Chinese writings. However, if scholars only focus on how computer-based writing and paper-based writing in researching on what influences students in writing in Chinese, this study suggests that researchers also need to introduce the participants to different genres of writing. In addition, studies on Chinese learners’ resource use are also worth exploring for Chinese writing research.

The other limitation of the study is that the writing sample size was too small to make a strong argument by statistical analysis. Hence, I also used qualitative research methods to triangulate the data and conducted individual writing sessions over a two-quarter time period to strengthen my study. I also observed that participants’ quality of writing was influenced by the amount of efforts required by their other classes. For example, when they were busy with their schoolwork, they sometimes made writing errors they seldom produced. Moreover, my experience of Chinese learning also influenced my research question design and data interpretation. I viewed Chinese writing skill as important, and as useful, as the other three language skills. My view on Chinese writing might influence participants’ understanding of Chinese writing. There is a possibility that Chinese learners in other institutions may not behave similarly as my participants. Therefore, it will be beneficial for Chinese writing study if this methodology can be evaluated at other institutions as well for comparison.
The findings of this study also suggest the need for studies of learners’ Chinese writing from a social interaction perspective. This is because this study revealed that the motivation for learning was constructed by the students’ learning experience and their interaction with Chinese people. Their perception of Chinese writing affected their writing and their performance in class. In recent years, the number of Chinese learners in classrooms has increased and we also see an increased participation in study-abroad programs in Chinese-speaking countries. With the increasing interactions among Chinese learners and Chinese teachers and native Chinese people, it is necessary to study the expectations of Chinese teachers and native Chinese people for Chinese learners in order to fully understand learner’s views on Chinese writing.

5.5 Conclusions

This study expanded the scope of Chinese learners’ writing study from simply the character level to a more comprehensive sentence (and composition) level. This study investigated the processes of computer-based writing and paper-based writing by beginning-level and intermediate-level learners. It used both quantitative and qualitative methods to capture the complexity of Chinese learners’ writing. Previous Chinese writing studies were limited to character recognition and character learning strategies. This study revealed that Chinese learners’ writing was influenced by various factors such as their views on writing, the design of the Chinese language class, resource use, and writing modes.
This study also suggested a new method of collecting writing data. The study focused on Chinese learners’ writing process during one writing session from the beginning to the end. In order to capture the complex process of Chinese writing, I used a camcorder, a pen movement tracking device (SmartPen), and screen capture software. These recordings provided rich data that enabled me to reveal the causes of writing errors. It also showed how Chinese learners interacted with online resources and how they revised their writing accordingly. This study suggests that this data-collecting method can be leveraged in other writing studies.

The purpose of this study was to report on how Chinese learners produce their writing in natural settings and how their writing had developed. This study does not favor computer-based writing over paper-based writing, but recognizes that Chinese learners have typically practiced Chinese writing in a hybrid manner which combines computer-based and paper-based Chinese writing. The participants mostly wrote their first language and Chinese using a computer. Due to learners’ life style and their use of computers in their education, it is impractical for them to avoid computer technology in their Chinese writing practices. However, there are some concerns among teachers that computer writing would not help the development of Chinese learners’ paper-based writing. However, as Collier and Werier (1995) stated in their study, good writers should develop strategies that work in any writing mode. Chinese computer-based writing has become a part of Chinese writing, so Chinese learners must learn how to use the computer in their learning process. As one of the most difficult parts of learning Chinese, Chinese learners’ writing has not received due attention from scholars. This study filled
this gap by capturing the complexity of Chinese learners’ writing. It reveals that there are many areas that need to be researched in order to effectively teach Chinese learners.
References


209


Appendix

Chinese writing acquisition studies in the Journal of Chinese Teachers Association

14. Light, T. Comparative reading speeds with romanized and character texts. 11(1), 1-10.