A COMPARATIVE STUDY OF SECOND LANGUAGE READING COMPREHENSION FROM PAPER AND COMPUTER SCREEN

Chunzhi You

A Thesis Submitted in Partial Fulfillment for the Requirements for the Degree of Doctor of Philosophy in English Language Studies

Suranaree University of Technology

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การศึกษาเปรียบเทียบความเข้าใจในการอ่านภาษาที่สอง จากหน้ากระดาษ และหน้าจอคอมพิวเตอร์

นางชุนชิ หยู

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรดุษฎีบัณฑิต
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A COMPARATIVE STUDY OF SECOND LANGUAGE READING COMPREHENSION FROM PAPER AND COMPUTER SCREEN

Suranaree University of Technology has approved this thesis submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

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ชุนชิ หยู : การศึกษาเปรียบเทียบความเข้าใจในการอ่านภาษาที่สองจากหน้ากระดาษและหน้าจอคอมพิวเตอร์ (A COMPARATIVE STUDY OF SECOND LANGUAGE READING COMPREHENSION FROM PAPER AND COMPUTER SCREEEN) อาจารย์ที่ปรึกษา : อาจารย์ ดร. พีรศักดิ์ สิริโยธิน, 210 หน้า

การศึกษานี้มีจุดประสงค์เพื่อเปรียบเทียบและตรวจสอบค้นคว้าผลของการนำเสนอเนื้อหา, ความรู้เกี่ยวกับการใช้คอมพิวเตอร์ และความคุ้นเคยเกี่ยวกับเนื้อหาในเรื่องความเข้าใจการอ่านของนักศึกษามหาวิทยาลัยจีนที่ไม่ได้เรียนภาษาอังกฤษเป็นวิชาเอก มีการศึกษาค้นคว้าเกี่ยวกับยุทธศาสตร์การอ่านที่นำมาใช้ในการอ่านจากวิธีการนำเสนอเนื้อหาสองรูปแบบและทัศนคติของนักศึกษาที่มีต่อคอมพิวเตอร์และหนังสือด้วยเช่นกัน

การนำเสนอในทางปฏิบัติหมายถึงวิธีการแสดงเนื้อหา ได้แก่ คอมพิวเตอร์และหนังสือ การศึกษานี้ใช้เนื้อหาที่คุ้นเคยดีและไม่คุ้นเคยดีอย่างละสองเนื้อหา ความรู้เกี่ยวกับคอมพิวเตอร์หมายถึงความรู้พื้นฐานและทักษะพื้นฐานในการใช้เทคโนโลยีคอมพิวเตอร์ ซึ่งมีอยู่สามระดับคือ ระดับต่ำ ระดับกลาง และระดับสูง นอกจากนี้ความคุ้นเคยกับเนื้อหาในทางปฏิบัติ หมายถึง ความรู้เดิมหรือความรู้ที่เป็นภูมิหลังเกี่ยวกับเนื้อหาของตำราที่เกี่ยวข้อง มีนักศึกษามหาวิทยาลัยจีนชั้นปีที่หนึ่งจำนวนหนึ่งร้อยยี่สิบคน ที่ไม่ได้เรียนภาษาอังกฤษเป็นวิชาเอก เข้าร่วมในการวิจัยครั้งนี้ วิธีการรวบรวมข้อมูลได้แก่ แบบทดสอบความเข้าใจการอ่าน แบบสอบถามยุทธศาสตร์การอ่าน และการสัมภาษณ์กึ่งโครงสร้าง วิธีการทางสถิติที่นำมาใช้ในการวิเคราะห์ข้อมูลเชิงปริมาณได้แก่ค่ามัธยมฐาน, ความเบี่ยงเบนมาตรฐาน และอโนวาแบบผสม ส่วนการวิเคราะห์ข้อมูลเชิงคุณภาพใช้วิธีการวิเคราะห์เนื้อหา

ผลการศึกษาพบว่า มีผลอย่างมีนัยยะสำคัญสำหรับความรู้เกี่ยวกับคอมพิวเตอร์และความคุ้นเคยเกี่ยวกับเนื้อหาในเรื่องความเข้าใจในการอ่าน แต่ไม่มีผลอย่างมีนัยยะสำคัญสำหรับการนำเสนอเนื้อหา ผลการศึกษาแสดงให้เห็นว่าไม่มีปฏิสัมพันธ์สองทางระหว่างการนำเสนอเนื้อหาและความรู้เกี่ยวกับคอมพิวเตอร์ ระหว่างการนำเสนอเนื้อหาและความคุ้นเคยกับเนื้อหา แต่มีปฏิสัมพันธ์สองทางระหว่างความรู้เกี่ยวกับคอมพิวเตอร์และความคุ้นเคยกับเนื้อหาอย่างมีนัยยะสำคัญ นอกจากนี้ผลการศึกษายังพบอีกว่า มีปฏิสัมพันธ์สามทางในกลุ่มตัวแปรอิสระสามตัว (การนำเสนอเนื้อหา, ความรู้เกี่ยวกับคอมพิวเตอร์, และความคุ้นเคยเกี่ยวกับเนื้อหา) จากการสำรวจยุทธศาสตร์ พบว่ามีความแตกต่างทางสถิติอย่างมีนัยยะสำคัญ ในภาพรวม การใช้ยุทธศาสตร์ระหว่างกลุ่มนักศึกษาที่อ่านจากคอมพิวเตอร์และกลุ่มนักศึกษาที่อ่านจากหนังสือ อย่างไรก็ตาม มีการแสดงให้เห็นถึงความแตกต่างอย่างมีนัยยะสำคัญในการใช้ยุทธศาสตร์สนับสนุนการอ่าน (SUP)

นอกจากนั้น ยังพบว่า นักศึกษามีการใช้ยุทธศาสตร์โดยรวมและยุทธศาสตร์ย่อยในระดับปานกลาง เมื่ออ่านจากสื่อการนำเสนอเนื้อหาสองแบบดังกล่าว

งานวิจัยนี้เสนอแนะว่า รายวิชาการอ่านภาษาอังกฤษโดยใช้คอมพิวเตอร์ระดับความรู้เกี่ยวกับคอมพิวเตอร์และยุทธศาสตร์การอ่านควรนำมาพิจารณาและควรมีการเตรียมความพร้อมนักศึกษาเพื่อการเรียนภาษาอังกฤษผ่านคอมพิวเตอร์โดยจัดโปรแกรมการฝึกอบรมด้านคอมพิวเตอร์เพื่อสอนทักษะการใช้คอมพิวเตอร์และการฝึกอบรมเกี่ยวกับยุทธศาสตร์การอ่านโดยอาศัยคอมพิวเตอร์

สาขาวิชาภาษาอังกฤษ ลายมือชื่อนักศึกษา _____

ปีการศึกษา 2552 ลายมือชื่ออาจารย์ที่ปรึกษา_____

CHUNZHI YOU : A COMPARATIVE STUDY OF SECOND LANGUAGE READING COMPREHENSION FROM PAPER AND COMPUTER SCREEN. THESIS ADVISOR : PEERASAK SIRIYOTHIN, Ph. D., 210 PP.

TEXT PRESENTATION/ COMPUTER LITERACY/ TEXT FAMILIARITY/ SECOND LANGUAGE READING COMPREHENSION/ READING STRATEGY

This study aimed to examine the effects of text presentation, computer literacy and text familiarity on reading comprehension of Chinese college non-English major students. The reading strategies employed when reading from two presentation modes and the students' attitudes toward computers and paper was also investigated.

Text presentation is operationally defined as the means of displaying texts, i.e., computers and paper. This study includes two familiar texts and two unfamiliar texts. Computer literacy refers to the basic knowledge and skills to deal with computer technology, involving three levels: low, moderate and high in the present study. In addition, text familiarity is operationally defined in this study as the prior knowledge or background knowledge of the content of the relevant text. One hundred and twenty Chinese first-year college non-English major students participated in the study. Reading Comprehension Test and Reading Strategy Questionnaire and Semi- structured interviews were employed as the main methods for data collection. The statistical methods employed to analyze the quantitative data include means, standard deviation and a mixed-design ANOVA. Content analysis was used to analyze the qualitative data.

The findings revealed that there were significant main effects for computer literacy and text familiarity on reading comprehension, but no significant main effects for text presentation. The findings showed that there were no significant two-way interactions between text presentation and computer literacy, between text presentation and text familiarity, while there was two-way interaction between computer literacy and text familiarity. The results also revealed no significant three-way interaction among the three independent variables (text presentation, computer literacy and text familiarity) was found. The findings of strategy survey showed that the statistically significant differences in overall strategy use were found between the computer reading group and the paper reading group; however, the significant differences were only shown in the use of Support Reading Strategies (SUP). Furthermore, the moderate use of overall strategies as well as the subscales strategies was also reported by the students when reading on two text presentation media.

The study suggested that in computer-based English reading instruction courses, the students' computer literacy level and reading strategies should be taken into consideration and a program of computer training to teach computer skills and computer-based reading strategy training should be introduced in order to prepare students for learning English via computers.

School of English Student's Signature: _____

Academic Year 2009 Advisor's Signature: _____

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CAI	Computer Assisted Instruction
CBT	Computer Based Test
CRT	Cathode Ray Tube
CE	College English
CET	College English Teaching
GPA	Grade Point Average
GLOB	Global Reading Strategies
IAS	Item Analysis System
MARSI	Metacognitive-Awareness-of-Reading-Strategies Inventory
MOE	the Ministry of Education
NCEE	National College Entrance Examination
NCRE	National Computer Rank Examination
PEQ	Pre-Experiment Questionnaire
PERSQ	Post-Experiment Reading Strategy Questionnaire
PROB	Problem-Solving Strategies
SORS	Survey of Reading Strategies
SUP	Support Reading Srategies
VDT	Visual Display Terminal
VDU	Visual Display Unit

CHAPTER 1

INTRODUCTION

This chapter presents an overview of the study. It starts with background of the study, followed by the statement of problem, purposes of the study, and definitions of the key terms. The significance of the study is discussed in the last section.

1.1 Background of the Study

With the opening up of China, English has been regarded as a key factor in China's development, a way of attracting foreign investment and improving foreign trade. As a required subject from primary school to college, English has a special position in China's education (Cheng, 2002). It has even become one of the core subjects in the National College Entrance Examination (NCEE). Ford (1989) once said that there were more Chinese studying English than there were Americans, with estimates as high as 250 million. Nowadays, the number can only increase as China has officially begun to implement its policy to introduce English as a compulsory subject for all students in compulsory education (Ministry of Education, 2001). There are two groups of learners at the college level: English majors and non-English majors. In this study, attention is exclusively directed at non-English major students in Engineering, Information Technology, Management, Physics and Chinese, etc.

According to the 1999 College English (CE) syllabus, English as a compulsory course for all Chinese college non-English major students, should aim at cultivating in the students a relatively high ability in reading, and a moderate ability in listening, speaking, writing, and translation so that they are able to use English as a means of exchanging information.

The syllabus describes the course objectives and specifications in terms of vocabulary, reading, listening, writing, and translation. Although learners are required to master all the language skills, more emphasis is laid on reading skills. Reading activity is considered one of the most important skills taught in school (Bensel, 2005). In addition, Chinese learners of English do not have many chances to listen, speak, or write in English, but they have more opportunities to read in English. For instance, they may access information from a variety of websites, English newspapers and textbooks, etc.

Furthermore, historically, Chinese students were taught English in order to read so that they might derive some understanding of other societies from books and other materials. Nowadays, the purpose for most college non-English majors when learning English is to read the literature in their special fields so that they might be involved in international discourse communities relevant to their fields. Therefore, reading is the most important skill among the four skills for English language learning, and it has also become a very important way to get access to information in their learning.

Reading in a Second or Foreign Language

Reading is what happens when people look at a text and assign meaning to the written symbols in that text (Aebersold & Field, 1997). In a new era of knowledge

and economy expansion, reading is still an indispensable way of spreading human culture. Some language researchers (e.g. Goodman, 1982; Smith, 1978, cited in Ajideh, 2003) regarded reading as an interaction between thought and language; therefore, it is a complicated psychological process which is the cycle of sampling, predicting, testing, and confirming. Some other language researchers (e.g. Alderson, 2000; Anderson, 1991; Block, 1992) viewed reading as the ability of an individual to construct meaning from written or printed verbal symbols. In reading, a reader has to link a visual form with his/her own opinion and prior experience before interpreting its meaning.

The ability to read is acknowledged to be the most stable and durable of the second language modalities (Bernhardt, 1991). Reading ability is often all that is needed by learners of English as a Foreign Language, as well as of other foreign languages (Alderson, 1992:1). Michigan Reading Association (1985) defined reading as the process of constructing meaning through the dynamic interaction among the reader's existing knowledge, the information suggested by the text and the context of the reading situation. Reading is a ‘meaning-constructing system’ that readers use to try to understand a text by relating it to what they already know (Donaldson, 1996). To understand a text, then, it is not enough for the reader simply to know the meaning of each individual word in isolation; rather, to utilize background and formal schemata to make sense of a text (Carrell, 1988).

In general, there is an agreement that the function of reading is to get meaning from printed text. Today, with the increased use of computers, texts are not only displayed on traditional medium of paper, but on the up-to-date medium of computer screens as well. Many people get input by reading a variety of material

sources both from reading on paper and on computer screens. Hence, reading has become more and more important in the new knowledge economy and remains the most effective human activity for transforming information into knowledge, whether it was read from paper or from computers.

Text Presentation: Reading from Computers and from Paper

With regards to paper-based texts, McDonell (2007) stated that what we know about students and text processing is most through the printed words of textbooks, books, magazines and newspapers. Our ability to retrieve information is taken for granted from paper-based texts. Through paper-based texts, students are able to build a coherent mental representation of information involving the processing of individual letters, words, and phrases and how these work and relate to one another (Alderson, 1992). Moreover, the reality of daily life shows that paper continues to be the preferred medium for much of our reading activity (O'Hara & Sellen, 1997).

On the other hand, since a variety of information materials are widely displayed on computer screens, reading on screens has become the main means of retrieving information in the form of e-mails, World Wide Web (WWW), chat-room conversations and so forth. Mills and Weldon (1987) claimed that a computer screen is used extensively as an input/output device for computer systems, and it can be used to display many different types of information, such as graphic and pictorial and so on. One of the primary uses for a computer screen is the display of texts (Muter & Maurutto, 1991). In addition, nowadays, computers are used widely both at home and at school and they have become commonplace for both teaching and learning. That is, computers play a major part in school; changes have begun to take place in school curriculum as well.

1.2 Statement of the Problem

With the increased use of computers and the advent of the Internet, e-mail, digital materials, e-journals, to get information is not only from paper but also from computers. Online reading serves as one of the sources of input for L2 readers. Coiro (2003) claimed that electronic texts introduce new supports as well as new challenges that can have a great impact on an individual's ability to comprehend what he or she reads. Caverly and Peterson (2002, cited in Shen, 2006) also stated that, today, computer technology has been integrated into almost every aspect of learning in higher education. In fact, "the Internet has become an important part of college students' lives, not only for their studies and daily routines, but as a tool for getting to know other people and the rest of the world" (Chou & Hsiao, 2000: 66).

Particularly, in 2004 the MOE in China issued its new College English Curriculum Requirement. The specific syllabus requirements of MOE 2004 syllabus are outlined in Document No. 21, under the title of "The Experimental Implementation of Teaching Reform of College English". With regard to the reform of the teaching model, MOE states:

> To reform the current teaching model from a reliance on textbook, chalk and teacher talk, to one of mutual communication, individualized endeavor, and a more interactive learning model which combines computer (network) teaching software with a language lively classroom. (p. 12)

Since then, the college English teaching (CET) reform has been put into practice. A Multimedia English Teaching Model has been tried out in China's CET. As a result, the multimedia and computers were integrated into English language instruction. At Guizhou University, where the present study was undertaken, for example, there are Internet-connected multimedia language laboratories for College

English instruction attached to College English department around the campus and students can use the equipment. Furthermore, textbooks are accompanied by CD-ROMs; homework is delivered and graded on line; and assignments are designed to be completed collaboratively through electronic mail.

As a wealth of reading materials is available via the Internet, learners' reading format appears to have shifted emphasis from reading the printed text to the use of the electronic medium to retrieve information. However, some researchers remain cautious of technology adoption. The outcome of such an English teaching model is still far from satisfactory. Edyburn (2007) asserted that little is known about whether technology engages reluctant readers in reading. Research is needed to compare reading performance with technology (e.g. digital texts or books) and reading performance with traditional instructional materials on any relevant measures (e.g. comprehension, and time on task). It needs to be verified to what extent the new means of reading via electronic media helps learners to enhance their reading performance, or impedes their processing of reading text. There has been a large amount of research concerning the differences between reading on paper and digital documents in terms of speed, accuracy and comprehension; however, the results are generally inconsistent. Therefore, further studies are necessary to get new results or to support the earlier findings.

Moreover, most of the studies in this field have been conducted with subjects whose first language is English, which may exclude other factors related to proficiency in English as with non-native speakers, such as the subjects of the present study whose mother tongue is Chinese, and English to them is a foreign language. Thus, the current study intends to examine factors that influence reading comprehension from two presentation media within the Chinese CE context.

Two other factors which need to be mentioned here as part of the rationale for conducting the present study are computer literacy and text familiarity.

The ability of an individual to interact with a computer, referred to as computer literacy, has been receiving more and more attention in research literature. The rapid rise of the use of personal computer and wealth of electronic information has led to the need for people to develop a new set of skills to effectively participate in contemporary society. The fact that different types of users interact with computer systems in different ways has long been recognized.

It is generally assumed that computer users need a special literacy competence to control monitors when reading on screens. However, such beliefs are largely lacking in empirical verification. Even though some studies (i.e. Gould, Alfaro, Finn, Haupt, Minuto, & Salaun, 1987a.; Tapscott, 1998; Eveland & Dunwoody, 2001; Clariana & Wallace, 2002) have been conducted to examine whether the past experience of using computer may affect reading comprehension, the results are inconsistent.

More importantly, in the context of the present study, the majority of students of the first-year students enrolled at Guizhou University come from different areas of Guizhou Province. Since most high schools in these areas lack multimedia language laboratories, students have minimal opportunities or lack the experience of using computers in their language learning. It might be probable that they are not familiar with the new teaching model that involves retrieving information or reading from a computer screen, and their reading performance may be impaired in their learning. Thus, the effects of computer literacy on students' reading comprehension should be explored.

According to Alderson (2000) and Carrell (1985, 1988), the reader's background knowledge are very important for processing texts. In the past two decades, considerable research has been done on the effects of text familiarity on reading comprehension. The results showed that there were positive influences on reading comprehension. The reader's background knowledge can help comprehend texts. Comprehension occurs when the new information interacts with the old knowledge (Anderson & Pearson, 1984; Smith, 1994). Clariana and Wallace (2002) concluded that content familiarity did affect the performance of the subjects of the computer-based group and paper-based group. In the study, content familiarity was one of the examinee characteristics to be included in separate analysis. A significant difference for content familiarity was found and the interaction of test mode and content familiarity was also significant.

However, most studies have been conducted to investigate the effects of text familiarity on reading comprehension only with the paper medium and research into the role of background knowledge in reading from computer screens was rare. And it is unknown to what extent findings from paper media can be extended to electronic media. Researchers have expressed the opinion that it is risky to apply the results of research on paper reading to computer reading. Especially, the study by Kerr and Symons (2006) raises the issue of whether there are interactions between passage topic and medium. Therefore, it is vital that the present study should be done to compare the effects of text familiarity on students' reading comprehension when reading from paper and from computer screens.

In conclusion, Dillon (1992) pointed out that ergonomists are still a long way from understanding fully the effect of presentation medium on reading. Also, Edyburn

(2007) proposed some new directions on reading research, e.g. research to understand whether or not students who struggle to access information in print formats prefer digital text or demonstrate better skills in comprehending. There is a lack of research empirically examining the nature of text presentation, computer literacy and text familiarity on reading comprehension and the complex relationships and the unexplored effects that may exist among them.

In addition, for the past two and three decades, the development of reading skills and strategies has been a major concern for teachers as well as readers. Although a good number of empirical investigations have found that the use of various reading strategies improved the students' reading comprehension, relatively little research has examined the different use of strategies between presentation modes. Also, Anderson (2003) proposed that a further study should be done to gather reading strategy data in online reading contexts and in hard copy contexts to know if there are any significant differences between these two reading contexts. Therefore, this study examines students' reading strategies in two reading conditions: reading from paper and from computer screens, in an attempt to address this gap in the field.

1.3 Purposes of the Study

The present study aims at investigating the effects of presentation media on reading comprehension of non-English major students in the Chinese context. The purposes of the study are:

a) To investigate how text presentation affect the reading comprehension of Chinese non-English major students.

b) To investigate how computer literacy affect the reading comprehension of Chinese non-English major students.

c) To investigate how text familiarity affect the reading comprehension of Chinese non-English major students.

d) To investigate the interaction effects between and among and the three variables (text presentation, computer literacy and text familiarity).

e) To examine the use of strategies when reading from paper and from computer screens.

f) To examine the students' attitudes toward reading from paper and from computer screens.

1.4 Research Questions

Based on the purposes of the study, the following research questions guided the present study:

1. Are there any differences in reading comprehension of Chinese non-English major students between reading from paper and from computer screens?
2. Are there any significant effects of computer literacy on reading comprehends-ion of Chinese non-English major students?
3. Are there any significant effects of text familiarity on reading comprehension of Chinese non-English major students?
4. Are there any significant interaction effects between and among the three variables: text presentations, text familiarity and computer literacy?
5. Do the students use different strategies when reading from paper and from computer screens?
6. What are the attitudes of Chinese non-English major students toward reading from paper and from computer screens?

1.5 Definitions of the Key Terms

Text presentation

Text presentation is operationally defined as a means to display texts. In the present study, text presentation referred to reading from paper and from computer screens. Text modes, text media, modes of text, presentation modes, and presentation media were used interchangeably to replace it. In the present study, the texts displayed on a computer are termed as computer-based texts, electronic texts, computerized texts, digital texts, while the texts displayed on paper are termed as paper-based texts, hard copy and printed texts.

Text familiarity

Text familiarity is operationally defined in this study as the prior knowledge or background knowledge of the content of relevant texts. This study includes two familiar texts and two unfamiliar texts.

Reading comprehension

Reading comprehension is defined as the scores obtained by the subjects on the reading comprehension test, which includes 40 multiple choice questions.

Computer literacy

Computer literacy is defined as the basic knowledge, skills needed by college students to be able to operate a computer in reading computer-based texts. It is used to categorize the subjects into three groups (high, moderate and low) based on the scores on the National Computer Rank Examination (Grade one).

1.6 Significance of the Study

The current study intends to examine the effects of text presentation along with the other two factors of computer literacy and text familiarity on students' reading comprehension in the Chinese college English context. It is believed that the results of this study have some benefits for Chinese College English reading instruction, reading instructors as well as non-English majors in their online teaching and learning.

Firstly, recent advancement in computer monitors, and software means that mainstream technology provides the users with unprecedented control over the screen/text image with which they interact (Douglas, Kellami, Long, Hodgetts, & Douglas, 2001). Computers and the Internet play an increasingly important role in the lives of L2 readers. Online reading serves as one of the sources of input for thousands of L2 readers besides reading from traditional printed materials. However, research into the effects of text presentation is relatively new and not sufficient to obtain consistent results in many aspects. Therefore, the results can be served as a database for further study about text presentation, along with computer literacy and text familiarity.

Secondly, the study can be a contribution to the China's CET reform. Since many educators believe the benefits of mixing traditional classroom instruction with online learning, multimedia and more entirely online classes are currently coming into existence in China's CET. A multimedia-supported learning environment would help students become more engaged with an assigned topic, become more inclined to consider different viewpoints, and better guide students in discovering knowledge. Thus, the results of the present study could help reading instructors as well as college

students to realize the importance of computer literacy in their online teaching and learning.

Thirdly, the results of this current research may add to the understanding of what and how strategies are used by students, especially within the context of multi-media web-based reading courses. Thus, when reading teachers engage their students in online learning tasks, they may realize that a strategy training component is essential in teaching reading; and reading teachers can focus students' attention on the reading strategies identified in the present study to help students improve their online reading ability.

Finally, since understanding of why people accept or reject using computers comprises one of the most important and challenging issues in the educational arena, the results could be of great help in understanding what attitudes the students have toward reading from computers.

1.7 Summary

In Chapter One, the researcher has provided a description of the background of the study, the statement of the problem, the purposes and the research questions of the study. The definitions of the key terms and the significance of the study have also been discussed.

CHAPTER 2

LITERATURE REVIEW

This chapter deals with the literature related to the present study. It is organized into five sections. The first section introduces the nature of L2 reading and reading theories that are applicable and useful for this study, namely, schema and metacognitive theories. The second section discusses the major variable, text presentation (reading from paper and from computer screens) in greater details. Also, the theoretical background and previous studies regarding text presentations and reading comprehension are described in this section. In the third and fourth sections, theoretical background and the previous research related to the other two variables, computer literacy and text familiarity are presented. Finally, the conceptual framework, classifications of reading strategies, assessing reading strategies, and related research into reading strategies are discussed.

2.1 Second Language Reading and Reading Theories

2.1.1 The Nature of Second Language Reading

Reading is regarded as a major source of comprehensible input and as the skill that many serious learners most need to employ (Eskey, 2002). Carrell and Eisterhold (1983) concluded:

1) Our understanding of reading is best considered as an interactive process that takes place between the reader and the text. The basic concept is that the reader

reconstructs the text information based in part on the knowledge drawn from the text and in part from the prior knowledge available to the reader.

2) Reading as an interactive process refers to the interaction of many component skills potentially in simultaneous operation; the interaction of these cognitive skills leads to fluent reading comprehension. Simply stated, reading involves both an array of lower-level rapid, automatic identification skills and an array of higher-level comprehension or interpretation skills.

Bernhardt (2005) pointed out that L2 reading has often been accused of being a slavish imitation of L1 reading research. L2 reading process has relied primarily upon explanatory models borrowed from first language research. Bernhardt asserted that in this process the reader can be involved in the construction of meaning from a text, based partly on new information presented by that text and partly on whatever relevant prior knowledge, feelings and opinions that a reader brings to the task of making sense of the printed words. Research into the nature of the reading process is abundant and various reading models have been proposed (see Ruddell, P., Ruddell, R. & Singer, 1994) based on a variety of theoretical perspectives. Barnett (1989) pointed out that a reading model provides an imagined representation of the reading process. A continuum of two opposing approaches were provided in understanding the reading process, namely, bottom-up and top-down approaches. The major distinction between the approaches is the emphasis given to text-based variables such as vocabulary, syntax, and grammatical structure and reader-based variables such as the reader's background knowledge, cognitive development, strategy use, interest, and purpose (Lally, 1998). Reading is not merely a receptive process of gathering information from the page in a word-by-word manner (Grabe, 1991). Rather, it is a selective process and characterized as an active process of comprehending.

2.1.2 Theories in L2 Reading

Over the years, there have been some shifts and changing trends in theories relating to reading. From the traditional view that focused on the printed form of a text to the cognitive view that emphasized the role of the reader's background knowledge, they ultimately culminated in the metacognitive view. In understanding the cognitive process to decode linguistic input for comprehension, cognitive and metacognitive theories play a very important role (Mokhtari & Reichard, 2002). Cognitive theory stresses on the active mental processes involved in language learning and on how people understand reading material. It focuses on an unobservable change in mental knowledge. Therefore, schema theory and metacognitive theory are most applicable to the present study.

Schema Theory

Bartlett (1932, cited in Ajideh, 2003) first proposed the concept of schema. He suggested that memory takes the form of schema, which provide a mental representation or framework for understanding, remembering and applying information. Rumelhart (1980) further developed the schema concept and described schema theory as basically a theory of how knowledge is mentally represented in the mind and used. As stated by Rumelhart (1980),

> Schemata can represent knowledge at all levels-from ideologies and cultural truths to knowledge about the meaning of a particular word, to knowledge about what patterns of excitations are associated with what letters of the alphabet. We have schemata to represent all levels of our experience, at all levels of abstraction. Finally, our schemata are our knowledge. All of our generic knowledge is embedded in schemata. (p. 41)

According to him, schemata are created through experience with the world, and the person's culture, which includes the interactions with people, objects and events within that culture.

Widdowson (1983) described schema as 'cognitive constructs' which allow for the organization of information in long-term memory. Cook (1989, cited in Singhal, 1998) stated it as 'the mind, stimulated by key words or phrases in the text or by the context, activates a knowledge schema' (p. 69). Both of them emphasized the cognitive characteristics of schema which allow us to relate incoming information to already known information.

In 'A Schema-theoretic View of Reading', Adams and Collins (1979:3) explained the goal of schema theory as "to specify the interface between the reader and the text –to specify how the reader's knowledge interacts with and shapes the information on the page and to specify how that knowledge must be organized to support the interaction." According to this view and some schema-theoretic research (Anderson, 1983; Rumelhart, 1980), reading comprehension is essentially a process of relating the information from a text to already existing knowledge framework in readers' minds. This assumes that comprehension occurs when readers successfully connect the new information in the text with the information in their memory. If the new information does not fit into the readers' schemata, it is likely to be misunderstood or ignored, or the original schemata will be revised to accommodate the new information. The research also indicates that the type of schema activated and the quality of that activation are two determinants of reading performance. The success of reading comprehension lies in the extent to which the relevant schemata are activated.

Carrell (1985, 1988) has written several papers on schema theory and claims that in the ESL reading classroom, content is of primary importance. However, readers need to activate prior knowledge before beginning to read because the

activated knowledge facilitates the reading process. Carrell (1987) recognized two dimensions of schemata: content and formal schema. Content schema refers to a reader's background or world knowledge, thus providing readers with a foundation, a basis for comparison (Carrell & Eisterhold, 1983; Carrell, Pharis, & Liberto, 1989). Formal schema refers to textual schema, meaning the organizational forms and rhetorical structures of written texts. Schooling and culture play the largest role in providing one with a knowledge base of formal schemata.

However, McNeil (1992) distinguished three different kinds of schemata related to reading comprehension: domain, general world knowledge and knowledge of rhetorical structures. Domain schema refers to the knowledge of specific topics, concepts, or processes for reading specific subject matter. General world knowledge is the schema related to understanding social relationships, causes, and activities common to many situations and domains. Schemata about rhetorical structure are the knowledge of the conventions for organizing and signaling the organization of texts.

In reading comprehension, schema serves as a reader’s background information that can be called prior knowledge. Schema theory is especially helpful in understanding how prior knowledge affects reading comprehension. Schema theorists believe that the process of comprehension is an interaction between readers’ existing schema and the printed information on the page.

Based on schema theory, choosing topics familiar to readers can increase comprehension, since the more readers know about a topic the more likely it is that they will bring up appropriate schemata. As some research shows, topic familiarity is one of the most important factors in determining student comprehension and can compensate linguistic difficulty. Schema theory thus provides a major theoretical basis that informs the present study to investigate the effects of text familiarity.

Metacognitive Theory

Metacognitive theory was initially developed by Flavell (1979), who defined metacognition as knowledge and cognition about one's own cognitive state and processes. It is simply defined as 'thinking about thinking' (Livingston, 1997). Alvermann and Pheps (2002) also pointed out that metacognition means knowing about knowing. They use the concept to describe what the students know and what the students understand about how to be strategic readers, and when to evaluate their comprehension (Lipson & Wixson, 1983, cited in Alvermann & Pheps, 2002).

According to Flavell (1979, 1987), metacognition contained both metacognitive knowledge and metacognitive experiences or regulation. Flavell regarded 'metacognitive knowledge' as acquired knowledge about cognitive processes, knowledge that can be used to control cognitive processes. 'Metacognitive knowledge' was further divided by Flavell (1987) into three categories: person variables, task variables and strategy variables.

1) knowledge of person variables refers to general knowledge about how human beings learn and process information, as well as individual knowledge of one's own learning processes.
2) knowledge of task variables includes knowledge about the nature of the task as well as the type of processing demands that it will place upon the individual.
3) knowledge about strategy variables includes knowledge about both cognitive and metacognitive strategies, as well as conditional knowledge about when and where it is appropriate to use such strategies.

Specifically, in reading context, Schoonen, Hulstijn, and Bossers (1998) defined ‘metacognitive knowledge’ as readers’ assessment of themselves and their knowledge and control of strategies for processing and learning from text, in relation to both the complexity of the task at hand and the goals and plans that guide reading process. Sheorey and Mokhtari (2001) regarded ‘metacognitive knowledge’ as the knowledge of the readers’ cognition relative to the reading process and the self-control mechanisms they use to monitor and enhance comprehension.

As to ‘metacognitive experiences’, it involves the use of metacognitive strategies or metacognitive regulation (Brown, 1987, cited in Livingston, 1997). Metacognitive strategies are sequential processes that one uses to control cognitive activities, and to ensure that a cognitive goal has been met. These processes help to regulate and oversee learning, and consist of planning and monitoring cognitive activities, as well as checking the outcomes of those activities (Livingston, 1997).

A wealth of studies demonstrated that metcognition plays a significant role in helping learners understand how to plan, monitor and evaluate their reading (e.g. Anderson, 2003; Mokhtari & Sheorey, 2002; Mónos, 2006; Reinking & Schreiner, 1985; Sheorey & Mokhtari, 2001; Schoonen et al., 1998). Specifically, in online reading context, Anderson (2003) concluded that learners should be metacognitively aware of what they are doing. They need to connect their strategies for learning while engaged in an online learning task.

In addition, Reinking and Bridwell-Bowles (1991) pointed out that much of the existing research that compares electronic and conventional texts has not been guided by well-defined theoretical frameworks. In addressing this, several “rudimentary theoretical positions” have emerged recently and these may be useful

for interpreting past research as well as planning new studies. Metacognition can be one of them, since it was once employed by Reinking and Schreiner (1985) and Reinking (1988) to guide the development of a computer-mediated text and to investigate its effect on reading comprehension. Reinking and Bridwell-Bowles (1991) claimed that the results of these studies and others in which technological attributes of the computer were used to expand or control readers' interactions with the text lend support to this theoretical position. They further stated that reader versus computer control has emerged as an important theoretical issue for those interested in studying computer-mediated text. The capabilities of the computer to direct more actively a reader's processing of the text might help students develop metacognitive skills in learning (Reinking & Bridwell-Bowles, 1991).

In summary, based on the nature of metagcognition mentioned above, metacognitive theory can be applied as one of the theoretical foundations for the present study. With the wide spread use of computer-based technology in our language instructions, the new direction in reading research is represented by studies that focus on the nature of reading in the rapidly expanding electronic media (Kamil and Lane, 1998). Since the present study is designed to further investigate the nature of the presentation media of texts, some of the related literature works were reviewed in the following sections.

2.2 Text Presentation and Reading Comprehension

2.2.1 Theoretical Background

The literature on the use of computers has increased dramatically in the past two decades. Books by Cakir, Hart, and Stewart (1980, cited in Mills & Weldon, 1987)

have provided early coverage of some of the basic issues and research findings involving computer use. In the previous studies, a computer screen can be referred to as ‘a cathode ray tube’ (CRT), ‘visual display terminal’ (VDT), ‘visual display unit’ (VDU). Hence, the texts (or books) displayed on a computer screen are termed as ‘electronic texts(or books)’, ‘computerized texts (or books)’, ‘computer based texts (or books)’, ‘digital texts (or books)’ in the previous studies (O'Hara & Sellen, 1997).

When comparing paper texts (books) and electronic texts (books), two schools of thought exist. Some people hold the opinion that the printed page will never be equaled or surpassed by a screen. Cawkell (1999, cited in Auman, 2002) believed that paper-based books are more natural than electronic books.

> Inefficient as the paper book or journal may be, the fact is that at the presentation interface the print-human match is far better than the machine-human match, both in terms of information transfer and of human behavior. For general browsing, book reading, scanning news items, appreciating pictures or drawings, and being generally entertained, print on paper is superior. It can be written on, carried about, and digested in airplanes, on trains, or in the bath. It looks nice on shelves, and makes a very acceptable gift. (p.54-58)

On the other hand, other people believe that computers (screens) are superior to paper in a matter of a few short years. According to Noam (1999), books are yesterday’s technology bulky, environmentally suspected, impermanent, expensive, hard to find, forever out of print, slow to produce, to write and to read, and a strain on the eye. Noam foresees that paper books will become a secondary resource in academia.

There are some advantages to electronic texts. Firstly, they use zero paper and ink, lower cost by providing the works online, and thus they are more affordable than their print texts (Machovec, 1998, cited in Auman, 2002). Secondly, they are

readable in the dark, are easily searchable, and have a bookmark facility. Thirdly, an additional advantage of digital texts pointed out by Noam (1999) is the ability of the reader to adjust the font size. Finally, the main academic resources will be available through the electronic media because of ease of access, storage, and cross-referencing.

Muter (1996) and James (2008) pointed out these clear advantages of computerized presentation of text over paper medium:

- Ease of searching for information
- Ease of updating
- Multimedia capabilities
- Dynamic text presentation
- Inexpensive and faster availability
- Interactivity
- Connectivity; webs of related information

Bolter (1991) claimed that a computer is the fourth great document medium, next to the papyrus, the medieval codex, and the printed book. Some have anticipated that such advances will radically alter the relationship between authors and readers, and will change forever our concept of libraries as repositories of physical volumes of text, and of publishers as producers and sellers of paper books (O'Hara & Sellen, 1997). According to the perspective of the school, the demise of paper is merely a matter of time; electronic text will soon replace paper. However, many of others fall somewhere in the middle, believing that electronic and print media will coexist in the future.

With the advent of CRTs and VDTs, many studies compared reading on paper with reading on a screen, focusing mainly on performance outcomes such as reading speed, accuracy and comprehension. Dillon (1992) provides an excellent comparison of these works. Significant methodological differences across studies make comparison difficult; however, several general trends can be inferred. Reading from a screen generally resulted in slower reading performance and worse proofreading accuracy.

Reading Speed

So far the most common experiments have showed that silent reading from a screen is significantly slower than reading from paper, ranging from 20-30% (e.g. Al-Othman, 2003; Auman, 2002; Dillon, 1992; Grimshaw, Dungworth, McKnight, and Morris, 2007; Kak, 1981; Kerr & Symons, 2006; Mayes, Sims, & Koonce, 2001; Muter, Latremouille, & Treurniet, 1982; Wastlund, Reinikka, Norlander, & Archer, 2005). Due to different interface designs among the studies, it is hard to determine if the slower reading speed is due to a constant or if it results from different factors in each study (Auman, 2002). In 1987, Gould et al. conducted a study attempting to identify a single variable (from user experience, display orientation, character size, font size, and polarity) that might account for the slow speed when reading from computer screens, however, they could not find any one variable that might explain the reasons. Research by Horton, Taylor, Ingacio and Hoft in 1996 determined that web pages are often skimmed instead of read thoroughly, leading to speculation that users may have adapted to the slowness of reading from the screen to read less thoroughly.

Although most of the evidence points to screen being slower reading than print reading, this finding has been countered by opposite results in some studies.

Askwall (1985) found that when reading short texts (22 sentences) there was no difference in speed. Muter and Maurutto (1991) found that improving screen technology lessens, and may put an end to reading speed differences. The findings are consistent with other studies (Cushman, 1986; Oborne and Holton, 1988; Noyes and Garland, 2003).

Accuracy

Accuracy of reading refers to any number of everyday activities such as locating information in a text, recalling the content of certain sections and so forth. In the studies into reading from screens, the term 'accuracy' most commonly refers to an individual's ability to identify errors in a proofreading exercise.

Both Muter et al. (1982) and Wilkinson and Robinshaw (1987) reported significantly poorer accuracy for computer-based texts, as measured by proof-reading. Similarly, reading from computer screens has been found by Newsted (1985) to be less accurate. In contrast to the findings by Gould et al. (1987a)) found no reliable differences in accuracy.

When subjects were prompted to increase their speed of reading, reading from screen resulted in better comprehension than reading from print (Dyson and Haselgrove, 2001). This could be because fast reading on the screen is still slower than fast reading of print, so subjects in the screen-reading group spent more time with the material.

Comprehension

The effect of presentation medium on comprehension is more important than the questions of speed and accuracy (Dillion, 1992). Dillion further pointed out that the issue of comprehension has not been fully researched. Findings from previous

studies indicated that there were little differences between levels of comprehension when reading from two presentation media (e.g. Cushman, 1986; Dillon, 1992; Muter et al., 1982, 1988; Muter & Maurutto, 1991; Noyes & Garland, 2003; Oborne & Holton, 1988; Rice, 1994). Dillon (1992) pointed out that the most common assessment for comprehension used in previous experimental studies is "Post-task questions about content of the reading material".

2.2.2 Research on Text Presentation and Reading Comprehension

Since it is known to all that reading from computers is different from paper, a great deal of research have been conducted on reading performance to report differences on computers and paper from the 1980s and 1990s until now. More studies were designed to investigate the effects of presentation medium on comprehension. Some show differences between the two media, while others demonstrate inconsistent results or contradict earlier results.

Those studies conducted by some researchers reported that there were no significant effects on reading comprehension for presentation medium (e.g. Grimshaw, et al., 2007; Muter et al, 1982; Kak, 1981; Muter & Maurutto, 1991; Mayes et al., 2001; Noyes & Garland, 2003). In the study by Muter et al (1982), all of the subjects were required to answer 25 multiple-choice questions by hand after reading for 2 hours. No effects were found on comprehension either for condition or question set. Kak (1981) presented subjects with a standardized reading test on paper and VDU, which yielded no significant differences.

Muter and Maurutto (1991) designed two experiments to test the hypothesis that there were no differences in speed or comprehension between CRTs and normal book conditions. In experiment 1, twenty-four subjects at the University of Toronto

participated in the study. The 5 university staff and 19 students read or skimmed passages of text that were presented either on a CRT or on paper. They found that skimming was 41% slower on the computer, whereas no comprehension differences were found in normal reading. Similarly, Muter and Maurutto in their second experiment compared books to both earlier and 1991 display qualities. Eighteen subjects were tested. The results showed that there were no significant differences in reading speed and comprehension between paper-presented test and that presented on the 1991 computer displays.

In the study by Mayes et al. (2001), two experiments were carried out to determine if reading information from a VDT resulted in poorer performance. In the experiment 1, forty subjects engaged in the study with a mean age of 21.25. The instruments included an article, the post-experiment questionnaire and the NASA-Task Load Index (NASA-TLX). There were three dependent variables: time, TLX score, and comprehension score. The independent variables were reading group (VDT and paper) and testing group (VDT and paper). Results showed that there was no significant difference between VDT group and the paper reading group in comprehension. Forty-eight subjects participated in the experiment 2. The same instruments as in experiment 1 were used. The independent variables were reading condition and workload condition. In contrast to the first study, no significant differences in reading times were found. A trend in the data indicated comprehension scores were lower for those reading from a VDT.

In reply to the study of Mayes et al., Noyes and Garland (2003) examined directly comparable text in the two media in terms of study and reading times, number of correct answers and memory retrieval measure. Measurement of ratings include

score improvement between pre- and post-tests and final achievement, learning memory awareness in conjunction with comprehension scores. The Remember–Know learning paradigm was used to measure awareness of knowledge. A total of 50 students participated in the experiment. The results indicated that, no difference in terms of comprehension scores was found between the VDT and paper-based materials.

In a very recent study, Grimshaw et al. (2007) investigated the differences in comprehension on the presentation medium. Two different books were used and 132 English native speakers participated in the study. Reading comprehension test with multiple-choice questions and retrieval type and inference questions were used to collect the data. The results indicated that the subjects generally took longer to read the extract from the computer than from the printed books. However, there were no significant differences in their comprehension and in the enjoyment of the extracts when reading the electronic versions of the extracts compared to when reading printed versions of the same.

Wayne (2003) examined the effects of reading printed texts, linear electronic texts and hypertexts on the immediate retention of content. There are 267 college freshmen participants who were divided into three groups and exposed to the three different forms of text presentation. After reading the material for a period of time, they were evaluated on its content by means of a multiple-choice test. The group, who had read the printed version of the text, achieved the greatest scores, with women achieving higher scores than men. Comprehension of texts presented through computers (linear and hypertext) was found to be significantly lower than that of the printed text.

Some other studies reported different results. Wastlund et al. (2005) conducted two experiments to investigate the influence of medium presentation on consumption and production of information. Seventy-two participants were involved in the study. The results did not indicate any significant effects with regard to condition and gender and there was no significant interaction effect. The first main finding showed that consumption of information, measured by a test of reading comprehension, is more difficult when the assignment is presented upon a VDT than upon paper. In sum, both experiments showed that the VDT presentation in varied degree impaired performance and increased participants' experience of stress and tiredness.

A study was undertaken by Joly, Capovilla, Bighetti, Neri, and Nicolau, (2009) to evaluate the differences of comprehension of a journalistic text read on a paper or in the Internet. Eighty freshman psychology students participated in the study. Reading comprehension was evaluated through the use of a reading comprehension test on a hard copy and on a computer. Three questions were answered after reading each text. The results showed that there were significant differences in the comprehension performance for printed and electronic texts. It was concluded that the subjects generally comprehended digital texts better than the printed texts.

Kerr and Symons (2006) examined the effects of computer and paper presentation of text on reading time, free recall, cued recall, and inferential comprehension measures. Sixty subjects participated in the study in Canada. They were asked to read two expository texts, one in paper format, and the other in computer monitor. After reading each text, they were required to recall as much of the information as possible and answer the questions to measure the recall and

comprehension. The results indicated that more time was taken by the subjects to read the passage and more information was recalled from the computer monitor. However, comprehension was impeded when reading from computer monitors. The participants were more efficient at comprehending the texts when reading from paper.

Sun and Xiao (2006) conducted a study in China, using a 2 (reading the word text and reading printed text) ×2 (short and long article) mixed design. This study examined the influence of the way of text presentation on reading efficiency under the condition of limited reading time. The results showed that the reading efficiency of the printed text was better than that of the word text. In particular, significant difference was found in reading the long length article than reading the short length one.

The studies reviewed above imply that some basic performance differences do exist between reading the computer-based and paper-based texts, but, the findings are largely inconsistent. Thus, further studies are needed to compare the differences between reading from computers and reading from paper formats in terms of reading comprehension.

2.3 Computer Literacy and Reading Comprehension

2.3.1 Theoretical Background

The nature of literacy is rapidly changing as new technologies emerge (Leu & Kinzer, 2000; Reinking, McKenna, Labbo, & Kieffer, 1998). Leu (2002) draws our attention to the role of new literacies. He says “the new literacies include the skills, strategies, and insights necessary to successfully exploit the rapidly changing information and communication technologies that continuously emerge in our world”

(p. 313). He also points out, “clearly, the literacy of yesterday is not the literacy of today and it will not be the literacy of tomorrow” (Leu, 2000:744).

Pianfetti (2001) claimed that nowadays, the definition of literacy has expanded from traditional notions of reading and writing to include the ability to learn, comprehend, and interact with technology in a meaningful way. There is an abundance of definitions of computer literacy; however, a widely accepted definition has not yet been established. Beynon and Mackay (1992) asserted that ‘computer literacy’ was concerned with mass provision of some minimal introduction to computers, so that those leaving school and entering the labour market did so feeling comfortable with new technology. They further pointed out that it could be generally defined in functional terms: “computer literacy can be considered to mean the minimum knowledge, know-how, familiarity, capabilities, abilities, and so forth”. Tsai (2002) defined it as “the basic knowledge, skills, and attitudes needed by all citizens to be able to deal with computer technology in their daily life” (p. 69). Hoffman and Vance (2005) referred ‘computer literacy’ to familiarity with the basics of operating systems, hardware configurations, and desktop applications. Computer literacy is more apparent in contemporary society, while similar in many regards to other types of literacy, is unique, and draws educators’ attention as an important set of skills that can influence the course of their students’ lives by providing them with the ability to use current technologies and prepare them to learn emerging technologies.

Criteria of computer literacy have included computer awareness, competency with software applications and programming ability. The topic of computer literacy is receiving increased attention, most clearly evidenced by the empirical and applied research on the topic.

Poynton (2005) summarized past and current empirical studies regarding computer literacy that had implications for educators. The implicit and explicit incorporation of computer literacy development into the school curricula is evidence of the need for students to develop computer skills and a general familiarity with technology.

The role of familiarity was highlighted by Brosnan and Lee (1998), Muter et al. (1982), Oborne and Holton (1988), and Wilkinson and Robinshaw (1987) to explain why individuals performed better with paper than computers. The research helped explain the survey results as it concluded that many people view more positively objects with which they are more familiar. It is debatable, therefore, the extent to which the results can be explained in terms of a lack of familiarity with computers. Obviously, it might be assumed that increased experience in reading from computers would reduce the performance deficits, or, more likely, make computer performance exceed paper.

2.3.2 Research on Computer Literacy and Comprehension

Computers have affected almost every part of our daily lives, ranging from the labour market to personal activities. The use of computers at school as well as at home, directly or indirectly, continues to impact learning. As a result, computer literacy is no longer a specialized skill, but rather a necessary one for a successful study career. Bussière and Gluszynski (2004) claimed that there exists a clear link between reading scores and perceived computer abilities.

A good number of studies have examined this link and found mixed effects. Some studies indicated positive links and effects (e.g. Attelwell & Juan, 1999; BECTa, 2000; Mann, Shakeshaft, Becker, & Kottkamp, 1999; Renaud, 1998; Van Daal &

Reitsma, 2000). Renaud (1998) analyzed the impact of in-school computer use on science performance of seventh grade low-achievers. The study found a positive relationship between computer use and achievement as a function of exposure to computer assisted science instructions. Similarly, Attewell and Juan (1999) using the National Longitudinal Study of 1988 data found that having a computer at home is associated with higher test scores in mathematics and reading.

Mann et al. (1999) investigated the impact of technology on school performance in West Virginia. The educational outcomes of the West Virginia Basic Skills/Computer Education (BS/CE) program were examined. The study showed that students who were exposed to the BS/CE program scored higher on the Stanford-9 state exam. They further claimed that those students without a computer at home made the biggest gains in total basic skills, total language, language expression, total reading, reading comprehension and vocabulary.

British Educational Communications and Technology agency BECTa (2000) performed a study looking into the correlation between educational performance and access and usage of Information and Communication Technology (ICT) in British schools. The study used English, mathematics, and science test scores. 2,500 primary schools in England participated in the study. For the analysis, schools were divided into ICT resource categories. In English, BECTa (2000) used the 1999 grades from national tests. They found that primary schools with 'Very Good' ICT resources were significantly more likely to gain good grades on the national tests.

On the contrary, other studies suggested that exposure to and the use of computers might have no impact or even negative effects on educational performance (e.g. Angrist & Lavy, 2001; Johnson, 2000; Tremblay, Ross, & Berthelot, 2002;

Trites & McGroarty, 2005). Angrist and Lavy (2001) investigated the effects of computers on test performance of students in Israeli schools. They found no evidence of a relationship between Computer-Assisted Instruction and test scores. Johnson (2000) revealed that students who used computers in the classroom at least once a week did not perform better on the National Assessment of Educational Progress (NAEP) reading test than did those who used computers less than once a week. Johnson's results were confirmed in 2001 through a study by Tremblay et al. (2002) which found no relationship between the presence of a computer in the classroom and the achievement of students.

Trites and McGroarty (2005) designed measures to assess more complex reading tasks: Reading to learn and reading to integrate. The participants were 251 students in this study. Three existing instruments were used: The Nelson-Denny Reading Test, Form G; the Institutional TOEFL Reading Comprehension Section and A computer familiarity questionnaire. Additionally, two instruments were also used to assess Reading to Learn, Reading to Integrate and Basic Comprehension. The research subproblems included determination of the influence of overall basic reading comprehension level, language background, medium of presentation(paper versus computer), level of education, and computer familiarity on Reading to Learn and Reading to Integrate measures; and the relationships among measures of Basic Comprehension, Reading to Learn, and Reading to Integrate. The results showed that performance on Reading to Learn and Reading to Integrate measures was significantly influenced by language background, level of education. Moreover, level of computer familiarity, the medium of presentation had no significant effect on Reading to Learn and Reading to Integrate performance.

In addition, many studies addressed the effects of computers on reading and assessment. Since computer familiarity is relevant to TOEFL administration, many studies examined its effect on computer-based and paper based TOEFL test (e.g. Al-Othman, 2003; Clariana & Wallace, 2002; Kirsch, Jamieson, Taylor, & Eignor, 1998; Taylor, Jamieson, Eignor, & Kirsch,1998).

Kirsch et al. (1998) and Taylor et al. (1998) conducted a large-scale study of computer literacy in the TOEFL-taking population and of the effect of computer literacy on TOEFL performance. The study found no difference in TOEFL performance between those who were familiar with computers and those who were not.

Clariana and Wallace (2002) carried out an experiment to investigate several key factors including content familiarity, computer familiarity, competitiveness, and gender in computer-based versus paper-based assessment. The participants were 105 freshman business undergraduates randomly assigned to either a computer-based or identical paper-based text. The results indicated that the computer-based text group outperformed the paper-based test group. Gender, competitiveness, and computer familiarity did not affect the performance while content familiarity did.

Al-Othman (2003) examines the relationship between online reading speed rates and performance on proficiency tests. Twenty-five post-graduate students enrolled in an ESL Course at the Private Center for Teaching English as a Foreign Language in Kuwait and who are also involved in postgraduate studies. Twelve were familiar with the computer while others were not. Instruments used included a background questionnaire, the Online Speed Reading Test, and a simulated TOEFL Reading Subtest given on the computer for subjects of the study. The results of this

study indicated that reading online is slower than on paper. It is clear from the results that candidates with a strong computer familiar background performed better on the reading subtest of a simulated CBT TOEFL than those with a weak computer familiar background. It was concluded that computer familiarity play a major role in CBT TOEFL performance.

2.4 Text Familiarity and Reading Comprehension

2.4.1 Theoretical Background

As to text familiarity, it is essential to understand scheme theory (see 2.1.2). Rumelhart (1980) described schemata as 'building blocks of cognition', which plays an important role in many research fields, especially in reading and writing instruction. Schemata are known to play an important role in reading comprehension (Anderson & Pearson, 1984; Carrell, 1987; Grabe, 1991; Rumelhart, 1980). Comprehension is seen as the interaction between top-down processing from activated schemata and bottom-up processing from concepts expressed by the sentence (Auble & Franks, 1983; Adams, 1980; Spiro, 1980, cited in Bensoussan, 1998). Comprehension occurs when new information interacts with old knowledge (Anderson & Pearson, 1984; Smith, 1994).

The schema theory of reading fits within the cognitively based view of reading. Rumelhart (1977) stated that if schemata are incomplete and do not provide an understanding of the incoming data from the text, problems in processing and understanding the text may occur. What follows will review the related research works on how text familiarity affects reading comprehension.

2.4.2. Research on Text Familiarity and Reading Comprehension

To date, a large amount of studies have been done into how text familiarity impacts reading comprehension (i.e. Bensoussan, 1998; Pulido,2004; Salmani-Nodoushan, 2003; Kang, 1992). Their findings suggested that texts which contain culturally-familiar content schema are easier to process. Other studies have shown similar effects in that participants better comprehended and/or remembered passages that were more familiar to them (Ammon, 1987; Carrell, 1981; Johnson, 1981, 1982; Langer, Barolome, Vasquez, & Lucas, 1990; Shimoda, 1989). Further evidence from such studies also suggested that schemata for content affected comprehension and remembering more than did their formal schemata for text organization.

Johnson (1981) investigated the effects of the cultural origin of prose on reading comprehension of 46 Iranian intermediate advanced ESL students at the university level. Half of the subjects read the unadapted English texts of two stories, one from Iranian folklore and one from American folklore, while the other half read the same stories in adapted English. After completing reading, the subjects were asked to do multiple-choice questions to test their reading comprehension. Outcome showed that the cultural origin of the story had a greater effect on comprehension than syntactic or semantic complexity of the text.

In another study conducted in 1982, Johnson compared ESL students' recall on a reading passage on Halloween. Seventy-two ESL students at the university level read a passage on the topic of Halloween. The passage contained both unfamiliar and familiar information based on the subjects' recent experience of the custom. Some subjects studied the meanings for unfamiliar words in the text. Results of recall protocols suggested that prior cultural experience prepared readers for comprehension

of the familiar information about Halloween on the passage. However, exposure to the unfamiliar words did not seem to have a significant effect on their reading comprehension.

Carrell (1987) conducted a study to investigate simultaneous effects of both formal and content schemata on ESL reading comprehension, involving two groups of subjects: 28 Muslim Arabs and 24 Catholic Hispanic ESL students of high-intermediate proficiency at a midwestern university. Each student read two texts, one with Muslim-oriented content and the other with Catholic-oriented content. Each text was presented in either a well-organized rhetorical format or an unfamiliar, altered rhetorical format. After the subjects read the text at their own pace, they were tested on recall by writing down everything they could remember from the passage. Also, a set of 14 multiple-choice comprehension inference questions for each text was given to the subjects. Analysis of the recall protocols and scores on the comprehension questions suggested that schemata affected the ESL readers' comprehension and recall. Participants better comprehended and remembered passages that were similar in some way or were deemed more familiar to their native cultures. The finding supported the results of previous studies that subjects remembered the most when both the content and rhetorical form was familiar to them. It was also revealed that reading is easiest when both content and form are familiar and that reading is the most difficult when both are unfamiliar.

Bensoussan (1998) examined the effects of faulty schemata on reading comprehension. The participants were 125 doing a test of reading comprehension at the end of an advanced English reading course at Haifa University. The final examination consisted of two parts: first section required students to translate five

sentences containing vocabulary learned during the course. The second section required them to read two academic texts on abstract topics already read in class. The findings showed that use of wrong schemata or prior knowledge was a significant factor influencing text scores.

Salmani-Nodoushan (2003) investigated the effects of text familiarity, task type, and language proficiency on university student's test and task performances. A total of 541 Iranian university students took the Task-Based Reading Test (TBRT). Three instruments were used in the present study: The sample version of the IELTS General Training Reading Module, a Self-report Questionnaire, and the Task-Based Reading Test. In the study, text familiarity was one of the independent variables. In order to determine whether the subjects had any prior familiarity with the content of the texts that appeared in the different modules of the TBRT. A self-report questionnaire was developed to collect data. The results showed that their overall test performance was found to be significantly influenced by text familiarity, language proficiency and the interaction between text familiarity and language proficiency.

Pulido (2004) examined the effects of topic familiarity on passage comprehension and intake, gain and retention of new lexical items from the passages. Ninety-nine adult learners of Spanish read more and less familiar script-based narratives. There appeared to be only a modest significant positive correlation between lexical intake from the more familiar passages and intake from the less familiar passages, the finding also suggested a possible effect of topic familiarity on lexical intake.

The related studies reviewed above indicated that although all the variables and factors surrounding the issues of how background knowledge influences reading

has not been fully understood, there is an agreement that background knowledge is important, and that content schema plays an integral role in reading comprehension. Overall, readers appeared to have a higher level of comprehension when the content was familiar to them. However, the previous studies have been done to examine the impact of text familiarity on reading comprehension when reading from traditional paper. Little empirical studies seem to have been conducted investigating the impact of text familiarity on reading comprehension when reading from computer screens. The present study aims to fill this gap.

2.5 Reading Strategies and Reading Comprehension

One of the purposes is to investigate the differences of strategy use between reading from paper and from computer screens. Hence, it is vital to understand the relationship between reading strategy and reading comprehension. To begin with, the conceptual framework and classifications of reading strategies are discussed. Furthermore, the assessment of reading strategies and reading strategy research are also described.

2.5.1 Conceptual Framework of Reading Strategies

Byram (2004) stated that the term ‘strategy’ is used to describe what is involved when people try to solve any problematic situation. In the interactive reading comprehension process, for example, readers can guess the meanings of unknown words from the context. This is one of the effective strategies for reading comprehension. So far, consensus about the definition of ‘reading strategies’ has not been made (see Ellis, 1994). The diversity is largely due to the way the term has been used in different contexts, such as first, second or foreign language learning.

According to Barnett (1989), reading strategies refer to "the mental operations involved when readers purposefully approach a text to make sense of what they read"(p, 66). Reading strategies are the moment by moment techniques that we employ to solve problems posed by second language input and output (Brown, 2001). Reading strategies were defined by Garner (1987) as an action or series of actions employed in order to construct meaning. Brantmeier (2002) summarizes reading strategies as follows: "The strategies may involve skimming, scanning, guessing, recognizing cognates and word families, reading for meaning, predicting, activating general knowledge, making inferences, following references, and separating main ideas from supporting ideas" (p.1).

In the light of these varieties of concepts, definitions and arguments, the term 'reading strategies' is defined for the present study as specific actions consciously employed by the students and plans for the purpose of solving problems encountered in constructing meaning of the texts when they read from paper and from computer screens.

2.5.2 Classifications of Reading Strategies

In reading strategy research, researchers used different types of classification schemes to categorize reading strategies (Anderson, 1991). For example, Grabe (1991) proposed six general reading skills and knowledge areas as follows: automatic recognition skills, vocabulary and structural knowledge, formal discourse structure knowledge, content or word background knowledge, synthesis and evaluation skills or strategies, and metacognitive knowledge and skills monitoring. Shih (1991) and Baker-Gonzalize and Blau (1995, cited in Hsu, 2007) suggested three stages of reading strategy use: before reading, while reading, and after reading. Mokhtari and

Reichard (2002) and Sheorey and Mokhtari (2001) used three broad categories in the instrument called MARSI (Mokhtari, 2000), namely, Global Reading Strategies (GLOB), Problem-Solving Strategies (PROB) and Support Reading Strategies (SUP) to assess the student's metacognitive awareness of reading strategies while reading academic or school-related materials. Metacognition represents the knowledge that students have for their cognitive processes as well as their ability to monitor, and even regulate, their cognitive processes. Metacognitive strategies are the strategies they choose to use when they have the knowledge about their cognitive processes (Mokhtari & Reichard, 2002; Lin, 2009; Sheorey & Mokhtari, 2001). As Metacognitive strategies have been proved to attribute to the success of reading strategy use (Carrell, Pharis, & Liberto, 1989; Jimenez, Garcia, & Pearson, 1996; Carrell, 1998). For the study, the researcher applied this category scheme to identify the differences of perceived strategy used by the participants when reading from paper and from computer screens.

Metacognitive-Awareness-of-Reading-Strategies Inventory (MARSI, see Appendix D)

Global Reading Strategies contains thirteen items and represents a set of reading strategies oriented toward a global analysis of text. Those strategies are used by learners to monitor or manage their reading. Examples include "I decide what to read closely and what to ignore;" "I think about what I know to help me understand what I read;" and "I have a purpose in mind when I read."

Problem-Solving Strategies contains eight items, referring to the actions and procedures readers take while working directly with the text. Such strategies are localized, focused techniques used when problems develop in understanding textual

information for solving problems when text becomes difficult to read. Examples of these strategies include “I adjust my reading speed according to what I read”.

Support Reading Strategies contains nine items described as functional or support strategies. According to Sheorey and Mokhtari (2001), such strategies are basically ‘support mechanisms intended to aid the reader in comprehending the text’, involving the use of outside reference materials, taking notes, or underlining or highlighting the text to better comprehend it. Examples include ‘I take notes while reading’, ‘I underline or circle information in the text.’

2.5.3 Assessing Reading Strategies

Many assessment tools exist for exploring the strategies used by L1/L2 researchers, for example, self-report questionnaire surveys, observations, interviews, learner journals, think-aloud techniques, and other measures have been used. Each one of these has its advantages and disadvantages (Oxford, 1990; Cohen & Scott; 1996). For this study, a self-report questionnaire survey and interviews were used. The questionnaire is adapted from MARSI to assess the students’ reading strategies used on two presentation modes (computers and paper).

2.5.4 Research on Reading Strategies

It is known that L2 reading is a very deliberate, demanding and complex process in which the students are actively involved in a repertoire of reading strategies (Shuyun & Munby, 1996). Several empirical studies have investigated and established a positive relationship between strategies and reading comprehension. For instance, Brookbank, Grover, Kullberg, and Strawser (1999) have found that the use of various reading strategies improved the students' reading comprehension. Some studies in second language (L2) contexts also showed that reading comprehension may be

attributed to the level of the effective use of reading strategies (Braum, 1985). Other studies that have attempted to investigate the relationship between reading strategies and success in comprehension have produced interesting results.

Sheorey and Mokhtari (2001) and Mokhtari and Sheorey (2002) have conducted significant research on the identification of metacognitive reading strategies of L2 learners. They have developed a new instrument, the *Survey Of Reading Strategies* (SORS), to measure the metacognitive reading strategies of L2 readers engaged in reading academic materials. Sheorey and Mokhtari (2001) used the SORS reports and found that the ESL students reported a higher use of strategies than the native English students, and a greater number of support reading strategies. Finally, students who had a higher self-reported rating of reading ability reported using a higher frequency of reading strategies than those readers who gave themselves a lower rating. The results suggested that skilled readers were more able to reflect on and monitor their cognitive processes while reading.

Mokhtari and Reichard (2002) investigated the strategic reading processes of first and second language readers in their metacognitive awareness and perceived use of specific strategies when reading for academic purposes in English. The subjects were 350 college students, studying in two different instructional settings (Morocco and the U.S.A). The MARSI instrument was used to measure the use of strategies. The study found that despite the fact that the two student groups had been schooled in significantly different socio-cultural environments, they reported remarkably similar patterns of strategy awareness and reported usage when reading academic materials in English. It was also shown that Moroccan students reported using certain types of strategies more often than did their American counterparts.

Abdul, Chew, and Kabilan (2006) investigated the awareness and use of metacognitive reading strategies of 20 good Malaysian Chinese readers. The Survey of Reading Strategies Questionnaire (SORS), developed by Mokhtari and Sheorey (2002), was administered to the subjects. Then, structured interviews were conducted with the top five good readers to obtain a picture of their use of metacognitive reading strategies. The study found that most of the subjects were moderately aware of metacognitive reading strategies and that most of the subjects moderately used Global Strategies.

Mónos (2006) conducted a study to investigate the metacognitive awareness of reading strategies of 86 Hungarian university students. The Survey of Reading Strategies of Hungarian College Students (SORS-HU) was used to reveal the type of reading strategies respondents reported using when reading academic materials in English. A background questionnaire was used to investigate the respondents' age, gender, self-rated overall proficiency in English, self-rated reading ability in English, and approximate hours per week spent on reading study-related materials during the academic year. The result indicated a high degree of awareness of the importance of applying mechanisms that aid reading comprehension among readers.

In conclusion, the findings reported above revealed that strategy use positively affects reading ability. In other words, the more strategies the readers use in their reading, the better they comprehend texts. However, most studies reviewed above on strategy use were conducted in paper context. Anderson (2003) pointed out that although there was the importance of reading strategy use and technology, little research had been reported on the online reading strategies of L2 readers. A few of researchers conducted studies exploring the strategy use when reading computer-based and paper-based texts (e.g. Anderson, 2003; Son, 2001; Yutdhana, 2007).

Son (2001) investigated the differences in the use of strategies for reading printed texts and electronic texts. A total of 9 second-year students in a Korean course at an Australian university participated in the study, ranging in age from 18 to 26 years old. Five instruments were used, namely, i) three reading passages in paper-based format, non-hypertext format and hypertext format, ii) a worksheet in Paper-based Format. iii) Two pieces of courseware called *Reading Explorer Da* (*RE Da*) and *Reading Explorer Ra* (*RE Ra*); iv) Tests, and v) Questionnaires. The results of this study indicated that foreign language readers employed different reading strategies depending on the text formats. This study found that cognitive strategies were used most in reading all the text formats. This suggested that text formats could influence reading strategies that L2 readers used.

Anderson (2003) conducted a study to examine the role of L2 strategies within the context of online reading tasks. Participants were 247 readers ranging in L2 proficiency from high beginning to high intermediate. The instrument for data collection was the Online Survey Of Reading Strategies. All data were analyzed using the ANOVA, the only differences appeared to be in Problem Solving Strategies. The findings indicated a variety of strategies that the learners reported using while reading academic materials online. An interesting finding in the data reported here was that the majority of the top 12 strategies used by the online readers are Problem Solving Strategies. The EFL readers reported using the Problem Solving Strategies more frequently than did the ESL readers.

In a very recent study by Yutdhana (2007), online reading strategies used by the graduate students of Naresuan University, Thailand, were investigated. The participants were 205 non-English major graduate students from three faculty clusters:

health sciences, social sciences, and science and technology. The instrument used was the modified Online Survey of Reading Strategies (OSORS). It was found that the graduate students used Global Reading Strategies, Problem-Solving Strategies, and Support Reading Strategies at the medium level. The current study also found that the Support Reading Strategies were used the least. With a further analysis, statistically significant differences were observed between the graduate students of social sciences and the other two faculty clusters—health sciences and sciences and technology.

Since some research has been done to gather reading strategy data from the readers in online reading contexts and in hard copy contexts, but the results were not conclusive. Therefore, further studies should be conducted to expand the database on the differences in the use of strategies when reading on the two reading contexts.

In summary, based upon the review of literature and limitations reported above, the present study investigates the effects of the three variables of text presentations, computer literacy, and text familiarity on their reading comprehension, and strategy use when Chinese non- English majors read from paper and from computer screens.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter initially justifies the choice of research methodology. Next, the subjects, the experimental design, the research procedures, the instruments and data analyses are illustrated in all details. Furthermore, a pilot study and its implications for the main study are reported. Finally, the subjects and procedures of the main study are described.

3.1 Rationale for Research Methodology

For this study, both quantitative and qualitative types of research were employed in order to investigate the effects of text presentation on the reading comprehension of Chinese college non-English major students when reading both from paper and from computer screens. That is, a mixed research approach was applied to obtain the data, which refers to an experiment and surveys.

Wright (1998) asserted that the goal of mixed methods research is not to replace either of these approaches but rather to draw from the strengths and minimize the weaknesses both in single research studies and across studies. Thus, in addition to designing an experimental task, questionnaires and qualitative interviews should be added to experiment as a manipulation check and as a way to discuss directly the issues under investigation and tap into participants' perspectives. For example, an oral interview was used to investigate the subjects' attitude towards reading from the two media and their reading strategies used with both media. According to Johnson and

Turner (2003), researchers should collect multiple data using different strategies, approaches and methods. For the present study, the triangulated data sources included participants' scores on the Reading Comprehension Test, responses of questionnaires and oral interviews.

3.2 Subjects

The subjects were 120 first-year non-English major undergraduate students, at Guizhou University (GU), Guizhou Province, southwestern China. The students were admitted in June, 2008, based on the required scores on the National College Entrance Examination (NCEE), to social sciences and humanities programs at GU for full-time academic study. The NCEE is a nation-wide standardized matriculation test for high school graduates before entering the university. All subjects shared similar characteristics in terms of age, level of education, and language ability as indicated by comparable college entry requirements based on their English scores.

Subjects, from three intact groups taught by the researcher with about 40 students in each class, were categorized by the scores on National Computer Rank Examination (Grade One) into three groups of computer literacy: Group I (Low), Group II (Moderate) and Group III (High). The allocation of an equal number of subjects from each of the three computer literacy groups to either of the two reading conditions (computer reading, paper reading) were randomized.

3.3 Instruments

The instruments used in the present study were a) National Computer Rank Examination (NCRE, Grade One), b) a Pre-Experiment Questionnaire, c) Reading

Comprehension Test, d) Post-Experiment Reading Strategy Questionnaire, and e) Semi-structured interviews.

3.3.1 National Computer Rank Examination (Grade One)

The National Computer Rank Examination (see Appendix A) is a standardized nationwide computer proficiency test in China, administered by the National Education Examinations Authority of the People's Republic of China. NCRE has been approved by the Ministry of Education for testing people's computer skills in the whole country. NCRE has set up the following four grades:

Grade One**:** to meet general requirements for computer application knowledge in daily life, the main purpose is to examine participants' ability to operate the computer including basic knowledge of microcomputers and software applications.

Grade Two ability to use one kind of computer language (BASIC, FORTRAN, FoxBASE, VisualBasic, or Visual FoxPro) for programming, and mastery of basic debugging techniques a computer is needed.

Grade Three**:** the comprehensive abilities to design programs, to manage PCs, examine PC systems and servers. It has been divided into four technical types: "PC technology", "information management technology", "data processing technology" and "network technology".

Grade Four: to test computer theory, structure of digits, discrete mathematics, software engineering, computer architecture, computer network and communication.

The test format consists of multiple-choices, a cloze test, and description question (only for Grade Four). NCRE which began in 1994 is held nationwide at the same time in every testing site to test the same content. Since 2005, the test has been held in two versions: paper-based and computer based.

For the present study, the researcher employed the 2006 NCRE Grade One, the newest one in the paper version to categorize the subjects into three groups of computer literacy. This test consists of two parts: part one contains 55 multiple choice questions; part two includes 10 cloze test items, with the total scores of 100.

3.3.2 Questionnaire

A questionnaire is a useful instrument in collecting different types of data such as background, knowledge and behaviors, attitudes, values, opinions or beliefs from respondent (Punch, 1998). According to Bialystok (1981), the advantage of using questionnaire is that it can easily be administered to a large group of participants, scoring and data compilation are relatively simple, and more importantly, precise quantitative measures can be derived. Wilkinson and Birmingham (2003) stated that an effective questionnaire enables the transmission of useful and clear and unambiguous questions so that the respondent may interpret them, articulate his or her response and transmit it effectively to the researcher. For the present study, in order to gain background information about the participants, to measure the level of familiarity with the reading texts, and to investigate strategy use in text presentation media and the attitudes toward them, questionnaires were used to collect a large amount of data from the subjects.

Pre-Experiment Questionnaire

Before conducting the main experimental task, a Pre-Experiment Questionnaire (PEQ, see Appendix B) was administered to the participants. There were two primary goals: first, in order to collect demographic information about their gender and age; and their English scores from the NCEE; second, to know whether they had prior knowledge of the reading passages to verify texts used in the present

study. Since it was believed that background knowledge of or familiarity with a subject area may influence reading comprehension and the type of strategies used by the participants, two types of texts were included in the study: familiar texts and unfamiliar texts.

The questionnaire contained seven items: items 1 through 3 were concerned with the subjects' gender, age, and English score in NCEE, respectively. Items 4 through 7 were related to familiarity with the reading passages.

Post-Experiment Reading Strategy Questionnaire

After completing the experimental task, Post Experiment Reading Strategy Questionnaire (PERSQ, see Appendix E) was administered to subjects to explore the differences in the use of reading strategies reported by the students when reading from paper and from computer screens.

Metacognitive-Awareness-of-Reading-Strategies Inventory (MARSI, see Appendix D) was adapted for use in the present study, focusing on metacognitive strategy use within the context of academic reading. MARSI was developed by Mokhtari and Reichard (2002) for measuring "adolescent and adult students' awareness and use of reading strategies while reading academic or school-related materials". It consisted of 30 items, using a five-point Likert scale ranging from 1 (I never or almost never do this) to 5 (I always or almost always do this).

The MARSI instrument measures three broad categories of reading strategies: Global Reading Strategies (GLOB), Problem-Solving Strategies (PROB) and Support Reading Strategies (SUP), while another instrument- The Survey Of Reading Strategies (SORS) (an adaptation of MARSI) developed by Sheorey and Mokhtari (2001) measures the same three categories of reading strategies but uses different

terms, namely Metacognitive strategies (MET), Cognitive strategies (COG) and Support strategies (SUP). Mokhtari and Reichard (2002) and Sheorey and Mokhtari (2001) reported the overall reliability for coefficients for the three subscales (Global Reading, Problem-Solving, and Support Reading Strategies) of MARSI is 0.92, 0.79 and 0.87, respectively. The reliability for the total sample was 0.93, indicating a reasonably dependable measure of metacognitive awareness of reading strategies (Sheorey & Mokhtari, 2001). The adapted questionnaire was named Post-Experiment Reading Strategy Questionnaire. A total of 21 items were included. The same names of the three categories were maintained, namely, Global strategies, Problem solving strategies and Support strategies.

In PERSQ, the first category including items 1, 4, 7, 8, 11, 15, 19, and 21 were Global reading strategies, which were those "intentional, carefully planned techniques"(Mokhtari & Sheorey, 2002: 4). Such strategies included "having a purpose in mind, previewing the text as to its length and organization". These strategies have been considered to be vital for successful learning in a second language (O'Malley & Chamot, 1990). The second category including items 5, 6, 10, 12, 14, 18, and 20 were "Problem solving strategies", dealing with the actions and procedures readers use while working directly with the text (Mokhtari & Sheorey, 2002); The third category including 2, 3, 9, 13, 16, and 17 was "Support reading strategies", dealing with using a dictionary, taking notes, underlining or highlighting the text to better comprehend it (Mokhtari & Sheorey, 2002).

In the PERSQ, five-point Likert scale ranging from 1 (I never or almost never do this) to 5 (I always or almost always do this) was used with three types of usage level (i.e. high, medium and low). According to Mokhtari and Sheorey (2002),

there are three levels of reading strategy usage that can be identified: high (average score of 3.5 or higher), moderate (average score of 2.5 to 3.49) and low (average score of 2.49 or lower). This scale was used as a convenience benchmark to interpret the data obtained and hence, identify the learners' reading strategy usage level to make comparisons between the subjects with respect to their reading strategy use while reading texts from paper and from computer screens.

The questionnaires were piloted before the main study on small number of students who shared similar characteristics with the subjects of the study to determine the internal consistency of the 21 items.

Reliability and Validity of the PERSQ

The reported Cronbach's alpha for the overall PERSQ was .89. The reported Cronbach's alpha values for Global Reading Strategies, Problem Solving Strategies and Support Reading Strategies are .87, .83, and .77, respectively. These data helped to prove that the PERSQ was a reliable instrument for the present study in assessing the use of reading strategies when reading on two presentation modes. Also the questionnaire was confirmed by five experts for its validity.

3.3.3 Reading Comprehension Test

In order to examine the effects of text presentations on reading comprehension, the participant's reading outcome was assessed on the Reading Comprehension Test (see Appendix C). It consisted of four reading passages with 10 multiple choice question items for each. In constructing an effective reading comprehension test for the current study, the theoretical foundations of Alderson (2000) and Clapham (1993) were used as a guide:

a) the test should contain enough items including easy and difficult items to allow students to demonstrate their English proficiency within a limited time.

b) test reliability and validity, level of difficulty of test items and power of discrimination should be taken into account as the basis of test item selection.

Brown (1987) defined 'reliability' as the extent to which the results can be considered consistent or stable. As to 'validity', Wiersma and Jurs (2005) defined it as the appropriateness of the interpretation of the results of a text and its specificity to the intended use. A valid test should test what it aims to test. It consists of four types of validity: face validity, construct validity, content validity and predictive validity, among which content validity is of most concern to the test constructor and is widely regarded as the essence of a language test. Castillo (1990) stated that usually the first approach to establishing content validity is through getting 'experts', in this case language teachers.

Apart from reliability and validity of the test, the level of difficulty and power of discrimination of the test were measured. To serve this purpose, Item Analysis System (IAS, see 3.7.3.2) developed by Khaimook (2004) was used. According to Mehrens and Lehmann (1978), Item Analysis (IA) is the process examining the students' responses to each test item to judge the quality of the item. There are two measures: one is the facility value which measures the level of difficulty of an item; the other is the discrimination index which measures the extent to which the results of an individual item correlate with results from the whole test.

Before conducting the main experiment, the reading comprehension test was piloted to measure its reliability, and to check the level of difficulty of test items and their power of discrimination.

Reading Passages

Since text familiarity or prior knowledge of the content of texts was one of the independent variables in the study every attempt was made in choosing the reading material to control for prior knowledge of topic. Familiarity with the text was confirmed by asking the subjects to skim the selected texts and complete the questions in Pre-experiment Questionnaire. And the researcher also checked with five instructors who had taught English for more than 15 years so that the researcher could determine whether the topics of the passages were familiar or unfamiliar to the subjects.

The texts used for the present study were four expository passages, two texts pertaining to familiar scenarios and two texts of unfamiliar scenarios. In selecting the familiar passages, those with the general topics which may be familiar to the subjects, such as, daily life, traveling, culture, etc. were taken into consideration. As to the choice of unfamiliar passages, it is generally agreed that those with new subjects or a specialized professional texts can be regarded as unfamiliar passages because readers may not have adequate schemata to relate to the text.

Therefore, two familiar passages were selected for this study from College English Intensive Reading Book One; the two unfamiliar passages were selected from CET Test Book, Level one. There are four levels in CET Test, ranging from one to four in order of proficiency level. The reason why the four passages were chosen was that they were at the level of first year non-English majors. The four passages were judged by five experienced EFL teachers at Guizhou University to be comprehensible

to first year college students. Additionally, the researcher made rough estimates of other aspects of the passages, such as length and text type based on some guidelines from the work of Clapham (1993), and teaching experience as a college English teacher for around 15 years. The mean length of the passages was about 345 words. Ten multiple-choice questions for each passage were used to measure the students' reading comprehension. Furthermore, the four passages were piloted to check their appropriateness and the results indicated that they all matched the level of the first-year college students. The description of the four passages is presented in section 3.7 (see Table.3.1).

Two Types of Text Presentation of the Reading Passages

The selected texts were presented in two different presentation media: on computers and on paper. The paper and digital versions of the texts were matched as similarly as possible. For both the computers and the paper display, the font was 12-point Times New Roman, single-spaced, with a maximum of 85 characters per line. Black text was typed on a white background. The first line of each paragraph was indented three spaces. Texts of the two versions was full justified

For computer reading, the four texts were typed into a computer. The resolution of the image was controlled for. Digital versions of the texts were powered by a Pentium IV processor and presented on a standard 14" colour monitor made by Lenovo in China. Pixel dimensions of the monitor were 1024×768, and it had a refresh rate of 60 Hz. The computer presentation allowed for 25 lines to be seen in the viewing area and was presented using a scrolling interface.

For paper reading, the same texts were printed out on A4 paper using a laser printer. Each passage had 44 lines in total. The text covered a space of approximately 29.7cm (height) × 21 cm (width).

Multiple -Choice Questions

Reading is an outward manifestation of an inward process, and therefore assessing L2 reading comprehension is a difficult task. Alderson (2000) pointed out that normally readers do not produce oral output data while reading, and therefore instructors cannot know what is happening in the mind students. To gain a picture of readers' understanding of a text, comprehension is measured after the reading is complete. And some of the most widely used comprehension assessment measures are multiple choice questions, written recalls, cloze tests, sentence completion, and open-ended questions. Alderson (2000) argued that there is no one best method for testing reading. The outcome of each individual assessment task provides a limited representation of reading comprehension.

For the present study, multiple choice questions were utilized to measure the outcome of reading from both media. Ur (1996) defined multiple-choice questions as consisting of a stem and a number of options (usually four), from which the testee has to select the right one. There are some reasons for multiple choice questions being widely used as a type of reading comprehension assessment. First, the multiple-choice test items can provide testers with the means to control test-takers' thought processes when responding (Alderson, 2000). Besides, multiple-choice questions can be used as a comparatively effective means of testing reading comprehension (Greenlee-Moore & Smith, 1996). For example, it was effectively used in the recent study investigating the effect of e-books on reading comprehension (Maynard & McKnight, 2001a); next, it is easy to grade and the readers can get immediate feedback on incorrect/correct answers in computer medium. Weir (1990) also mentioned that multiple-choice questions are fashionable since marking them is totally objective; and finally, the

students would be familiar with the test format, which can reduce anxiety that may be introduced by the application of unfamiliar task types in a test.

Multiple-choice questions include retrieval cues, and the answers are predetermined with no ambiguity in the scoring of right or wrong answers. The 40 multiple choice items for the present study met the following criteria: all items were absolutely passage dependent (Bernhardt, 1991); the subjects were not able to determine correct responses by looking at the other questions on the page (Brantmeier, 2003); each of the multiple choice questions had four response choices: one correct response and three distracters; all distracters were plausible (Alderson, 2000), and all multiple-choice questions were designed so that they could be answered correctly only if the participant had read and understood the relevant passages.

3.3.4 Semi-Structured Interviews

Interviews have the ability to address issues relating to a particular research concern. It is one of the main data collection tools in qualitative research, and a good way of accessing people's perceptions, meanings and definitions of situations and constructions of reality.

One advantage of interviews is that they can help researchers obtain data about the interviewees' personal information, opinions, beliefs, and attitudes. The interviewer can clarify his or her questions when the interviewees do not understand. However, a weakness is that there is a lack of standardization which raises concerns about reliability, since some interviewees will intentionally distort the answer. Biases are difficult to rule out, and the interview may consume a great deal of time and effort.

According to Nunan (1992), interviews can be characterized in terms of their degree of formality and can be placed on a continuum ranging from unstructured

through semi-structured to structured. In an unstructured interview, researchers exercise a little or no control over the interviewee during the interview. Open-ended questions are usually asked, and the interviewees respond to those questions in their own words. In a semi-structured interview, the interviewer has worked out a set of questions in advance, and during the process he or she can leave out particular questions or include additional ones. And the interviewer exercises more control over the topics and the contents.

Nunan further claimed that "…because of its flexibility, the semi-structured interview has found favour with many researchers, particularly those working within an interpretative research tradition" (1992:149). This is also consistent with Merriam (2002) who mentions that a semi-structured interview is flexible enough to allow researcher o respond to the situation at hand, to the emerging world-view of the participants, and to new or unforeseen ideas on the topic.

Therefore, in the present study, semi-structured interviews were used to learn about the subjects' attitudes toward reading from paper and from computer screens. According to Ellis (1994: 534) the interview is one way that researchers can investigate language learning strategies that students use and how they use them because interviews call for retrospective accounts of the strategies they have employed, thus also it was used to investigate their strategy use when subjects read from the two media.

In order to achieve a genuine and open response from participants and avoid misunderstanding because of language problems, the researcher posed neutral, open-ended questions to interviewees in Chinese. Beyond that, the interviews were guided by the goal of eliciting their perspectives in depth. Interviews were tape recorded (audio tape) for the sake of detailed analysis afterwards. Hence, the

researcher asked the participants for permission of tape-recording before the interview. After the interview, the researcher transcribed verbatim all the interviews and translated them into English for data analysis.

3.4 Experimental Design

The experiment was set up as a 2 (text presentations) ×3 (computer literacy) ×2 (text familiarity) mixed factorial design (see Figure 3.1), with text presentation and computer literacy as between-subjects variables, and text familiarity as a within-subjects variable. The independent variables of the study were modes of presentation (Computers, Paper), Computer literacy (Low, Moderate and High) and Text familiarity (Familiar, Unfamiliar). The dependent variable of the study was reading comprehension (scores on the Reading Comprehension Test).

3.5 Research Procedures

Data collection was conducted in three phases in the study. The first phase was to gather the subjects' demographic information and to confirm their familiarity with the selected reading passages; and also to categorize the subjects into three groups in terms of their computer literacy level by the use of NCRE (Grade One). The second phase was mainly to examine the effects of text presentation on the subjects' reading comprehension via reading passages from paper and from computer screens. The third phase was to investigate the subjects' reading strategy use in two media via post experiment questionnaire and explore their attitudes toward reading from paper and from computer screens by using semi-structured interviews. The detailed description for the data collection procedures are presented in 3.8.2.

3.6 Data Analysis

The data obtained from different research resources were analyzed and interpreted both quantitatively and qualitatively.

3.6.1 Quantitative Data Analysis

The information about the participants gathered from the questionnaires as well as scores for the number of correct answers for the Reading Comprehension Test and NCRE were entered into a computer for data analysis. This part deals with the statistical methods used in the present study. All statistical tests were performed at a .05 significance level.

3.6.1.1 Descriptive Statistics

Descriptive statistics was employed to calculate the mean gender, age of the subjects, and the mean scores on NCRE and the Reading comprehension test. Also it was used to analyze the data from the PERSQ to examine the strategy use when reading on paper and on computer screens.

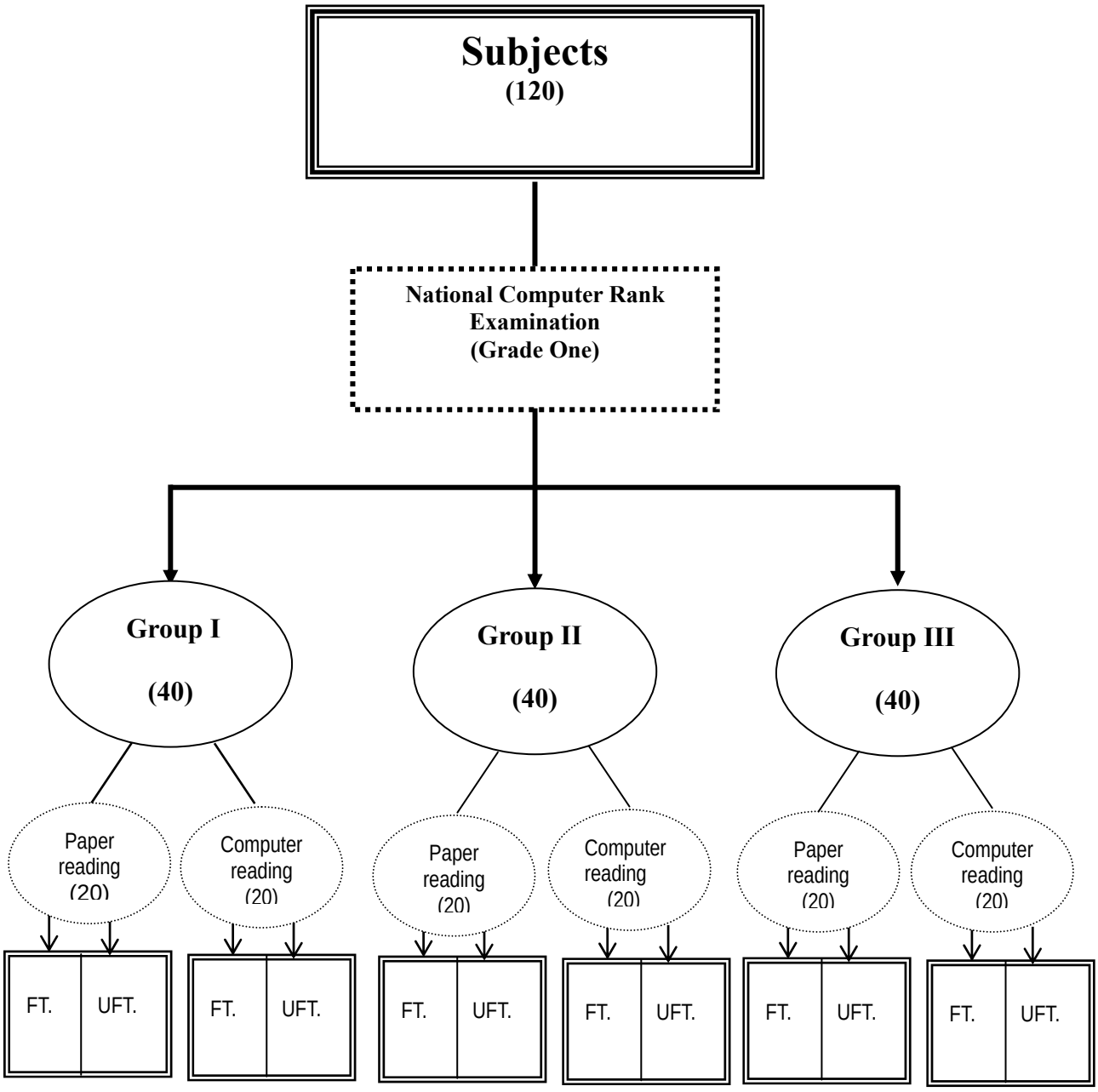

Figure 3.1 Experimental Design

Group I =Low level of computer literacy,

Group II =Moderate level of computer literacy,

Group III =High level of computer literacy,

FT. = Familiar Text

UFT. = Unfamiliar Text.

3.6.1.2 ANOVA

In order to verify that there were no significant differences in language proficiency, gender and age among the three computer literacy groups, the average scores of the three groups reported by the subjects on Pre-experiment Questionnaire were analyzed by ANOVA.

3.6.1.3 Independent Samples t-Test

Before the experimental task, the subjects' mean scores of language proficiency, gender and age between the two presentation modes were calculated to identify if there were any significant differences, an independent t- Test was employed. The null hypothesis was proved that the average scores between the two presentation modes were not significantly different. After the experiment task, it was also used to test the effects of the text presentations on reading comprehension when reading from paper and from computer screens.

3.6.1.4 Mixed Design ANOVA

The mixed design ANOVA is generally used to test for differences between two or more independent groups while subjecting participants to repeated measures. The dependent variable is continuous (measured at the ratio or interval level) and is measured for each group across each level of the repeated factor. Therefore, the mixed design ANOVA is regarded as the most appropriate test for the present study. It was employed to examine the main effects of the three independent variables, namely, text presentation, computer literacy and text familiarity to answer the first three research questions. Also, the interactions between and among the three variables were examined to answer the fourth research question.

3.6.2 Qualitative Data Analysis

For the present study, content analysis was used to analyze the transcriptions of the semi-structured interviews to get in-depth feedback on whether the subjects employ different strategies when they read on two presentation media, and to explore the students' attitudes toward reading from paper and from computer screens.

The interview data were first transcribed verbatim and translated into English for the sake of analysis since the interviews were conducted in Chinese. Then, the researcher listened to each recording as many times as necessary to be sure the transcription accurately reflect the attitudes of the participants toward reading from both media and their experiences with respect to the experimental task, their real strategy use on the two reading media as well. After that, the researcher conducted content analysis in terms of participants' categories, synthesized the results, and then made a written report.

3. 7 Pilot Study

From September 15th to October 9th, 2008, a pilot study was conducted at Guizhou University, Guizhou Province, China. All the instruments employed in the main study, namely, NCRE (Grade One), Pre-Experiment Questionnaire (PEQ), Reading Comprehension Test, Post-Experiment Reading Strategy Questionnaire (PERSQ), Semi-structured interviews were piloted. The procedures of the pilot study and its implications for the main study are presented in the sections below.

3.7.1 Subjects

The pilot study was conducted with 30 first-year non-English major undergraduate students, 20 males and 10 females, with an age range of 18-20 years,.

The subjects shared similar characteristics relative to age, level of education, and language ability as those in the main study.

3.7.2 Procedures

The procedures were presented as follows:

Step 1: NCRE (Grade One) was initially given to the subjects in paper version in order to collect data about their computer literacy. Based on the scores from the examination, the subjects were divided into three categories of computer literacy. NCRE was applied to categorize the students into 3 groups: Group I, Group II and Group III.

Next, the PEQ was administered to the participants in order to collect demographic information about their gender, age, and their English scores from the NCEE; Meanwhile, the reading passages without the comprehension questions also was given to the subjects to know whether they have prior knowledge of the reading passages to verify texts used in the present study by ticking the brackets under the title of “familiar” or “unfamiliar” in the pre-experiment questionnaire.

Step 2: After that, 30 participants were required to do the experimental task. The participants completed all the tasks in the allotted time 70 minutes. The similar procedures are described in detail in step 2 of phase II for main study (see 3.8.2.2)

Step 3: The survey of reading strategy use took place right after completing the reading task. All participants were asked to fill out the PERSQ in 15 minutes during the regular class time based on the reading passages they have just read

Step 4: Within the following two days semi-structured interviews was undertaken in order to investigate the strategy use, and the subjects’ attitudes toward reading from paper and from computer screens. Six students were randomly selected

as the interviewees from the three computer literacy groups: Group I, Group II and Group III, 2 interviewees from each; among the 2, 1 was from paper reading and 1 from computer reading condition.

3.7.3 Data Analysis

During weeks 3 and 4 of September, data collected from the pilot study were analyzed by the researcher. All the test paper and questionnaire were checked and graded by the researcher. The data obtained was analyzed and interpreted in two main ways, quantitative and qualitative data analyses.

3.7.3.1 Questionnaires

Pre-Experiment Questionnaire

The descriptive statistics, one-way ANOVA and the independent samples *t*-test were used to analyze the data from the Pre-experiment Questionnaire in terms of gender, text familiarity, and language proficiency, etc.

Post Experiment Reading Strategy Questionnaire

Data from post experiment questionnaire were analyzed by descriptive statistics for the means and standard deviation for strategy use. And also the independent samples *t*-test was calculated to compare the strategy use on two text media.

3.7.3.2 Reading Comprehension Test

The reading comprehension test papers were graded by the researcher. In grading the test items, the correct answer is given “1” and the incorrect or unanswered item is given “0”. This criterion and the test itself were also approved by three experienced EFL teachers and experts. In addition, Item Analysis System (IAS) was used to test its validity and reliability.

Test Reliability

The reliability of the test was checked by using internal consistency between the items and the overall scores with index of Coefficient Alpha of Cronbach. The value of Cronbach's alpha for the test was 0.821, suggesting that the items have relatively high internal consistency since a reliability coefficient of .70 or higher is considered acceptable in most social science research situations (A-kakul, 1999).

Test Validity

A valid test should test what it aims to test. The Reading Comprehension Test with four passages and 40 multiple choice questions was verified by 5 teachers and experts before the experimental task. Three are EFL teachers who have been teaching English for over 15 years. The other two are experts who have obtained associate professors in academic status and also have been teaching English for more than 15 years. After completing the test, the subjects were asked to orally comment about the test difficulty and the test format to check the validity of the test. The purpose is to validate the contents of the Reading Comprehension Test to check whether or not the passages for the study are familiar or unfamiliar, and also whether or not the test items are appropriate for the College non-English major students.

Item Analysis System

Based on the data obtained from the pilot study, the Item Analysis System (IAS) developed by Khaimook (2004) was carried out to check the quality of all the 40 items in the Reading Comprehension Test for the study. Since item analysis is a very useful procedure for the test constructor to take into consideration when constructing a test. Hughes (1989) gives a comment about the importance of the item analysis:

> "Even individual items make their own contribution to the total test. Some contribute more than others, and it is the purpose of tem analysis to identify those that need to be changed or replaced". (p.160)

Therefore, it is essential to employ the students' test scores obtained through the piloting stage for the item analysis.

According to Khaimook (2004), the items were checked according to Classical Test Theory (CTT), which is a traditional approach to test development centering upon two item statistics: item difficulty (p = the proportion of examinees choosing the correct response) and item discrimination (r = the correlation between passing the item and some measure of ability such as the total test score)

Each item was analyzed for the difficulty level (p) and discrimination index (r). In IAS, the items with the difficulty value between 0.30 and 0.70 ($0.3 <= p <= 0.7$), and $r > 0.2$ are considered to be appropriate. If $p > 0.7$ and $r < 0.2$, the items are considered too easy with low discrimination, while if $p < 0.3$ and $r < 0.2$, the items are considered too difficult with low discrimination.

Formula 1: Test Difficulty Level Formula (Khaimook, 2004)

$P = (P_H + P_L)/2$

P= difficulty level of the test

P_H = the proportion of correct response in high ability group

P_L = the proportion of correct response in low ability group.

The formula means that the difficulty index of an item is the proportion of correct response in high ability group and low ability group divided by 2.

Forlula 2: Discrimination Power Formula (Khaimook, 2004)

$r = P_H - P_L$

r = discrimination index

P_H = the proportion of correct response in high group

P_L = the proportion of correct response in low group

The discrimination index for appropriate items must meet the criterion of 'r >=0.2'.

3.7.3.3 Semi-structured Interview

The interviews were recorded by MP4, and transcribed and translated into English. The student's interview data were analyzed with content analysis.

3.7.4 Results of the Pilot Study

3.7.4.1 Reading Comprehension Test

Reading passages

One thing that needs to discuss here is that two initial passages (1 and 4) were changed. The initial passage 1 titled as "The Old and the Young" was replaced by another passage titled as "High Cost of Living". One reason is that the old passage 1 with 556 words is much longer than the rest of the passages with around 340 words; another reason is that the topic of the old passage 1 is similar to that of passage 2, in terms of contents, that is, both are concerned with culture. The initial Passage 4 "Alder Trees" was replaced by the new passage 4 titled as "the History of Glass". The reason is that the sentence structure and words are vague and difficult for the subjects. The description of the four passages is presented in Table 3.1.

Table 3.1 Description of the Four Passages

Passage Type	Title	Length	Text Type	Main Idea
Familiar	High Cost of Living	345	Expository	The cost of living for families keeps increasing in USA.
	Language and Culture	349	Expository	Influence of language and culture on human beings
Unfamiliar	Statistics	331	Expository	Development of statistics
	History of Glass	356	Expository	The history of glass

By descriptive statistics, the frequency of the text familiarity for the four passages used in the study was calculated; the results are shown in the following table.

Table 3.2 Frequency of Text Familiarity for Four Passages (N=30)

Passage	Text Familiarity	Percentage
Passage 1	Unfamiliar	16.7
	Familiar	83.3
Passage 2	Unfamiliar	23.5
	Familiar	76.5
Passage 3	Unfamiliar	73.3
	Familiar	26.7
Passage 4	Unfamiliar	70.0
	Familiar	30.0

Table 3.2 shows that the majority of students reported that they were familiar with passage 1 (83.3 percent) and passage 2 (76.5 percent) while the majority of students were not familiar with passage 3 (73.3 percent) and 4 (70 percent). The researcher also checked the text familiarity with five instructors who have been

teaching English for more than 15 years. Therefore, the passage 1 and 2 are verified to be familiar and passage 3 and 4 are unfamiliar to the subjects.

In conclusion, the reading comprehension test was considered to be valid as the instrument to determine the students' reading ability for the present study since they have been validated by the teachers and experts. The results from IAS indicate that of all the 40 items, 31 items are considered to be the appropriate items, 9 items are inappropriate, among which 5 items are too easy and 4 items are too difficult. The appropriate items with Level of Power of Difficulty and Discrimination values are listed in Table 3.3.

Table 3.3 shows that 31 items fit Classical Test Theory model since they meet the criteria of difficulty values between 0.3 and 0.7, and discrimination values over 0.2. Five items (Items 2, 5, 6, 7, 14) out of the total 40 items are too easy because their difficult indexes are higher than 0.7 and discrimination indexes are lower than 0.20. Four items (Items 32, 34, 36, 40) are too difficult for the subjects, since their difficulty indexes are lower than 0.3 and their discrimination values are below 0.2. Therefore, those too easy and too difficult items need to be improved or modified to fit the subjects in the main study.

3.7.4.2 Post Experiment Reading Strategy Questionnaire

The data obtained from the questionnaires were submitted to SPSS 15.0 for Windows to calculate the reliability index for each group and its overall index also were calculated. The reliability of the questionnaire was checked, using method of Coefficient Alpha of Cronbach (0.89) indicating a reasonable degree of consistency in measuring perceived use of reading strategies when reading from computers and reading from paper. Also all of the statements of the questionnaire were checked by five experts for its content validity.

Table 3.3 Results of Item Analysis of Reading Comprehension Test Items

Items	Level of Difficulty	Power of Discrimination	Analysis Result
1	0.490	0.295	Appropriate item
2	0.270	0.221	Too easy
3	0.470	0.319	Appropriate item
4	0.580	0.106	Appropriate item
5	0.240	0.298	Too easy
6	0.540	0.159	Too easy
7	0.590	0.110	Too easy
8	0.450	0.250	Appropriate item
9	0.350	0.233	Appropriate item
10	0.410	0.123	Appropriate item
11	0.470	0.335	Appropriate item
12	0.320	0.255	Appropriate item
13	0.520	0.338	Appropriate item
14	0.450	0.176	Too easy
15	0.410	0.312	Appropriate item
16	0.560	0.160	Appropriate item
17	0.430	0.283	Appropriate item
18	0.310	0.237	Appropriate item
19	0.520	0.136	Appropriate item
20	0.300	0.324	Appropriate item
21	0.510	0.225	Appropriate item
22	0.550	0.273	Appropriate item
23	0.560	0.207	Appropriate item
24	0.660	0.228	Appropriate item
25	0.590	0.039	Appropriate item
26	0.540	0.307	Appropriate item
27	0.520	0.248	Appropriate item
28	0.420	0.303	Appropriate item
29	0.600	0.257	Appropriate item
30	0.450	0.180	Appropriate item
31	0.460	0.191	Appropriate item
32	0.250	0.165	Too difficult
33	0.420	0.170	Appropriate item
34	0.590	0.157	Too difficult
35	0.440	0.298	Appropriate item
36	0.780	0.129	Too difficult
37	0.610	0.178	Appropriate item
38	0.310	0.154	Appropriate item
39	0.560	0.207	Appropriate item
40	0.590	0.133	Too difficult

In doing the pilot study, the researcher discussed the items with the students to check whether or not they could understand all the items fully and also check any ambiguities for any items. After finishing the post experiment questionnaire, the students reported that they could not fully understand some items in English and there were a little ambiguity for some items. The data analysis for the questionnaires and interviews was carefully discussed in the main study (see Chapter IV).

After the pilot study, the researcher prepared the final version of the Pre-Experiment Questionnaire and Post Experiment Reading Strategy Questionnaire for the main study.

3.7. 5 Implications for the Main Study

1. Pilot study confirmed that passages 1 and 2 are familiar texts whereas passage 3 and 4 are unfamiliar texts, and all passages are appropriate for the first year college non-English major students in terms of text difficulty.

2. Some items of the Reading comprehension test need to be rewritten and improved. Bt using Item Analysis, it was found that item 2, 5, 6, 7, and 14 too easy, and item 32, 34, 36, and 40 too difficult. All of these items need to be modified to fit for the participants in the main study.

3. Since in pilot study, some participants reported that 70 minutes were not enough for them to finish the experiment task, time for doing reading comprehension test and post experiment reading strategy questionnaire (PERSQ) should be longer for the main experimental phase. Thus, time allocated to RCT should be changed from 70 into 80 minutes, and time for PERSQ will be changed from 15 minutes into 20 minutes.

4. In terms of PERSQ, since some students reported having difficulty in understanding the contents of some of the terms of the strategy items in English, it

was decided that the questionnaire be administered in the native language, Chinese, which the participants were most proficient in and comfortable with. Thus, this was to guarantee successful data collection and avoid comprehension difficulties that participants might encounter when given the English version.

Moreover, from the pilot study, some items were discarded, namely, items 9, 15, 18. Since it is a reading comprehension test, not reading a story material for fun, Item 5 'reading for fun' is not appropriate in this situation. As to initial item 15 'using reference materials', in the course of doing reading task, the students were not allowed to use any reference materials, therefore, this item is not appropriate. With reference to item 18 'using tables, figures, and pictures in the text', since there were no any tables, figures and pictures in the reading texts, this item is not related to the study. As a result, the initial total 24 items were reduced by number to 21 strategies.

5. When doing the experimental task, the participants should be given repeated explanation of what they should do orally in addition to being given the instruction sheet for them to read. The purpose of which is to ensure that the participants would know the procedures of the experiment task clearly and completely.

6. Preparation of the interviewees is needed. Pilot interviews showed that those who received the questions longer could provide more information than those who got the questions shorter before the interview. Therefore, prior to the interview, the guided question list should be given to the students so that they can have enough time to prepare.

3.8 Main Study

3.8.1 Subjects

A total of one hundred and twenty first-year non-English major undergraduate students at Guizhou University (GU), Guizhou Province of China, participated in the main study. They were from three intact groups taught by the researcher according to the curriculum plan in multimedia web-based course. The researcher met them every Thursday and Friday morning for 100 minutes.

The subjects were categorized into three groups of computer literacy: Group I (Low), Group II (Moderate) and Group III (High) by the scores of NCRE (Grade One).

The subjects were matched across conditions of text presentation (computer, paper) in terms of language proficiency, and as far as possible in terms of gender. After the pre-questionnaire survey, the data were submitted to SPSS 15.0 for testing. The one-way ANOVA and independent *t*-test were performed to analyze the data obtained from background questionnaire and the NCRE. Results showed that the age of the participants ranged from 18 to 20, with the mean age of 19.

As to gender, there were no differences between males and females, $F(2,116)= 1.061$, $p > .05$ among the three computer literacy groups of low, moderate and high, and between the two reading conditions: computer reading and paper reading ($t = .217$, $df = 118$, $p > .05$).

Controls for language proficiency were confirmed by conducting t-tests on the students in two reading conditions and by one-way analyses of variance among the three groups. No significant differences were found between text presentation modes of computer reading and paper reading condition ($t = .283$, $df = 115$, $p > .05$) among the three computer literacy groups of low, moderate and high, $F(2, 119) = 1.286$, $p > .05$.

3.8.2 Data Collection Procedures

The data collection procedures of the main study included three phases, namely, the pre-experiment phase, the experimental phase, and the post experiment phase.

3.8.2.1 Phase I Pre-Experiment Phase

Phase I was conducted following the three steps:

Step 1: During week 1 of November, 2008, NCRE was given to all the subjects in their web-based multimedia course time in paper version. The aim was to collect multiple measures of subjects' computer skills, knowledge, and use to examine differences in their ability or familiarity with using a computer. Firstly, the researcher explained the purpose of the present study and doing the NCRE test paper. Next, the subjects were asked to read the instruction carefully before they began to do the test. Finally, the researcher checked them carefully when all the papers were submitted.

Step 2: The researcher examined the NCRE paper and categorized the subjects into three groups in terms of their computer literacy level by the scores of the NCRE (The full score is 100). The scores were used to categorize the subjects into three groups: those students who got scores between 27 and 40 were allocated into Low group (Group I), those with scores between 44 and 50 were into Moderate group (Group II), those with scores between 51 and 68 were into High group (Group III).

Step 3: During week 2 of the same month, the Pre-Experiment Questionnaire (PEQ) was administered to all the subjects in order to gain some information about the subjects' gender and age, and to confirm the subjects' familiarity with the selected reading passages. The researcher informed the students of

the requirement for completing the background survey as carefully as they could. Based on the data from PEQ, controls for some factors such as language proficiency and gender were undertaken. Furthermore, background information related to the subjects was collected.

3.8.2.2 Phase II: Experimental Phase

The experimental phase for main study took place in week 4 of November, 2008. The participants were tested simultaneously in three multimedia language labs in the charge of the College English Department. The rooms were illuminated from an overhead light source. The experimental task was conducted with the help of two of the researcher's colleagues. All subjects were required to complete the reading task in the allotted time (80 minutes). The procedure for Phase II was described as follows.

Step 1: The researcher did the preparation work. For Computer reading group, the documents that were to be read by the participants were opened on all the computers in order to reduce the time required for opening the test as well as any problems that might occur during computer start-up and opening the document. For Paper reading group, the reading materials were put on the desk in an envelope.

Step 2: The participants were seated based on the presentation modes either in front of a computer or at a desk. Half the subjects of each computer literacy group were seated in front of a computer, while the other half at a desk. All subjects were required to read the instruction sheet on what they should read for. Those in Computer

reading group were given the opportunity to familiarise themselves with the presentation and its navigation. The instructions were then repeated verbally to ensure that participants fully understand the task requirements.

Step 3: All the subjects in the two reading conditions read the two familiar passages and the two unfamiliar passages within 40 minutes.

Step 4: Each participant started the experimental task by reading the material provided and indicated to the researcher when they finished reading all of the passages for the first time. After that, they could re-read any sections they wanted within the allotted time.

Step 5: After finishing the reading passages, the participants in two conditions received 40 multiple-choice questions in paper version on any aspect of the material, 10 for each passage, and an answer sheet as well. Upon completing all the questions within 40 minutes, the subjects submitted the test paper and the answer sheets to the researcher. All the test papers were checked to ensure that each item was answered by subjects whenever they were handed over.

3.8.2.3 Phase III: Post Experiment Phase

This phase included two sessions: a survey of reading strategy use and semi-structured interviews which are described as follows.

Session One: A survey of reading strategy use was carried out right after completing the reading task during the rest 20 minutes for 100-minute class time. All the participants were asked to fill out the PERSQ (Chinese version) based on reading passages they had just read in order to collect data about

strategy use while reading on two presentation modes. From the pilot study, it was decided that the Chinese version of the PERSQ be used. The translated Chinese version was reviewed and checked for its clarity, readability, and appropriacy by two of my colleagues, who were associate professors and had been teaching English for 20 years, were highly proficient in both English and Chinese.

Session Two: Within one week after the experimental task, the semi-structured interviews were undertaken in order to investigate the strategy use and the subjects' attitudes toward reading from paper and from computer screens. Eighteen students were randomly selected as the interviewees from the three computer literacy groups: Group I, Group II and Group III, six interviewees from each; among the six, three were from Paper reading and three from Computer reading group.

Prior to the interviews, the researcher contacted those students and made appointments with them individually when they were conveniently available, because the students' regular timetables seemed to leave very little free time and the researcher did not want to use their in-class time. The researcher requested the students to spare some free time when they did not have classes. Next, before interview, the researcher got permission to record all information of interview. Furthermore, the interviewees were informed that all interview data was not for evaluation, so there was no right or wrong answers. Finally, the Semi-structured Interview Form (See Appendix F) was given to each interviewee.

While the interview was being conducted, the researcher addressed the students by their formal names, also asked about their life as college students, the

purpose of which was to build a relationship between the interviewer and the student, and instill trust and confidence while conducting the interview. The students reported that they did not feel anxious or nervous when being interviewed. The length of each interview varied from 15 to 25 minutes.

The guided interview questions were used to guide the interview process according to the research purposes and research questions in order to elicit opinions about the students' attitudes toward reading from paper and from computer screens to investigate their strategy use on both media.

The questions for the interview include the students' perception about their reading strategies they employed in reading on two text media, about what their experience in reading English materials, what their preference of the reading media, how they felt when reading from computers.

Some contents of the oral interview questions come from the related reading research and some come from the researcher's own experience about the reading strategies. The oral interview questions were presented in Appendix F.

Those questions were given to the students one week or three days ahead of the interviews. Since pilot interviews implied that those who received the questions longer could provide more information than those who got the questions shorter before the interviews.

In the course of interview, probes and prompts were used as a device to get the interviewee to expand on a response or guide them to give more information. In case students may not be aware of the strategy they have used, the researcher would give an example of reading strategy to help students recall strategy use.

3.9 Summary

This chapter showed the details of the research methodology employed in this study, which included all features of the research study. Also, the pilot study of all instruments used in the present study and some implications were elaborated in detail. Furthermore, in the last section, the main study including the subjects and the data collection procedures were discussed. The data analyses and the results for the main study will be presented in Chapter IV.

CHAPTER 4

RESULTS

This chapter reports the results of data analyzed both quantitatively and qualitatively. The research findings were presented in order to answer the research questions mentioned in Chapter 1. This chapter is organized according to the six research questions. Results of all of the questions are also reported through the tables.

4.1 Answer to Research Question 1:

Research Question 1 "Are there any significant differences in reading comprehension of Chinese non-English major students when reading from paper and from computer screens?"

4.1.1 Descriptive Statistics for Text Presentation

The participants' reading performance was compared in order to examine the effects of text presentation (paper reading and computer reading) on reading comprehension. The data obtained were entered into the Statistical Package in Social Sciences (SPSS), with version 15.0 for Windows for statistical analyses. For research question one, descriptive statistics was first computed to provide a general information of the comprehension total Means and Standard deviations for text presentation which are shown in table 4.1.

Table 4.1 Descriptive Results for Text Presentation (N=120)

Text presentation	Mean	S.D.	N
Computer reading	24.57	4.064	60
Paper reading	24.63	3.601	60

From the table above, it can be seen that the students' average reading score obtained in reading from computers were 24.57 with 4.064 as standard deviation, while the average score in reading from paper was 24.63 with 3.601 as standard deviation.

4.1.2 Mixed Design ANOVA Analysis for Text Presentation

In order to know if there are significant differences between the means of the two text presentation groups, a further test was used. The null hypothesis was set as "there are no different mean scores for the two text presentation modes". A 2 x 3 x (2) [text presentation x computer literacy x (text familiarity)] mixed design ANOVA in SPSS 15.0 was performed on reading comprehension, with text presentation, computer literacy as between-subjects variables and text familiarity as the within-subjects variable, and with reading comprehension as the dependent variable. The significance level was set at .05.

The mixed-design ANOVA model is used to test for differences between two or more independent groups while subjecting participants to repeated measures under the assumption of normal distribution of the scores. The dependent variable is continuous (measured at the ratio or interval level) and is measured for each group across each level of the repeated factor. Therefore, mixed-design ANOVA was

regarded as the most appropriate test for the present study. The results are shown in Table 4.2.

Table 4.2 Mixed Design ANOVA Results of Reading Comprehension for Text Presentation (N=120)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	35990.504	1	35990.504	5406.579	.000
Text Presentation	.337	1	.337	.051	.822
Error	758.875	114	6.657		

Note: Significance level is at .05.

Table 4.2 shows that there were no main effects for text presentation with $F(1,114)= .051$, $p > .05$ on the students' reading comprehension. The null hypothesis that there are no different mean scores of the text presentation modes was accepted, suggesting that the mean scores for reading comprehension of the two presentation modes were not significantly different. Therefore, it can be concluded that there are no significant differences in reading comprehension of Chinese non-English major students when reading from paper and from computer screens.

4.2 Answer to Research Question 2:

Research Question 2 "Are there any significant effects of computer literacy on reading comprehension of Chinese non-English major students?

One of the purposes for the present study was to examine the effects of computer literacy on reading comprehension of Chinese non-English major students.

The null hypothesis was set as: “there are no main effects of computer literacy on reading comprehension of Chinese non-English major students”.

The participants were categorized into three groups concerning their computer skill level (low, moderate, and high) according to the scores of NCRE (Grade One). Descriptive statistics and mixed design ANOVA in SPSS 15.0 were employed.

4.2.1 Descriptive Statistics for Computer Literacy

Descriptive statistic analysis was the first step to get an overall picture of the means and standard deviation among the three groups (See Table 4.3)

Table 4.3 Descriptive Statistics for Comprehension Means and Standard Deviation in terms of Computer Literacy (N=120)

Computer Literacy	Mean	S.D.	Minimum	Maximum
Low group	22.70	2.622	14	30
Moderate group	25.78	2.838	16	36
High group	25.15	3.030	15	32

As Table 4.3 shows, the means were 22.70 (SD=2.622) for Low group, 25.78(SD=2.838) for Moderate group, 25.15(SD=3.030) for High group. The results revealed that the students’ performance in relation to the three computer literacy groups varied differently. The scores for Low group, Moderate group and High group ranged from 14 to 30 points, from 16 to 36 points, and from 15 to 32 points, respectively.

4.2.2 Mixed Design ANOVA Analysis for Computer Literacy

In order to verify the possible effects, the mixed design ANOVA was employed and the results are presented in Table 4.4.

Table 4.4 Mixed Design ANOVA Results of Reading Comprehension in terms of Computer Literacy (N=120)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	35990.504	1	35990.504	5406.579	.000
computer literacy	102.808	2	51.404	7.722	.001*
Error	758.875	114	6.657		

Note: Significance level is at .05.

- p< .05

It was found that the main effects for computer literacy were statistically significant with $F_{(2,114)}=8.716$, $p < .05$. Therefore, the Tukey Post Hoc multiple comparisons were performed to further identify which group means is different from the others (see Table 4.4).

Table 4.5 Results of Multiple Comparisons for Computer Literacy

Computer literacy	Computer literacy	Mean Difference	Std. Error	Sig.
Low group	Moderate group	-2.80 *	.637	.000
	High group	-1.95 *	.637	.008
Moderate group	Low group	2.80 *	.637	.000
	High group	.85	.637	.379
High group	Low group	1.95 *	.637	.008
	Moderate group	-.85	.637	.379

Note: * . The mean difference is significant at the .05 level.

As shown in Table 4.5, there were significant differences between Low and Moderate group (MD= -2.80, $p < .05$), and between Low and High group (MD=1.95, $p < .05$), but there were no significant differences between Moderate and High group (MD= .85, $p > .05$).

The mixed design ANOVA showed that the participants' scores among the three groups were significantly different ($p < .05$). Therefore, the null hypothesis that there are no main effects for computer literacy on reading comprehension of Chinese college non-English major students was rejected. That is, computer literacy had significant effects on the students' reading comprehension.

4.3 Answer Research Question 3:

Research Question 3 "Are there any significant effects of text familiarity on reading comprehension of Chinese non-English major students?"

This section aims to answer research question 3 to identify whether text familiarity affects reading comprehension. In the research design, this variable was set as the within-subjects variable, which means that each person in one group of subjects was tested under all the conditions (or levels) making up the treatment factor. In the present study, the other two factors (text presentation and computer literacy) were between-subjects variables. Therefore, a 2 x 3 x (2), that is, text presentation x computer literacy x (text familiarity) mixed design ANOVA was conducted to verify the possible effects of text familiarity on reading comprehension.

4.3.1 Descriptive Statistics for Text Familiarity

Firstly, the descriptive statistics was employed to compute the means and standard deviation of reading comprehension when participants read both familiar texts and unfamiliar texts.

Table 4.6 Descriptive Statistics for Reading Comprehension in terms of Text Familiarity (N=120)

Text Familiarity	Mean	S. D.
Familiar Texts	14.56	3.035
Unfamiliar Texts	10.04	2.874

Table 4.6 is an overview of the participants' reading comprehension when the students read familiar and unfamiliar texts. The mean of 14.56 with 3.035 as the Standard deviation in reading the familiar texts was higher than the mean of 10.04 with 2.874 as standard deviation in reading unfamiliar texts. It can be noted that the participants performed better when reading the familiar texts than when reading the unfamiliar texts.

4.3.2 Mixed Design ANOVA Analysis for Text Familiarity

Then, in an attempt to verify the main effects of text familiarity on reading comprehension, the mixed design ANOVA was computed. The null hypothesis is set as: "there are no main effects of text familiarity on reading comprehension of Chinese non-English major students". The results for the main effects of text familiarity on reading comprehension were presented in Table 4.7

Table 4.7 Mixed Design ANOVA Results of Reading Comprehension in terms of Text Familiarity (N=120)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Text Familiarity	1228.537	1	1228.537	253.044	.000**
Error	553.475	114	4.855		

Note: Significance level is at .05.

** p<.001

The mixed design ANOVA results for the main effects of text familiarity shown in Table 4.7 were found significantly different with F (1,114)=253.044, p<.05, on reading comprehension when reading the familiar and unfamiliar texts. The P-value is less than the significance value set as .05. Therefore, the null hypothesis was rejected that there are no main effects of text familiarity on reading comprehension of Chinese non-English major students. It can be concluded that text familiarity had significant effects on reading comprehension.

4.4 Answer Research Question 4:

Question 4 "Are there any significant interaction effects between and among the three variables: text presentation, text familiarity and computer literacy on reading comprehension of Chinese non-English major students?

To answer research question 4, descriptive statistics was used and mixed design ANOVA tests was performed. The two-way interactions between text presentation and computer literacy, between text presentation and text familiarity, and between computer literacy and text familiarity are presented. Also the three-way

interaction among text presentation, computer literacy and text familiarity are illustrated in the following sections.

4.4.1 Two-way Interaction between Text Presentation and Computer Literacy

Descriptive statistics was firstly used to present the means and standard deviation (see Table 4.8).

Table 4.8 Descriptive Statistics for Comprehension Means and Standard Deviation in terms of Text Presentation and Computer Literacy (N=120)

Text Presentation	Computer Literacy	Mean	S.D.
Computer	Low group	22.40	2.984
	Moderate group	25.60	3.152
	High group	25.70	2.958
Paper	Low group	23.00	2.259
	Moderate group	25.95	2.523
	High group	24.60	3.103

Table 4.8 shows that in computer reading format, the mean scores of Low group, Moderate group and High group were 22.40 (SD=2.984), 25.60(SD=3.152) and 25.70 (SD=2.958), respectively. The highest mean score was obtained by High group while the lowest one by Low group. Conversely, in paper reading format, the mean scores of each group were 23.00 (SD=2.259), 25.95 (SD=2.523) and 24.60 (SD=3.103), respectively. Unlike in computer reading format, in paper reading format, the highest mean score was obtained by Moderate group not by High group.

The mixed design ANOVA was performed by using Between-subjects Tests. The results for interaction between text presentation and computer literacy are presented in Table 4. 9.

Table 4.9 Mixed Design ANOVA Results for Interaction between Text Presentation and Computer Literacy (N=120)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	35990.504	1	35990.504	5406.579	.000
Text Presentation* Computer literacy	4.975	2	2.488	.374	.689
Error	758.875	114	6.657		

Note: Significance level is at .05.

Table above shows that there was no significant interaction between text presentation and computer literacy with MS= 13.517, $F(2,114) = .374$, $p > .05$.

4.4.2 Two-way Interaction between Text Presentation and Text Familiarity

Descriptive statistics was first employed to present the means and standard deviation of reading comprehension when subjects read both familiar texts and unfamiliar texts (see Table 4.10)

Table 4.10 Descriptive Statistics for Reading Comprehension in terms of Text Familiarity and Text presentation (N=120)

Text Familiarity	N	Text Presentation	Mean	Std. Deviation
Familiar Texts	60	Computer	14.30	3.180
	60	Paper	14.82	2.894
Unfamiliar Texts	60	Computer	10.27	2.939
	60	Paper	9.81	2.778

Table 4.10 is an overview of the participants' reading comprehension when reading on two presentation modes measured by reading familiar texts and unfamiliar texts. In terms of the familiar texts, the respective mean for Computer reading group were 14.30 (SD=3.180), while for Paper reading group was 14.82 (SD=2.894). In terms of the unfamiliar texts, the mean for Computer reading group was 10.27(SD=2.939), while for Paper reading group it was 9.81(SD=2.778). It can be seen that students performed better when reading on paper than on computers in dealing with both the familiar and unfamiliar texts.

Next, the mixed design ANOVA was computed by using Wilks' Lambda multivariate tests to test if there was significant interaction between text presentation and text familiarity.

Table 4.11 Mixed Design ANOVA Results for Interaction of Text Presentation and Text Familiarity (N=120)

Effect	Value	F	Hypothesis df	Error df	Sig.
text presentation * text familiarity	.974	2.987	1	114	.087

As Table 4.11 shows, the mixed design ANOVA by using Wilks' Lambda multivariate tests yielded no significant interaction between text presentation and text familiarity with Lambda= .974, $F(1,114) = 2.987$, $p > .05$.

4.4.3 Two-way Interaction between Computer Literacy and Text Lamiliarity

The results of descriptive statistics for reading comprehension in terms of computer literacy and text familiarity are presented in Table 4.12 as below.

Table 4.12 Descriptive Statistics for Reading Comprehension in terms of Computer Literacy and Text Familiarity (N=120)

Computer literacy	Text familiarity	Mean	S. D
Low group	Familiar Texts	12.925	2.795
	Unfamiliar Texts	9.725	2.843
Moderate group	Familiar Texts	15.725	3.046
	Unfamiliar Texts	9.850	2.379
High group	Familiar Texts	14.875	2.635
	Unfamiliar Texts	10.375	2.972

Table 4.12 above shows that the students' reading performance in dealing with the familiar and the unfamiliar texts. It was shown that the mean scores for Low, Moderate and High group reading the familiar texts were 12.925(SD=2.795), 15.725(SD=3.046) and 14.875(SD=2.635),respectively, while the mean scores for each group reading the unfamiliar texts, were 9.725(SD=2.843), 9.850(SD=2.379) and 10.375(SD=2.972), respectively.

After that, mixed design ANOVA was performed to further test if there was any significant interaction between the two variables, i.e. computer literacy and text familiarity.

Table 4.13 Mixed Design ANOVA Results for Interaction of Computer Literacy and Text Familiarity (N=120)

Effect	Value	F	Hypothesis df	Error df	Sig.
computer literacy * text familiarity	.885	7.371	1	114	.001

As Table 4.13 shows, the mixed design ANOVA by using Wilks' Lambda multivariate tests yielded significant interaction between computer literacy and text familiarity with Wilks' Lambda= .885, F(2,114), $p<.05$. It indicated that the students' performance across different levels of computer literacy was not only under the influence of the main effects of text familiarity, but also under the influence of the interaction effect of these two variables. It is decided that the subjects from each group produced different comprehension scores when reading the familiar and unfamiliar texts.

Generally, any significant interactions are found between and among independent variables, the following-up tests should be done to detect whether the effect of one independent variable is consistent for all levels of a second independent variable. Four common approaches, i.e. One-way ANOVA, Post Hoc Tests, Simple Effects Tests, and Planned Comparisons are employed to obtain more focused, specific information on where differences are in the interaction effect. In the study, since it was found that significant interaction occurred between computer literacy and text familiarity, the two levels of text familiarity, namely familiar texts and unfamiliar texts, the Simple Effects Tests were computed comparing each level of text familiarity across low, moderate and high level of computer literacy.

Table 4.14 shows that when students read the familiar texts, there were significant differences in comprehension between Low group and Moderate group ($p<.05$), Low group and High group ($p< .05$). However, there were no significant differences between Moderate group and High group ($p>.05$).

Table 4.14 Results of Simple Effects Tests for Interaction between Computer Literacy and Text Familiarity.

Computer Literacy	Text familiarity	Contrast Estimate	Std. Error	Sig.
Low group vs Moderate group	Familiar texts	-2.800	.637	.000
	Unfamiliar texts	-.125	.412	.762
Low group vs High group	Familiar texts	-1.950	.794	.003
	Unfamiliar texts	-.650	.512	.207
Moderate group vs High group	Familiar texts	.850	.648	.185
	Unfamiliar texts	-.525	.637	.205

Note: Significance level is at .05.

From the table above, it can be found that when the students dealt with unfamiliar texts, no significant differences were found between Low group and Moderate group ($p>.05$), Low group and High group ($p>.05$), and between Moderate group and High group ($p>.05$). All the p-values were more than the significant level .05 set for the study. It was noted that familiar texts significantly affected reading comprehension of the students with different computer literacy while unfamiliar texts did not.

4.4.4 Three-way Interaction among Text Presentation, Computer Literacy nd Text familiarity

Descriptive statistics was employed to provide a description of the subjects' reading scores in terms of the three independent variables, namely, text presentation, computer literacy and text familiarity. The relevant means and standard deviation are presented in Table 4.15.

Table4.15 Descriptive Statistics for Comprehension in Terms of Text Presentation, Computer literacy and Text Familiarity (N=120).

Text Familiarity	Text Presentation	N	Computer Literacy	Mean	S.D
Familiar Texts	Computer	20	Low group	12.80	2.985
		20	Moderate group	15.40	3.152
		20	High group	14.70	2.958
	Paper	20	Low group	13.05	2.259
		20	Moderate group	16.37	2.523
		20	High group	15.05	3.103
Unfamiliar Texts	Computer	20	Low group	9.60	2.698
		20	Moderate group	10.20	1.989
		20	High group	11.00	2.947
	Paper	20	Low group	9.95	2.059
		20	Moderate group	9.58	1.318
		20	High group	9.88	2.943

The table above shows that when the students read the familiar texts, the mean scores for Low, Moderate and High groups on computers were 12.80(SD=2.985), 15.40(SD=3.152) and 14.70(SD=2.958), respectively, whereas the mean scores for Low, Moderate and High groups on paper were13.05(SD=2.259), 16.37(SD=2.523) and15.05(SD=3.103), respectively. In contrast, when the students read the unfamiliar texts, the mean scores for Low, Moderate and High groups on computers were 9.60(SD=2.698), 10.20(SD=1.989) and11.00(SD=2.947), respectively, while the mean scores for Low, Moderate and High groups on paper were 9.95(SD=2.059), 9.58(SD=1.318) and 9.88(SD=2.943), respectively.

In order to test if there was significant three-way interaction among the independent variables on subjects' reading performance, the mixed design ANOVA was performed. The mixed design ANOVA results are presented in Table 4.16.

Table 4.16 Mixed Design ANOVA Results for Interaction of Text Presentation, Computer Literacy and Text Familiarity (N=120)

Effect	Value	F	Hypothesis df	Error df	Sig.
text presentation* computer literacy * text familiarity	.987	.763	2	114	.469

Note: Significance level is at .05.

As Table 4.16 shows, the mixed design ANOVA by using Wilks' Lambda multivariate tests yielded no significant three-way interaction among text presentation, computer literacy and text familiarity with Wilks' Lambda = .987, $F(2,114) = .763$, $p > .05$. It was indicated that there was no three-way interaction among the three independent variables.

4.5 Answer to Research Question 5:

Research Question 5 "Do the students use different strategies when reading from paper and from computer screens?"

In order to answer this question, Post-Experiment Reading Strategy Questionnaire (hereafter, PERSQ) and semi-structured interviews were conducted to obtain the data.

4.5.1 Quantitative Data from PERSQ

The PERSQ was administered to all the 120 subjects immediately after they finished the experimental task. The students were asked to fill in the questionnaire

paper carefully and honestly, bearing in mind that there were no right or wrong answers. Typically, the subjects were able to complete the survey in the given time, with some students taking a slightly longer time. Although each questionnaire was checked carefully by the researcher when it was submitted, one questionnaire was not fully completed; as a result, that questionnaire was excluded. The remaining 119 questionnaire were manually examined by the researcher. After that, the questionnaire data were coded and keyed into SPSS 15.0 for Windows for statistical analysis.

In the PERSQ, five-point Likert scale ranging from 1 (I never or almost never do this) to 5 (I always or almost always do this) was used with three types of usage level (i.e. high, medium and low). According to Mokhtari and Sheorey (2002), there are three levels of reading strategy usage that can be identified: high (average score of 3.5 or higher), moderate (average score of 2.5 to 3.49) and low (average score of 2.49 or lower). For the present study, these usage levels were employed as a convenient benchmark to make comparisons between the subjects with respect to their different use of reading strategies while reading texts from paper and from computer screens.

In examining the questionnaire paper, one point was given to “I never or almost never do this”; two points to “I do this only occasionally”; three points to “I sometimes do this”, four points to “I usually do this”; and five points to “I always or almost always do this”. The students’ responses in terms of the overall, the individual strategies as well as the three subscales, namely, Global Reading Strategies [henceforth, GLOB], Problem Solving Strategies [henceforth, PROB], and Support Reading Strategies [henceforth, SUP] were examined. The data obtained were analyzed by using descriptive statistics as well as an independent samples *t*-test to

identify whether the students employ strategies differently when reading from paper and from computer screens. The results of the overall use as well as the individual strategies are presented in Table 4.17.

4.5.1.1 Differences in Overall Reading Strategy Use between Two Presentation Groups.

Based on the results of the questionnaire responded by 120 students, table 4.17 shows that the mean score of the overall reading strategy use for Computer group was 3.06 (SD=.365), while the one for Paper group was 3.22 (SD= .468), indicating that the overall means for both Computer and Paper groups were at the medium-usage level according to established strategy usage criteria (mean between 2.50- 3.49). The analysis of independent samples *t*-test shows that statistically significant differences were found in overall strategy use between the Computer and Paper groups with $t(118) = -2.059$, $p < .05$.

As far as individual strategies were concerned, Table 4.17 shows that for Computer group, the range of the means was from the highest mean of 3.72 for Item 8 "I think about what I know to help me understand what I read" to the lowest mean of 1.85 for Item 17 "I follow the line I am reading with my finger or my pen". Furthermore, among the 21 strategies, 3 strategies (14 percent) fell into the high-usage level, 15 strategies (72 percent) went to the medium-usage level, 3 strategies (14 percent) was reported to be in the low-usage level.

Table4.17 Comparisons of the Differences of Strategy Use between Groups (n=119)

Strategy Items	Computer (n=60)		Paper (n=59)		t	P-value
	Mean	S.D	Mean	S.D		
1. (GLOB) I have a purpose in mind when I read.	3.50	1.097	3.58	1.054	-.387	.700
2. (SUP) I take notes while reading to help me understand what I read.	2.02	.813	3.03	.946	-3.225	.002*
3. I check my understanding when I come across new information.	2.68	.965	3.19	1.210	-2.509	.013 *
4. (GLOB) I take an overall view of the text to see what it is about before I read.	3.22	1.091	3.17	1.234	.221	.825
5. (PROB) When I read, I guess the meaning of unknown words or phrases.	3.47	1.065	**3.73**	1.014	-1.375	.172
6. (PROB) I read slowly and carefully to make sure I understand what I am reading.	2.80	1.102	3.17	1.780	-1.78	.078
7. (GLOB) I review the text first by noting its characteristics, such as length and organization.	2.87	1.081	2.64	1.063	.113	.260
8. (GLOB) I think about what I know to help me understand what I read.	**3.72**	.954	3.59	.912	.819	.415
9. (SUP) I underline or circle information to help me remember it.	2.08	.869	3.44	1.277	-.6.789	.000**
10.(PROB) I adjust my reading speed according to what I am reading.	3.38	.958	3.51	1.194	-.631	.529

Table 4.17 Comparisons of the Differences of Strategy Use between Groups (Cont.)

Strategy Items	Computer (n=60)		Paper (n=59)		t	p-value
	Mean	S.D	Mean	S.D		
11. (GLOB) When reading, I decide what to read closely and what to ignore.	2.97	.956	3.02	1.266	-.245	.807
12. (PROB) When the text becomes difficult, I pay closer attention to what I am reading.	3.18	1.066	3.32	1.041	-.718	.474
13. (SUP) When reading, I translate from English into my native language.	2.90	1.189	3.27	1.127	-1.747	.083
14. (PROB) I stop from time to time and think about what I am reading.	2.70	.979	2.78	1.018	-.435	.664
15. (GLOB) I use context clues to help me better understand what I am reading.	3.35	.936	3.49	.838	-.869	.387
16. (SUP) I paraphrase (restate ideas in my own words) to better understand what I read.	2.83	1.107	3.05	1.166	-1.044	.299
17. (SUP) I follow the line of what I am reading with my finger or my pen.	**1.85**	.954	2.85	1.436	-4.47	.000**
18. (PROB) I re-read for better understanding	3.58	1.078	3.61	1.189	-.129	.898
19. (GLOB) I first skim an English passage, then go back and read it carefully.	3.02	1.200	3.08	1.253	-298	.766
20. (PROB) I try to get back on track when I lose concentration.	2.83	1.107	3.05	1.156	-.1048	.297
21. (GLOB) When reading, I think about information in both English and my mother tongue.	3.07	1.148	3.45	1.268	-1.736	.085
Overall Strategies	**3.06**	**.365**	**3.22**	**.468**	**-2.059**	**.042***

Note: 3.5 or higher = high, 2.5–3.49 = medium, 2.49 or lower = low
Significance level is at .05.
* p<.05 ** p< .001

However, the means for Paper group varied from the highest mean of 3.73 for Item 5 “Guessing the meaning of unknown words or phrases” to the lowest 2.64 for Item 7 “Reviewing the text first by noting its characteristics”. In addition, 5 items (28 percent) were found in high-usage level, and 13 (72 percent) items in medium-usage level, but no item was found in low-usage level. The analysis of independent samples *t*-test shows that statistically significant differences were found between Computer and Paper groups for Item 2 “Taking notes while reading” with $t(118) = -3.225$, $p < .05$; for Item 3 “Checking my understanding” with $t(118) = -2.509$, $p < .05$; Item9 “Underlining or circling information ” with $t(118) = -6.789$, $p < .05$; and for Item17 “ Following the line with finger or pen” with $t(118) = -4.47$, $p < .05$.

4.5.1.2 Differences of Subjects’ Reading Strategy Use of the Three Subscales between Computer and Paper Group

Furthermore, the use of three subscales of reading strategies (i.e. GLOB PROB and SUP) was analyzed. The results are shown in Table 4.18.

Table 4.18 Differences of Strategy Use of the Three Subscales between Computer and Paper Groups (N=119)

Strategy Subscales	Computer(n=59)		Paper (n=60)		t	P value
	Mean	S.D.	Mean	S.D.		
Global Strategies	3.186	.482	3.248	.693	-.208	.836
Problem Solving Strategies	3.272	.537	3.347	.596	-1.612	.110
Support Strategies	2.394	.456	3.105	.682	-6.658	**.000****

Note: 3.5 or higher = high, 2.5–3.49 = medium, 2.49 or lower = low
Significance level is at .05.
** p< .001

As for Computer group, the means for GLOB, PROB and SUP were 3.186 (SD=.482), 3.272 (SD=.537) and 2.394 (SD=.456), respectively, while as for Paper group, the means for the three subscales GLOB, PROB and SUP were 3.248 (SD=.693), 3.347 (SD=.596) and 3.105(SD=.682), respectively. It indicates that the means of the three subscales for both Computer and Paper groups fall in the medium-usage category (mean of 2.5–3.49). The means between Computer and Paper group for PROB were the highest, while the means for SUP were the lowest. The means for these subscales displayed a medium-usage level, also clearly suggesting that those students of the two groups exercised PROB the most, followed by GLOB and SUP.

It was also found that by using the independent samples *t*-test there were significant differences in the use of SUP with t (118)= -6.658, p< .05 (see the bold in Table 4.18), while there were no significant differences in the use of subscale of GLOB with t (118)= -.208, p> .05, and in the use of subscale of PROB with t (118)= -1.612, p> .05.

Therefore, it can be concluded that the students of both Computer and Paper groups used strategies differently, and the differences were found only in the use of SUP. The frequency of overall strategy use as well as subscales falls in the medium usage level.

4.5.2 Qualitative Data from Semi-structured Interview

Question 5 was also investigated qualitatively based on the data obtained from semi-structured interviews. In order to get detailed, in-depth information for strategy use, and to triangulate the data, semi-structured interviews were conducted one week after the experiment. The purpose of the students' oral interviews at this

stage was to elicit students' perceived use of reading strategies on both reading conditions (computers and paper). There were 18 subjects randomly selected to participate in the interview from two text presentation groups, nine students from each group. The interviews were carried out in Chinese and the contents of each interview were recorded with recording pen by the researcher (see Section 3.8.2). Eighteen students participated in the interviews and the general picture of the interviewees is illustrated in Table 4.19. As to the interviewees' detailed information, it was presented in Students' Files (see Appendix G).

Table 4.19 Characteristics of the Interviewees (N=18)

Computer literacy / Text presentation	Low group (LG)	Moderate group (MG)	High group (HG)
Computer	CL 8, CL 11, CL 13	CM4, CM 6, CM 5	CH10, CH12, CH16
Paper	PL3, PL 7, SS14	PM1, PM17, PM18	PH2, PH9, PH15

Note: CL= Computer low group CM= Computer moderate group CH= Computer high group

PL= Paper low group PM= Paper moderate group PH= Paper high group

Table 4.19 shows that nine interviewees were from the computer group and 9 from the paper group; among those of each condition, three students were from high literacy group, three were from moderate literacy group, and three were from low computer literacy group, respectively.

A transcription of each interview recording was conducted as soon as possible and translated from Chinese into English by the researcher. After translation, the data were analyzed in order to identify the differences of English reading strategies employed by these students when reading from two presentation modes (i.e. computers and from paper). It took the researcher almost one month to conduct the transcription and translation. The researcher employed a content analysis on all transcripts of the semi-structured interviews.

The results obtained from the interviews were presented as follows by the guided questions related to their opinions of different strategy use when they read on two text presentation modes.

Q1. Do you often read English passages within and outside of the class?

The majority of students (13 out 18, 71 percent) claimed that they did not read English materials outside of English classes, only in the classes under the supervision of teachers. For example, some students stated:

> CH 12 …."*Not very often, about twice one (a) week in the class, but if I read only the texts from the English course."*
>
> CL 8 … "(I do) *not often read (English materials) after class, only in class time, however I read the passages only from the textbook."*
>
> PH 15… *"I always read English texts in the high school classes, but now rarely, especially not after the class. But at college, I rarely read as the course books are difficult for me."*

However, the rest reported that they often read English materials in and outside of English classes. For example, some students claimed:

CL13 ….. "*Yes, I do, I liked to read foreign works written in English not only in class but also after class…"*

PM18… "*Yes, I read English passages from the textbook, and also read some English articles from some newspaper, such as English Weekly."*

The data above showed that most students have the same ideas that they did not often or rarely spend time reading English materials outside of the English classes, even in class time; they only read the texts from course books. But only some students read English materials in and after classes.

Q 2. Do you use any strategies to help you understand English passages when you read?

In terms of strategy use, two major questions (Questions 2 and 3) for interviews were developed to investigate students' opinions about their strategy use when they read from paper and from computer screens.

Question 2 was intended to have a general view of their strategy awareness or whether they used some skills or strategies to help them solve problems or enhance the comprehension of what they read.

According to the students' responses, some students (10 out of 18, 56 percent) reported that they used some reading skills or strategies in their reading, i.e. when meeting some difficulties in their reading, they would resort to the reading strategies to help solve the problems or enhance their reading comprehension. For example,

PM 1 said: ".. *I don't use strategies often, but when I am doing exercises, I use some. ...I adjust my reading speed, guess the unknown words."*

PH 9 stated: "…..*yes, I often use strategies when I read English passages, I use the common strategies, such as guess the new words from the context, I read quickly the first time and slowly the second time…".*

Some other students (7 out of 18, 39 percent) reported that they did not know much about how to use strategies in their reading. They commented that they did not really know what they were doing through the whole reading. As their responses indicated, they spent plenty of time reading a passage, sometimes word by word; however, they could not recognize the key points and central idea of passages. Some students from the Computer groups expressed that they often felt a loss when reading, especially when reading from computers. Some sample data are presented as follows.

CM 6 said: "*…I don't know much about reading strategies. Sometimes I don't know what I need to do if I don't understand the passages..."*

CH12 stated: "*..I think I know some reading skills, when I read, , sometimes word by word, but I cannot get the main idea, or answer the comprehension questions after English texts correctly, which make me confused…"*

Only one student (CM 4) reported that he had no idea about strategies in reading. As he claimed:

" *I have no idea about that (strategies), since when I do the reading comprehension questions, I read the texts carefully, it seems that I know every word, but I cannot recognize the key points and central idea of what I am reading"*

Q3. Do you use different strategies when reading from paper and from a computer screen?

The question was intended to explore if there are differences in strategy use

when reading from two presentation modes. Most of the students from two modes (12 out of 18, 67 percent) reported that there were no differences in strategy use when they read on the two presentation modes except for some strategies (see the bold in the following sample excerpts). However, a few of students (5 out of 18, 27 percent) stated that there were differences in strategy use when they read on the two presentation modes. Only 1 (6 percent) student expressed no any opinions about this issue.

The majority of students agreed that there were no differences; they stated that they used almost the same strategies when they read from computers compared with reading from paper. PL 7 said:

> "*It is not different, I don't think there are differences in strategy use when I read, because I use the same strategies as I always do. But* ***I don't circle or tick or underline the points on computer screens as I do on paper***".

Those students from the Computer group made more comments about this question. As the responses indicated, the students claimed that when they read from computers, it was not easy or possible to mark or underline the key points without disturbing the flow of reading. Some sample excerpts are presented as follows.

CL13 stated that it was almost the same, no difference when reading on two presentation modes.

> *"Sometimes I read a few times, I would re-read briefly and go back to the parts again when understanding becomes a problem, or when concentration is lost.* ***Er….., it is not easy to mark or underline the key points on computer"***

CH 16 stated:

> " *I think the same, not different…. When meet new words, I (would) think it over* (to see) *if I know the topic well, and use some strategies, …er.. I guess the meaning of unknown words, um… I re-read it to help me (*understand*).* ***Generally, on paper, I would mark the important parts to help me remember the key points****.* "

One student (CL12) used more problem solving strategies than the other ones; he responded that when he read on paper, he adjusted his reading speed according to the text difficulty. As he put it:

> *"It is the same, no any difference , on paper I underlie the key points, guess words, and use background knowledge to help me comprehend texts."*

In contrast, five students reported that there were differences in strategy use when reading on two presentation modes. Sample excerpts are as follows:

PL3 stated:

> "*Yes , It is different , generally, I will read carefully, and think in English and my mother tongue as well, …. guess words and phrases.*"
>
> *On paper, I like to read through the whole passage,* ***and then read line by line with finger pointing at it, read the topic sentence in each paragraph."***

He also explained more:

> *"On the computer, I read with purpose, and use skimming and scanning strategies. I prefer to read the question items attached to passages and read the most important part, or locate the relevant answers to the questions."*

CM6 said:

> *"Yes, quite different, for example,* ***it is not possible to underline and mark the important parts, and not appropriate to read fast on the computer screen.*** *However, on paper, I usually use some strategies, such as, read with purpose, and get a general idea before I read it in detail, and underline the important and useful points."*

CL 8 expressed the same idea, she thought it was very different that she could sign (mark) on paper and re-read what she forgot, but on computer screens it wasn't convenient and easy to do markings. She explained the other strategies employed in her reading:

> *" Er…I also guess the meaning of new words and try to know the author's tone and value orientation in writing."*

However, one student (CM 4) responded that he did not really know more about strategy use, since when he did the reading comprehension exercises, he usually read the texts carefully, word by word. It seems that he knew every word, but sometimes could not understand the texts well. So he had no idea about the question.

It can be seen that most students reported that when they read on traditional media, they could make some marks, such as underlining, taking notes, etc. However, when they read from computer screens, it was not common or natural to make some marks.

Q 4. Can you describe the strategies you use when reading on paper and on computer screens?

Most students (12 out of 18, 67 percent) reported that the strategies used on computers and on paper were almost the same. For example, "first, read through the whole passage quickly, then go back and read in details"; "Guess unknown words from the context". They provided some strategies when they use the two presentation modes. The following are some examples:

PH 9 stated:

> "*…In general, I will read carefully, and think in English and my mother tongue, guess words and phrases. On the paper, I like to read through the whole passage, then read line by line with finger pointing at it,…er.. I* ***can circle the useful words or underline the key sentence****s, and…um I read the topic sentence in each paragraph."*
>
> *"On the computer, I read with purpose, and use the skimming and scanning strategies. I prefer to read the question items attached to passages first and read the most important part, then locate the relevant answers to the questions."*

PM18 claimed that when facing texts with new information, he got a general idea about what he read. And he also stated:

> "*I use clues and guess the meanings of the words or phrases that I do not understand…. I adjust my reading speed according to what I am reading."*

CH10 stated:

> *"In general, I read with purpose, I… um… first read through the whole passage, then read it in detail, finally look up those unknown words."*

Some students stated strongly that background knowledge helped them understand or comprehend what they read more easily. As CM 5 stated:

> *"I think about what I am reading and I ask questions about the text. I also look for important details. Specifically, when reading on the computer, before reading, I read over the text so I can get an idea on what I am readin*g."

Some other students also expressed that when they read unfamiliar texts, they directed extra attention at the part which they had difficulty understanding. Reading speed was also adjusted according to the familiarity of texts. Here are some sample excerpts.

CM6 demonstrated:

> *" I have a purpose for reading, and use what I know to help me understand the reading materials… er…when some parts are difficult… so I read a few times… sometimes I read slowly…I also make short notes while I am reading, and…I sometimes…adjust my reading speed."*

CL 13 claimed:

> "*If I am reading unfamiliar texts, I pay closer attention to them. And I constantly monitor my understanding of the text.* ***When I read on paper-based texts I can jot down some of the points to help me remember what I read."***

In conclusion, the students' views and opinions regarding strategy use when reading from paper and from a computer screen were summarized as follows.

From the interview data above, it could be noted that in general, there were no differences in strategy use, but the differences were shown in some strategies, such as underlining or highlighting the text, or taking notes. They explained that when they read on paper they could make some marks. However, when they read on computers, it was not common or natural to take notes or underline any words or text on computer screens. The results were consistent with the quantitative data obtained by PERSQ, which found that the students used strategies differently, not in the subscales of GLOB and PROB, but the differences were shown only in the use of the subscale

of SUP between reading from paper and from a computer screen. Therefore, question 5 could be answered that there were differences in strategy use on two presentation modes.

4.6 Answer to Research Question 6:

What are the attitudes of Chinese non-English major students toward reading from paper and from computers?

The data for this question were collected by semi-structured interview. Their attitudes were evaluated in four categories suggested by Kay (1993).

1) General attitudes toward computer use

Question 1. Do you often read English passages from computers?

Question 2. What do you use computers for?

Question 3. How often do you use computers?

2) Preconception

What level of learning, from material presented on computers, do you think you achieve?''

3). Affective feelings for reading on paper and computers

Question 1: Are you comfortable with using a computer to read English passages?

Question 2: How do you feel when reading from paper and from computer screens?

4) Preferences

Which do you prefer, to read from paper or from computer screens? Why?

Based on the interview guided questions (see Appendix F), the students' attitudes toward the presentation modes were elicited from the interviewees. In order to get the data, the researcher employed content analysis on all transcripts of the

semi-structured interviews. Some sample interview data are presented as follows by the categories mentioned above.

1). General attitudes towards computer use

This section is to find out about the general attitudes towards computers in general, and towards using computer technology in reading English passages. The majority reported that they did not use computers often on campus. Most students (14 out of 18, 78 percent) used computers to play computer games, to check email, to chat with friends and to surf the Internet. Some examples of excerpts are as follows.

CL 11 said:

> *"Not very often, about twice a week. (I) use computers to surf the Internet, I play (computer) games, I seldom use computers to learn English outside class."*

PH15 stated:

> "*I study English once a week outside class in computer lab to meet the English teacher's requirement, otherwise, I use computers to play games, check e-mail or chat with friends."*

From the data above, it can be found that most students read English passages from computer screens within class time. Outside of the classes, they sometimes used computers to do assignments, but most of the time; they did not use computers for learning or reading English passages.

2) Preconceptions

The question ''What level of learning, from materials presented on computers do you think you achieve?'' was asked. Overall, most students (12 out of 18, 67 percent) considered that the level of learning from computers would be less or much less than from paper. As most students stated,

CL13 claimed: *"I achieve little from computer reading, compared to reading from paper. And on computer, I would forget what I have just read*."

PL14 said: *"I think, comprehension level from computer screens is lower than on paper, sometimes I even want to stop reading."*

However, one student (PH 2) expressed the opposite idea, He said:

"I don't think it really influences comprehension, but it is a different sense when we read on computer….um ..Maybe because I already used to reading on paper since I am at young age."

In addition, one student (CL 8) demonstrated that she had no pinion about this theme. As she put it:

"I don't know what level I can comprehend the text presented on computers, but at least, comprehension is not better than on paper."

From the students' reports, the level of learning from computers is not better than paper, even with the wide use of computers, some students claimed that they always forgot what they read, lost patience, even wanted to stop reading.

3). Affective components of attitudes towards paper and computer reading

The questions in this category "question 1: Are you comfortable with using a computer to read English passages?" and question 2 " How do you feel when reading from paper and from computers?" were to explore the students' mental states when reading from the two types of modes. The majority of students (15 out of 18, 83 percent) reported that they felt uncomfortable, even apprehensive when reading from

computer screens. Examples are as follows:

PL 3 said: *" for me, I don't use computers often for learning, only in class time, I want to finish it(reading or doing exercises) fast(soon) ...Because reading ... I mean reading academic texts, or English passages on computers make me feel anxious and upset and not comfortable. Learning online makes my eyes tired easily…"*

CH 10 said: *"..I feel tired (when I read) on computer screens,..., sometimes I even want to stop reading, (I) feel uncomfortable and upset. It makes my eyes tired…* "

Some students even claimed that they felt apprehensive, scared or intimidated when reading on computers. For example, two students (CL 8 and CL11) reported that they hesitated to use a computer for fear of making mistakes. It scared to think that they may cause the computers to destroy a large amount of information by hitting the wrong key. I am somewhat scared by using computers.

However, there were two students (CM5 and PM17, 11 percent) expressing the opposite idea as follows:

CM 5 said:

"*I feel comfortable when using computers for doing assignments, except sometimes feel bored and tired".*

Similarly, PM 17 stated that he thought when he met unknown words he could consult the words online easily.

Their responses indicated that only a few students reported they felt comfortable when using or reading computers, the majority, especially those from low group students demonstrated they felt tense, uncomfortable, even frightened when using computers.

4) Preferences

The question ‘‘which do you prefer to read, from paper or from computer screens? Why?’’ were asked. Overall, the majority (15 students, 83 percent) showed a preference for reading from paper, two students (11 percent) for computers. One individual (PM18, 5 percent) expressed ‘no opinion’. The interview transcription examples are as follows.

PH 9 said: “*I like to read (English materials) from paper because I can mark easily while I am reading, and it is quite convenient for me to locate the useful and important points for reading in the future.”*

CL 11 said:

> “*…I prefer paper to computer, because I feel tense when I read from computer screens. I read English passages on computers three times a week when I have English classes.”*

However, two students (CM 5 and PM 17, 11 percent) showed their positive attitude towards computer use in responding to the question in category 3 (Affective feelings for reading computers and paper) and had preferences for computers. The former (CM 5) said:

> *“I like to read on computers because there is lots of information on it, but I don’t know how much I can achieve from reading on computer.”*

While the latter (PM 17) stated:

> *“I now see them [computers] more as learning tools rather than surf-the-net, check-the-e-mail tools, I can do homework on compute*rs, and…umm...*I think, it is efficient and convenient to read and write on computers*….”

Only one student (PM 18) expressed no opinion:

> *" It is hard to say, since there are no difference between the two text modes, I don't think one is superior to the other....maybe I like both..."*

From their responses, it can be seen that although some students showed preference for computers, most students had preference to paper.

Despite the comments by two students that they preferred computers to paper as a reading medium, and one showed no opinion, a significant number of students agreed that the traditional reading medium of paper is preferable. They also stated that they preferred to get information from a printed page instead of a computer screen. In addition, the students demonstrated that they did not feel comfortable, even felt intimidated when reading from screens. It was also found that students read English passages on computer screens mostly in class time, but seldom after the English classes. To some extent, it can be found that the students with higher computer literacy level held more positive attitudes toward computer reading than those with lower level.

4.7 Summary

This chapter illustrated the data analyses and the results which were applied to respond to the six research questions of the study. The next chapter will provide a discussion of the results of the study, conclusions of the study, implications, recommendations and limitations of the study.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

This final chapter firstly discusses the findings presented in the previous chapter. Secondly, the major findings and conclusions of the research are summarized. Thirdly, implications and recommendations for computer-based multimedia second/foreign language reading instruction are provided and finally, limitations of the study are described.

5.1 Discussion

This research was conducted in an attempt to examine the effects of text presentation on reading comprehension of non-English major students in the Chinese context. The strategies the students employed when reading from paper and from computer screens and their attitudes toward text presentation were explored. This section is organized according to the six research questions, based on the results of the main experimental task regarding the effects of three independent variables, namely, text presentation, computer literacy and text familiarity on reading comprehension, and interactions between and among the three variables. Also, the findings about perceived reading strategy use on two modes of text presentation and the students' attitudes toward the two modes of text presentation are discussed.

5.1.1 Effects of Text Presentation on Reading Comprehension

This section discusses the findings presented in section 4.1 of Chapter Four,

that is, no significant differences were found between Computer reading group and Paper reading group for reading comprehension [$F(1,114) = .051$, $p > .05$] (See Table 4.2). It can be concluded that there were no significant differences in the subjects' comprehension scores between reading the paper-based texts and reading the computerized texts.

The results of this study were in accordance with the previous studies which found no significant differences between the text presentation formats (e.g. Grimshaw et al., 2007; Muter et al, 1982; Muter & Maurutto, 1991; Mayes et al., 2001; Noyes and Garland, 2003). However, the finding did not confirm the previous studies that significant differences of reading comprehension existed when reading on two presentation media (e.g. Han & Chu, 2003; Joly et al*.,* 2009; Kerr & Symons, 2006; Sun & Xiao, 2006; Wasttlund et al., 2005; Wayne, 2003). For instance, the results of Wayne's study revealed superior comprehension for the texts presented in printed format, while the studies of Joly et al. (2009) and Kerr and Symons (2006) found that comprehension when reading digital texts was better than that when reading hard copy texts.

The reason for the finding that there were no differences between the two media may be that the presentation media of the materials were adequately matched in content and appearance. Specifically, the finding of the study suggested that if the material used is matched, for typeface, font size, polarity and general clarity, in other words, if the computerized and paper-based versions of the reading material are as similar as possible, comprehension does not differ significantly between these two presentation media.

The inconsistencies of earlier findings may be partly due to differences in the comparability of the two forms of the media presented in the studies, and variations in computer literacy level (Joly et al., 2009). Although there were no significant differences in reading comprehension across the two presentation media, reading via computers should take into consideration the computer skills and knowledge.

5.1.2 Effects of Computer Literacy on Reading Comprehension

The main effects of computer literacy were found for reading comprehension [$F_{(2,114)}$= 7.722, $p < .05$] (See in Table 4.4). The result revealed that computer literacy affected the students' reading comprehension. The finding supported the results concluded by previous studies that computer literacy affects performance (e.g. Attelwell & Juan, 1999; BECTa, 2000; van Daal & Reitsman, 2000; Taylor et al., 1998), whereas it contradicted the findings of the other studies that the amount of previous exposure to and the use of computers might have no impact or even have negative effects on educational performance (e.g. Angrist & Lavy, 2001; Johnson, 2000; Tremblay et al., 2001; Trites & McGroarty, 2005). The possible reason is that the students varied in computer literacy. That is, the differences may have been related to the level of familiarity with the text media. According to Hess and Miura (1985), the less experience and less exposure to the computer the subjects have, the more interference they may encounter in the reading process via computers.

Furthermore, the results of the present study suggested that there were significant differences between Low group and Moderate group, Low group and High group. There are two possible explanations for the fact.

Firstly, the High group and Moderate group subjects presumably had more experience in reading computer-based texts; therefore, when they read on computers,

the medium did not impair the process of comprehending the materials. However, those from the Low group may not have been familiar with the computer medium; hence, they may have been hindered in their reading performance, since a more cognitive load may be required when reading computer-based texts on computers than on paper (see Noyes and Garland, 2003).

Second, the differences may have been due to computer anxiety of those students who are not familiar with computer reading. Leso and Peck (1992) define computer anxiety "as a feeling of being fearful or apprehensive when using or considering the use of a computer." Computer anxiety has detrimental effects on the learning process via computers and may weaken processing the texts (see Howard, Murphy, & Thomas, 1986; Ayersman & Reed, 1995; Dyck & Smither, 1994).

Interestingly, there were no differences between Moderate group and High group. The possible reason is that the Moderate group may be equipped with enough basic skills, although not as high as High group, to cope with some problems in reading from computers. In addition, they may have been less anxious, which produced less handicapping factors when they interacted with computers.

5.1.3 Effects of Text Familiarity on Reading Comprehension

The present study investigated the effects of text familiarity on reading comprehension of Chinese non-English major students. As presented in 4.3 of Chapter IV, the mean of 14.56 in reading the familiar texts was higher than the mean of 10.04 in reading the unfamiliar texts. The main effects of text familiarity were found for reading comprehension [$F(1,114) = 253.044$, $p<.05$]. That is, there were significant effects of text familiarity on reading comprehension of Chinese non-English major students. It can be noted that the students performed better when reading the familiar

texts than when reading the unfamiliar texts. The outcome of the present study was similar to the results of previous studies. (e.g. Anderson, 1983; Bensoussan, 1998; Carrell, 1987; Salmani-Nodoushan, 2003). Their findings suggested that texts pertaining to familiar content schema are easier to process in that participants better comprehended the passages that were more familiar to them. Carrell (1987) found that subjects remembered the most when the content was familiar to them. It was also revealed that reading is easiest when the content is familiar and that reading is the most difficult when the content is unfamiliar. Furthermore, based on schema theory, the more readers know about a topic, the more likely it is that they will bring up appropriate schemata. Bensoussan's (1998) study showed that use of wrong schemata or prior knowledge was a significant factor influencing text scores. The success of reading comprehension lies in the extent to which the relevant schemata were activated. The findings of the present study also showed similar effects to the previous studies (Ammon, 1987; Johnson, 1981, 1982; Pulido, 2004). Those studies indicated that the readers' performance was significantly influenced by text familiarity.

From the findings of the study, it was concluded that text familiarity affected the reading comprehension of Chinese non-English major students. Although all the variables and factors surrounding the issues of how background knowledge influences reading comprehension is not fully understood, there is agreement that background knowledge is important, and that content schema plays an integral role in reading comprehension. As Carrell (1985, 1988) claimed in her view on schema theory, content is of primary importance in the ESL reading classroom.

5.1.4 Interactions between and among Text Presentation, Computer Literacy and Text Familiarity

The present study investigated the interaction effects between and among the three independent variables: text presentation, computer literacy and text familiarity on reading comprehension. The results showed that there was no two-way interactions found between text presentation and computer literacy (see Table 4.9, $p>.05$), and between text presentation and text familiarity (see Table 4.11, $p>.05$), and also no three-way interaction among text presentations, computer literacy and text familiarity (see Table 4.16, $p>.05$). However, a significant two-way interaction occurred between text familiarity and computer literacy (see Table 4.13, $p<.05$).

Some previous studies on interactions between and among text familiarity and other variables, such as language proficiency and text types, found that there were interaction effects between or among them (e.g. Bensoussan ,1998; Carrell, 1987, Pulido, 2004, Salmani-Nodoushan, 2003). It could be noted that little research into the interactions of the three variables on reading comprehension had been done in the L2 reading realm, especially concerning reading from computer screens.

The analysis of the Simple Effects Contrasts showed that significant differences in the students' reading performance were found between Low and Moderate groups, between Low and High groups, whereas no significant differences existed between Moderate and High groups when reading the familiar texts. In comparison, no significant differences were found between Low and Moderate groups, between Low and High groups, and between Moderate and High groups when reading the unfamiliar texts. The findings showed that subjects' reading performance across different levels of computer literacy was not only under the influence of the main

effects of text familiarity, but also under the influence of the interaction effects of the two variables. It indicated that interaction effects existed between Low and Moderate groups, Low and High groups, but not between Moderate and High groups when dealing with the familiar texts, while no interaction effects were found across each level of computer literacy when dealing with the unfamiliar texts.

This can be explained in two aspects. One is that when the students read the familiar texts, they may have had the same level of abundant and good background knowledge about the materials, and it was possible for them to activate right schemata to help them process the texts. Barnett (1989), Carrell and Eisterhold (1983), and Johnson (1982) stated that content schema in terms of background knowledge is a factor that influences second (or foreign) language reading. Salmani-Nodoushan (2003) suggested that readers' overall test performance was found to be significantly influenced by text familiarity. In this case, both text familiarity and computer literacy might have effects on reading comprehension. Hence, the students in High and Moderate groups may have had same level of background knowledge as those in Low group, but they may have less computer anxiety than those in Low group. Thus, the students in High and Moderate groups may have processed the texts better and may perform better than those in Low group.

The other aspect is that when the students read unfamiliar texts, they may not have had enough background or prior knowledge to help them comprehend the reading texts, or they may not have activated appropriate schemata to process the texts. If schemata are incomplete and do not provide an understanding of the incoming data from texts, problems may occur in processing and understanding texts (Rumelhart, 1977). Therefore, the effects of computer literacy, in this case, might be ignored.

That is, no matter how much level of computer literacy they had, or whether they were equipped with enough computer skills or knowledge, they may not have processed the texts correctly, or they may have misunderstood the texts. The findings further proved the fact that text familiarity is one of the most important factors in determining student comprehension and can compensate linguistic difficulty (Carrell, 1985, 1987, 1988).

5.1.5 Differences in Overall Reading Strategy Use between Two Presentation Groups

The study aimed to explore whether there were any significant differences in the perceived use of reading strategies between Computer group and Paper group. The study triangulated data collection methods employing both written questionnaire and semi-structured interviews.

The findings from the results presented in section 4.5 of Chapter IV were summarized as follows.

The findings showed that the moderate use of overall strategies as well as the subscale strategies was reported by the students when reading on two text presentation media. Furthermore, the statistically significant differences in overall strategy use were found between Computer and paper groups [$t(118) = -2.059$, $p<.05$], however, the significant differences were only shown in the use of Support Reading Strategies (SUP). That is, the statistically significant differences of the reported usage of strategies between Computer and Paper groups were in the subscale of SUP. It revealed that Paper group students seemed to consider SUP to be relatively more valuable than did Computer group students.

The findings of the study were in line with the Son's (2001) study which found that foreign language readers employed different reading strategies depending on the text formats they worked with. Furthermore, the findings were similar to the study by Sheorey and Mokhtari (2001), suggesting that the major distinction between students' reported usage of strategies was in the category of SUP. However, the findings of the study was not similar to the studies by Anderson (2003) and Yutdhana (2007), which found that there were no significant differences for overall online strategy use.

The possible reason for the finding that the overall strategy use was at the moderate level is that those first-year students might not have been systematically trained before entering college, since in high school, English teaching and learning was exam-oriented, and more attention was focused on the product of reading, e.g., a score on a reading comprehension test rather than on the process of reading. Though most of them know to use some strategies, they may, to some extent, lack good awareness in using strategies, that is, they were not strategic readers to achieve second language learning, especially to enhance their reading ability at college level.

5.1.5.1 Reading Strategies Frequently Used and Least Used by Subjects

This study explored the perceived use of reading strategies on two text presentation modes. According to the independent samples *t*-test results, there were significant differences in the overall strategy use between Computer group and Paper group. In terms of the three subscales, significant differences were found in the use of SUP, but no significant differences were found in the subscales of GLOB and PROB. Within the strategy use pattern, some strategies were frequently used while the others were least used.

Based on the different ranks of the means of the strategies, the top five and bottom five strategies used by Computer group and Paper group students are listed in the descending order by their means in Table 5.1 below.

Table 5.1 Reading Strategies Most Used and Least Used by the Students (n=119)

Top strategies for Computer group	Mean	Top strategies for paper group	Mean
Strategy 8 GLOB)	3.72	Strategy 5 (PROB)	3.73
Strategy 18 (PROB)	3.58	Strategy18. (PROB)	3.61
Strategy 1(GLOB)	3.50	Strategy 8. (GLOB)	3.59
Strategy 5 (PROB)	3.47	Strategy 1 (GLOB)	3.58
Strategy 10(PROB)	3.38	Strategy 10(PROB)	3.51
Bottom strategies for Computer group	**Mean**	**Bottom strategies for paper group**	**Mean**
Strategy 14(PROB)	2.70	Strategy2 (SUP)	3.03
Strategy 3 (SUP)	2.68	Strategy 11 (GLOB)	3.02
Strategy 9(SUP)	2.08	Strategy 17 (SUP)	2.85
Strategy 2(SUP)	2.02	Strategy 14 (PROB)	2.78
Strategy 17(SUP)	1.85	Strategy 7 (GLOB)	2.64

Note: 3.5 or higher = high, 2.5–3.49 = medium, 2.49 or lower = low

Table 5.1 shows that the means for Computer group ranged from 3.38 to 3.72, while the means of Paper group from 3.51 to 3.73. In terms of bottom five reading strategies, the means for Computer group ranged from 1.85 to 2.70, while the means for Paper group from 2.64 to 3.03. The top five strategies for both Computer and Paper groups were involved in both GLOB and PROB strategies while the bottom

five strategies showed a mix of GLOB, PROB and SUP strategies. It was found that the students employed GLOB and PROB strategies more frequently than SUP. Further discussion for this fact will be elaborated in the next section.

5.1.5.2 Reading Strategies Frequently Used by Subjects

It was found that the strategies frequently used by both Computer and Paper group students were Items 1, 5, 8, 10, 18, i.e. guessing the meaning of unknown words or phrases; using the background knowledge to help understand texts; using context clues and re-reading texts. That is to say, these strategies were frequently used by Paper group students; similarly, they were also used most by Computer group students.

The following possible reasons may account for the fact. First, Chinese non-English major students, though at medium usage level, may know how to employ some strategies to solve problems occurred in their reading whether from a computer or from paper. Likewise, they may know to monitor, regulate and evaluate their reading. Second, whether students read from paper and from computer screens, they may know that they should prepare themselves with some background knowledge by predicting and previewing the reading materials, then when they read, they could manage their reading by using context clues, guessing unknown words and rereading to help process and comprehend the reading materials. Third, the students may be familiar with those strategies, hereby, they may know when and how to use them in their reading (Son, 2001).

Specifically, in terms of Computer group, the highest means fell in Strategy 8 (M=3.72) “I think about what I know to help me understand what I read”. This may be because when students read on computer screens, they tend to prefer to make good use of

background knowledge to help them to activate comprehension other than resorting to the text itself only, as navigating and spotting the exact sentences on digital texts are work intense and laborious and not as easy as doing it on printed materials (Noyes & Garland, 2003). Moreover, as reviewed in literature (section2.5), background knowledge plays an important role in comprehending reading materials (Carrell, 1987)

In contrast, in terms of Paper group, the highest means fell in Strategy 5 (M=3.73) "when I read, I guess the meaning of unknown words or phrases". The possible reason is that this strategy might be one of the strategies they were familiar with and used commonly. Students used conventional techniques much more familiar to them from their experience with printed material (Son, 2001). It also indicated that students know how to use strategies to solve their problems occurring dealing with their reading materials. The finding in this aspect was similar to the studies (e.g. Laufer, 1997; Paribakht 2004, cited in Alavi & Kaivanpanah, 2009) which have shown that the most commonly used strategy was "infer the meaning from context", that is, learners make an attempt to guess the meaning of unknown words in order to compensate for the lack of comprehension. The interview data also supported the finding. Most students reported that they came across new words, they tended to guess from the context."

Interestingly, the mean of Strategy 5 was only 3.47 for Computer group, which shows that when students read computerized texts, the students resorted to "background knowledge" more often than "guessing the meaning of unknown words or phrases". As to the rest of top five strategies, there were no large variation of means for both Computer and Paper group.

In summary, the most important strategies for both the Computer and Paper group students are PROB which refers to the strategies used when readers "work

directly with texts" and comprehension problems occur (Mokhtari & Sheorey 2002:4). This reflected that the students might have a relatively higher degree of awareness to deal with the comprehension problems by using PROB in their reading. The second important strategies for the students were GLOB, which meant that the students may intentionally apply the strategies in order to monitor or manage their reading.

5.1.5.3 Reading Strategies Least Used by Subjects

With regards to bottom five strategies, the strategies least used by both Computer and Paper groups were "taking notes", "stopping from time to time and thinking about what was read;" and "following the line with finger or pen". Interestingly, it was also found that the means of strategy 2 and strategy 17 for both text media varied differently, the means of strategy 2 for Paper group was 3.73 while the means for Computer group was 2.02. The means of strategy 17 for Paper group was 2.85, whereas for the Computer group was 1.85. It indicated that although the strategies were least used by students when working with two presentation media, the students of the paper group used the strategies far more often than those of Computer reading group.

The finding showed that students did not often "stop from time to time to think what was read". The reason for not using this strategy frequently may be that students would rather avoid using time consuming strategies since they might realize that they did not have more time to stop and think while doing the test within the class period of time. Although "underlining or circling information" seemingly is useful and easy to apply, it was unused. This may be because of the nature of reading in a particular presentation mode. It is not as easy and convenient to mark on computers as on paper.

However, the strategies least used only by the students from Paper group were strategy 11"when reading I decide what to read closely and what to ignore", and

Strategy 7 “I review the text first by noting its characteristics like length and organization”. The reason is that the students might not have known how to manage or regulate their reading since both strategies were in the subscale of GLOB, referring to the ones that are intentionally applied in order to monitor or manage reading. Another reason is that the students might not have been familiar with the two strategies, that is, these strategies might not be used commonly by them in their reading, so they might not have known how to employ them in their reading.

5.1.5.4. Differences in the Use of Support Reading Strategies between Reading from Computers and from Paper

The results indicated that the students’ strategy use was statistically different when reading from paper and from computer screens, but differences were only shown in the use of SUP. The present study found that SUP strategies were used the least, in this respect, which was similar to the studies by Yutdhana (2007) and Anderson (2003). Anderson (2003) indicated that seven of the bottom 12 reading strategies were SUP.

The possibilities are that SUP strategies generally are served as a useful function for the students and also can provide the support mechanisms aiming at sustaining responses to reading. Examples include taking notes while reading, paraphrasing text information, underlining, highlighting, and other support strategies.

The means showed that SUP strategies were used by Paper group more frequently than Computer group. The possible reason might be that based on the function of the strategies, some strategies can be used on one mode but cannot be used on another one; for example, on computer screens, it is not easy for students to take notes on the margins of the text because there are a number of difficulties which may

interfere with the smooth flow of reading. Conversely, note-taking activity while reading on paper can be made quickly and it can be interwoven with the ongoing reading. These findings are consistent with the study of O'Hara and Sellen (1997). Their study showed that the computer condition did not provide enough flexibility to do marking or underlining, nor did it support the richness and variation of this on paper. Another reason for the general reluctance to marking or underlining online documents was that it may result in making changes to the original reading materials: emboldening, italicising or underlining all alter the original document.

In addition, data from the interviews supported the findings in section 4.5.2. Those comments emphasized the difficulty of making marks within the context of reading from computers. In doing some markings, the students experienced a number of difficulties which interfered with the smooth flow of reading.

To summarize, the reading strategy use was significantly different when students read on computers and on paper. As to the subscales, the differences were only shown in the use of subscale of SUP. It was clearly concluded that students reported medium strategy use on the two modes of text presentation concerning the subscales as well as overall strategy use.

The subjects in the paper group were more inclined to read through the whole content, then go back and read texts carefully. The reason is that paper-based texts might be convenient as far as turning on the pages. Computer screens can only present the content in a fixed frame, the way of page turning of computer-based texts is hard to let readers to form a general and stereo view of text contents. Some strategies can be used on both modes whereas some other strategies may only be used in the computer condition, thus could enhance the subjects' reading comprehension.

5.1.6 Attitudes toward Reading from Computers and from Paper

One of the purposes of the study was to explore the students' attitudes toward reading from paper and from computer screens. As Kay (1993) suggested, a person's attitudes toward computers was defined by their feelings of favorableness or unfavorableness toward computers and computer-related activities. They were evaluated in this study by four categories 1) General attitudes towards computer use 2) Preconception, 3) Affective feelings for reading computer screens and paper, and 4) Preferences. This section deals with the findings from the analysis of interview data and discussion.

5.1.6.1 General Attitudes toward Computer Use

From the analyses of interview data, it was found that the majority of students read English passages from computers only in class time. After the classes, they sometimes use computers to do assignments, but most of time; they do not use computers for learning or reading English passages. Generally, they use computers to check e-mail, play games, etc.

One of the reasons is that the students may not regard computers more as a learning tool for their learning rather than the tools for playing- games, surfing online or checking the email. As Noyes and Garland (2005) stated, the students still view computers as 'toys' that allow them to play games, e-mail their friends and search the Web, as opposed to being used for serious academic work. Another reason is that most students may not have such experience in integrating technology in their learning before they entered the college, thus they may not have the habit of reading from computers and they may not get the right guidance in learning language from web-based sources.

5.1.6.2 Preconceptions

From the students' report, it was found that the level of learning from computers was not better than from paper, even less or much less than from paper.

The finding was similar to the study by Rogers, Regehr, Yeh, and Howdieshell (1998). Since reading from computers could make them forget what they had just read, most students reported that it was not easy to remember what was read. Some students claimed when they read on computers they may lose patience, or want to stop reading. Some other students explained the reason why they cannot achieve more from computers than from paper.

5.1.6.3 Affective Components of Attitudes towards Reading from Computers and from Paper

From students' responses, it can be found that using computers or reading on them could make the students feel uncomfortable and tense, even feel scared or intimidated. Also it was not easy to calm down or to concentrate on the screens to read carefully. In addition, reading on computers could tire their eyes. One of the possible reasons is that the students may be afraid of making mistakes or they may be afraid to delete the useful information.

Another reason is that the way that reading on computers was rather different from that on traditional paper format, for example, scrolling up and down with mouse on computer screens may make the eyes tiresome.

The third reason is that the students thought the level of learning from computers was not better than paper, even with the wide use of computers, because some students claimed that they always forgot what they have read and easy to lose patience, even wanted to stop reading.

5.1.6.4 Preference

The interview results showed that a significant number of students agreed that the traditional reading medium (i.e. paper) preferable. It was found in the responses to the questions on preference that students, whether they had low, moderate and high level of computer literacy, preferred to use paper rather than computers, and reported they learned more from paper than from computers. This findings was consistent with the studies by Cawkell (1999, cited in Auman, 2002) who hold the opinion that the printed page will never be equaled or surpassed by a screen, suggesting that paper still continues to be the preferred medium in general.

The possible reasons for the finding that the students prefer paper rather than computers for learning are as follows.

Firstly, it may be as a result of the physical characteristics of paper that make it aesthetically more pleasing as well as that paper is easier to handle in a learning situation. As Sun and Xiao (2006) and Kay (1993) suggested that aesthetic qualities of paper may influence their preconceptions about the amount they can learn from paper reading in comparison to computer reading.

Secondly, it may be as a result of familiarity with paper medium, students might feel more at ease with paper because unlike computers, paper is available to most individuals from a very early age. It is well known that paper is perceived as much more natural and familiar to computers. Muter et al. (1982), Oborne and Holton (1988), Wilkinson and Robinshaw (1987), and Brosnan and Lee (1998) asserted the significant role of familiarity of presentation medium when reading. It was highlighted in their studies why individuals performed better with paper than computers. Their findings can help explain that we view more positively objects with which we are more familiar.

Thirdly, the way of turning pages on computers are rather different from that on paper. Sun and Xiao (2006) stated that turning pages on screens may interfere with the flow of reading, hence may influence the reading comprehension.

However, the results did not confirm the conclusion of some other research. Muter (1996), James (2008), Bolter (1991) and O'Hara and Sellen (1997) claimed that the demise of paper is merely a matter of time; electronic text will soon replace paper. They further stated that screens are superior to paper in a matter of a few short years. According to them, books are yesterday's technology. They are bulky, environmentally suspected, impermanent, expensive, hard to find, forever out of print, and slow to produce, to write and to read, while the electronic media are more favorable because of ease of access and storage.

In summary, the students expressed negative attitudes toward reading on computers. They preferred reading from paper rather than from computers. The major difficulties participants encountered when reading on computers were: they felt uncomfortable and tense, even felt scared or intimidated, they experienced eyestrain, and they achieved less from computers than from paper. The findings may expand the research realm of this issue and may help explain the slow realization of 'paperless office' concept of the 1980s (Sellen & Harper, 2001 cited in Noyes & Garland, 2005). Despite the growth in computers and associated activities, students today still show a preference for paper over computers. Therefore, as Plume (1988) demonstrated, paper was still the more popular method of communication and is likely to remain so.

5.2 Conclusions

The study attempted to examine the effects of the three variables, namely, text presentation, computer literacy and text familiarity on reading comprehension of Chinese non-English major students. This study also aimed to survey the reading strategies used by the students when reading from two presentation modes. The students' attitudes toward reading from paper and from computer screens were also investigated. The six research questions were postulated to guide the current study.

1. Are there any differences in reading comprehension of Chinese non-English major students between reading from paper and from computer screens?
2. Are there any significant effects of computer literacy on reading comprehension of Chinese non-English major students?
3. Are there any significant effects of text familiarity on reading comprehension of Chinese non-English major students?
4. Are there any significant interaction effects between and among the three variables: text presentations, text familiarity and computer literacy?
5. Do the students use different strategies when reading from paper and from computer screens?
6. What are the attitudes of Chinese non-English major students toward reading from paper and from computer screens?

The research design was a 2 (text presentations) ×3 (computer literacy) ×2 (text familiarity) mixed factorial design. One hundred and twenty first-year non-English major students at GU of China participated in the study. The major instruments used in the present study were a) National Computer Rank Examination

(Grade One), b) Pre-Experiment Questionnaire, c) Reading Comprehension Test, d) Post-Experiment Reading Strategy Questionnaire, and e) Semi- Structured Interviews.

The procedures of the study were conducted in three phases. The first phase was done to collect the subjects' demographic information and to confirm their familiarity with the selected reading passages; and also to categorize the subjects into three groups in terms of their computer literacy level by the use of NCRE. The second phase was the experimental part conducted to investigate the effects of text presentation, computer literacy and text familiarity on the subjects' reading comprehension via reading passages from paper and from computer screens in an attempt to collect data to answer the first four questions. The third phase was done to answer the last two questions, aiming to investigate the subjects' reading strategy use on two media via post experiment questionnaire and semi-structured interviews and also to explore the subjects' attitudes toward reading from paper and from computer screens by using semi-structured interview. The data obtained from different instruments was analyzed in two main ways: quantitative data analysis and qualitative data analysis, including descriptive statistics, independent samples *t*-test, one-way ANOVA, mixed design ANOVA and content analysis.

The findings were summarized as follows.

Firstly, the findings revealed that there were no significant main effects for text presentation. That is, there were no significant differences in the subjects' comprehension scores when they read the paper-based texts, compared to when they read the computerized texts.

Secondly, the findings revealed that there were significant main effects for computer literacy on reading comprehension. That is, there were significant

differences between Low group and Moderate group, Low group and High group, but not between Moderate group and High group.

Thirdly, the findings revealed that there was a significant effect of text familiarity on reading comprehension of Chinese non-English major students. It can be noted that the students performed better when reading the familiar texts than when reading the unfamiliar texts.

Fourthly, the findings also revealed that there were no significant two-way interactions between text presentation and computer literacy, between text presentation and text familiarity, whereas there was two-way interaction between computer literacy and text familiarity. The results also showed no significant three-way interaction among the three independent variables (text presentation, computer literacy and text familiarity) was found. Specifically, it revealed that subjects' reading performance across different levels of computer literacy was not only under the influence of the main effects of text familiarity, but also under the influence of the interaction effects of the two variables. It also showed that the students' reading performance of Low group was significantly lower than those of Moderate and High groups in reading familiar texts, whereas reading performances of Low, Moderate and High groups were not significantly different in reading unfamiliar texts.

Fifthly, the findings revealed that the overall strategies as well as the subscales strategies were reported in the moderate-usage level by the students on two text presentation media. Furthermore, the statistically significant differences in overall strategy use were found between Computer reading group and Paper reading group, the significant differences, however, were only shown in the use of Support strategies.

It can be noted that paper group students seemed to consider support reading strategies to be relatively more valuable than computer group students. It was also found that the students employed Global Reading Strategies and Problem Solving Strategies more frequently than Support Reading strategies.

Finally, with reference to students' attitudes toward presentation modes, the findings showed that the students preferred to use paper rather than computers and they learned more from paper than from computers. The students also demonstrated that they did not feel comfortable, even tense, and experienced eye stress, when reading from computers.

5.3 Implications and Recommendations

This study examined the effects of text presentation, computer literacy and text familiarity on reading comprehension. Also reading strategy use on two presentation modes and attitudes toward text presentation were investigated. As a result, this study provides several significant implications and recommendations for pedagogical practices.

5.3.1 Instructors and computer-based material designers should pay special attention to the problems experienced by students in reading the computer-based materials. Since students preferred paper to computers and they perceived they achieved less from computers than paper, trying to improve the learning outcome from computers should become one of the major concerns in designing the materials. Simply putting content online is not sufficient to make it usable. As Zusman and Landis (2002) suggested, with paper, people concentrate on content rather than on presentation. Therefore, computer-based materials should allow students to concentrate on content, not on presentation.

5.3.2 The results may help education institutes, reading instructors as well as college students to promote awareness of attaching importance to computer literacy in their online teaching and learning. As Dupin-Bryant (2002) stated, instructors should never assume all students have basic computer skills and knowledge. Though many students use computers these days, they have varying prior experiences with computers. Dupin-Bryant (2002) and Kirtley (2005) pointed out that if a course requires a certain level of computer proficiency, students need to be taught to gain basic skills. Therefore, education institutes should provide all students at least a basic computer training program in the first semester of the first year in an attempt to overcome the problem of lack of computer skills and knowledge occurring with first-year college students. This can help prepare the students for learning English via computers.

5.3.3 In reading instruction, instructors should be alert to the importance of background knowledge. They also should be aware that students need to be equipped with all kinds of schematic knowledge necessary to English reading by organizing some classroom activities such as some pre-reading activities, so as to facilitate the activation of appropriate schema to help them understand reading materials.

5.3.4 Instructors should help students raise metacognitive awareness of using strategies to achieve second language learning, especially to enhance their reading ability at college level, by introducing effective strategies either in the classroom or in other academic situations. Therefore, teaching students how to use strategies is a major concern in the reading classroom, especially within multi-media web-based reading courses.

5.3.5 Since some reading strategies should be introduced in a systematic way to the students, reading instructors can focus students' attention on the reading strategies identified in the present study to help students improve their online reading ability. The

reading strategies for on-line training are proposed based on the findings from PERSQ survey and Semi-structured interviews for the present study (see Table 5.2).

Table 5.2 Reading Strategies for computer-based reading programs

Primary Strategies	
1	I think about what I know to help me understand texts.
2	I re-read texts for better understanding when I read.
3	I have a purpose in mind when I read.
4	When reading texts, I guess the meaning of unknown words or phrases.
5	I adjust my reading speed according to what I am reading.
Secondary Strategies	
6	I use context clues to help me better understand what I am reading.
7	I take an overall view of the text to see what it is about before I read.
8	When the text becomes difficult, I pay closer attention to what I am reading.
9	I first skim an English passage, then go back and read it carefully.
10	When reading, I think about information in both English and my mother tongue.

Online reading strategies that should be included in any training program are classified into two categories on the basis of usage frequency as revealed by the questionnaire. Table 5.2 shows that ten items were included in the training list accounting for about 50 per cent of the total questionnaire items in Table 4.17, falling into two categories: Primary Strategies and Secondary Strategies. Primary strategies (Items 1 to 5) were the top five strategies (see Table 5.1), referring respectively to using the background knowledge to help understand texts; re-reading texts; having purpose in mind; guessing the meaning of unknown words or phrases, and adjusting the reading speed. According to Table 5.1, the means for the computer group ranged from 3.72 (SD= .954) to 3.38 (SD= .958), while the means of the paper group from

3.73 (SD= 1.014) to 3.51 (SD=1.194), which indicated that those strategies were most frequently used by the computer group students as well as by the paper group ones. Therefore, reading instructors should attach more importance to these strategies in their reading instruction for online reading and paper-based reading.

As to Secondary Strategies, another five items (items 6 to 10) were included based on the rank of means next to the top five strategies reported by the computer group students, referring to items 15, 4, 12, 19 and 21 in Table 4.17. Although these strategies were not reported as most frequently used by the students, they were moderately used by the computer group students (mean of 2.5-3.49). Their means were from 3.35 (SD=.936) to 3.07 (SD= 1.148). In comparison with the paper group, the means of these strategies were not reported to be the same as the computer group. The reason for using the rank order of the means of computer group is that the training list is for the context of a computer-based reading course. The strategies were classified as the secondary strategies because the means were not as high as those of primary strategies. Although they were not as important as the primary strategies, reading instructors need to train students in using these strategies, especially in the context of a computer-based reading course.

The rationale for including the total ten strategies is that these strategies were identified to be relatively frequently used by students in this study. In addition, the strategies fall into the GLOB and PROB subscales of the study. As Mokhtari & Sheorey (2002) suggested, PROB strategies can be used to increase students' awareness about dealing with the comprehension problems in their reading. As well, they can be trained to apply the GLOB strategies intentionally in order to monitor or manage their reading. Therefore, reading instructors exploit the potential of these strategies to greatly enhance comprehension by incorporating them into computer-based reading instruction programs for college students.

5.4 Limitations and Suggestions for Further Research

Although the findings of the present study have revealed the benefits in some aspects, such as, the text presentation research field, computer-based reading instruction as well as reading strategy training, several factors need to be taken into consideration when interpreting the results and generalizing the findings. Also further research was suggested based on the results of the study.

5.4.1 The study was conducted with 120 first year undergraduate non-English majors at Guizhou University, China. The findings from the study, therefore, have to be considered and applied with great caution in other language learning contexts. The subjects of this study may not be representative of other students, such as English major students. Thus, the findings are limited to subjects with a profile similar to those participating in this study.

5.4.2 Since the materials used are only expository texts without any animated pictures, tables and figures, the findings may not be generalized and applied to other text types.

5.4.3 The type of assessment of reading comprehension used for the study was multiple–choice questions only, thus, the data might not reveal the students' explicit reading comprehension. Thus, in future research, more question types should be included to measure the students' reading comprehension.

5.4.4 This study can be used to expand the database in the research area of text presentation; therefore, further studies can be continued and replicated in order to close the gap between the limitations of empirical data on the effects of text presentation on L2 reading performance.

5.4.5 So far, little research has been done to examine the differences in reading strategy use between on computers and on paper, therefore, more empirical research could be done. Besides, the present study explored the strategy use when

reading on two presentation modes, but the data were collected from the subjects when they read from different presentation group. Therefore, a further study should be conducted to gather reading strategy data from the subjects when they read both from paper and from computer screens to know if there are any significant differences between these two presentation modes.

5.4.6 The present study was confined to one research methodology using interviews to investigate students' attitudes toward computers and paper; therefore, further investigations should be conducted using triangulated research methods to obtain triangulated data.

5.5 Summary

To conclude, this chapter addresses the main critical points of research. To begin with, the analytical discussion of the findings presented in detail in the previous chapter was described regarding the three independent variables, i.e. text presentation, computer literacy and text familiarity, reading strategies used on two presentation media and attitudes toward the two text presentation media (computers and paper). Next, the conclusion of the study was made, including the purposes, the research questions, the research design, the method of data collection, and the findings obtained from the study. Third, the implications and recommendations were provided to make broad contributions to English language teaching, to encourage conducting other types of further investigation into the effects of text presentation on L2 reading performance, and to compare the differences of strategy use between reading computer-based texts and paper-based texts, particularly in Chinese EFL contexts. Lastly, the limitations are summarized because this study is limited in certain ways as in any other research.

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APPENDICES

APPENDIX A

INSTRUCTIONS

·This examination is to test your knowledge and abilities to use computer.

·Read each question carefully and try to answer ALL the questions.

·At the end of the test, hand the test paper, your answer sheet to the instructors.

·You have 1 hour to finish the test.

Test Paper

2003 年全国计算机等级考试试题(一级)

National Computer Rank Examination Grade One

一、选择题((1)—(30)题每小题 1 分， (31)—(55)题每小题 2 分，共 80 分)下列各题 A)、B)、C)、D)四个选项中，只有一个选项是正确的，请将正确选项涂写在答题卡相应位置上，答在试卷上不得分。

(1) 计算机的软件系统可分为

A) 程序和数据　　B) 操作系统和语言处理系统

C) 程序、数据和文档　　D) 系统软件和应用软件

(2) 与十进制数 100 等值的二进制数是

A) 0010011　B) 1100010　　C) 1100100　　D) 1100110

(3)下列关于存储器的叙述中正确的是

A) CPU 能直接访问存储在内存中的数据，也能直接访问存储在外存中的数据

B) CPU 不能直接访问存储在内存中的数据，能直接访问存储在外存中的数据

C)CPU 只能直接访问存储在内存中的数据,不能直接访问存储在外存中的数据

D) CPU 既不能直接访问存储在内存中的数据，也不能直接访问存储在外存中的数据

(4) 在微型计算机中，应用最普遍的字符编码是

A)ASCII 码　　B)BCD 码　　C)汉字编码　　D)补码

(5) 计算机病毒可以使整个计算机瘫痪，危害极大。计算机病毒是

A) 一条命令　B) 一段特殊的程序　　C) 一种生物病毒　D) 一种芯片

(6) 计算机中所有信息的存储都采用

A) 二进制　　B) 八进制　　C) 十进制　　D) 十六进制

(7) Windows 98 中，可以打开“开始”菜单的组合键是

A) Alt+Esc　　B) Ctrl+esc　　C) Tab+Esc　　D) Shift 十 Esc

(8) 在 Windows 98 缺省状态下，鼠标指针的含义是

A) 忙　　B) 链接选择　　C) 后台操作　　D) 不可用

(9) 在 Windows 98 中，右单击“开始”按钮，弹出的快捷菜单中有

A) “新建”命令　　B) “查找”命令

C) “关闭”命令　　D) “替换”命令

(10) Windows 98 中，磁盘驱动器“属性”对话框“工具”标签中包括的磁盘管理工具有

A) 修复　　B) 碎片整理　　C) 复制　　D) 格式化

(11) windows 98 中，按 PrintScreen 键，则使整个桌面内容

A) 打印到打印纸上　　B) 打印到指定文件

C) 复制到指定文件　　D) 复制到剪贴板

(12) Windows 98 中，通过“鼠标属性”对话框，不能调整鼠标器的

□□ A) 单击速度　　B) 双击速度 □ C) 移动速度　　D) 指针轨迹

(13) 在 Windows 98 “显示属性”对话框中，用于调整显示器分辨率功能的标签是

□□ A) 背景　　B) 外观　　C) 效果　　D) 设置

(14) Word97 具有的功能是

□□ A) 表格处理　　B) 绘制图形　C) 自动更正　　D) 以上三项都是

(15)下列选项不属于 Word97 窗口组成部分的是

□□ A) 标题栏　　B) 对话框　　C) 菜单栏　　D) 状态栏

(16) 在 word97 编辑状态下，绘制一文本框，应使用的下拉菜单是

□□ A) 插入　　B) 表格　　C) 编辑　　D) 工具

(17) word 97 的替换功能所在的下拉菜单是

□□ A) 视图　　B) 编辑　　C) 插入　　D) 格式

(18) 在 word 97 编辑状态下，若要在当前窗口中打开(关闭)绘图工具栏，则可选择的操作是

□□ A) 单击“工具”--“绘图”　　B) 单击“视图”--“绘图”

□□C) 单击“编辑”--“工具栏”- -“绘图”　D) 单击“视图”--“工具栏” --“绘 图”

(19) 在 Word 97 编辑状态下，若要进行字体效果的设置(如上、下标等)，首先应打开

□□ A) “编辑”下拉菜单　　B) “视图”下拉菜单

□□ C) “格式”下拉菜单　　D) “工具”下拉菜单

(20) 在 Word 97 的默认状态下，将鼠标指针移到某一行左端的文档选定区，鼠标指针变成，此时单击鼠标左键，则

□□ A) 该行被选定　　B) 该行的下一行被选定

□□ C) 该行所在的段落被选定　　D) 全文被选定

(21) 在 Word 97 中无法实现的操作是

□□ A) 在页眉中插入剪贴画　□

□ B) 建立奇偶页内容不同的页眉

□□ C) 在页眉中插入分隔符　□□

D) 在页眉中插入日期

(22) 图文混排是 word 97 的特色功能之一，以下叙述中错误的是

□□ A) 可以在文档中插入剪贴画　　B) 可以在文档中插入图形

□□ C) 可以在文档中使用文本框　　D)可以在文档中使用配色方案

(23) 在 Excel97 中，一个工作表最多可含有的行数是

□□ A) 255　　B) 256　　C) 65536　　D) 任意多

(24) 在 Excel 97 工作表中，日期型数据“2001 年 12 月 21 日”的正确输入形式是

□□ A) 21—12-2001　　B) 21．12．2001

□□ C) 21,12,2001　　D) 21：12：2001

(25) 在 Excel 97 工作表中，单元格区域 D2：E4 所包含的单元格个数是

□□ A) 5　　B) 6　　C) 7　　D) 8

(26) 在 Excel 97 工作表中，选定某单元格，单击“编辑”菜单下的“删除”选项，不可能完成的操作是

□□ A) 删除该行　　B) 右侧单元格左移

C) 删除该列　　D) 左侧单元格右移

(27) 在 Excel 97 工作表的某单元格内输入数字字符串“456”，正确的输入方式是

□□ A) 456　　B) '456　　C) =456　　D) "456"

(28) PowerPoint 97 演示文稿中，将一张布局为“项目清单”的幻灯片改为“对象”幻灯片，应使用的对话框是

□□ A) 幻灯片版式　　B) 幻灯片配色方案

C) 背景　　D) 应用设计模版

(29) 计算机网络按其覆盖的范围，可划分为

□□ A) 以太网和移动通信网　　B) 电路交换网和分组交换网

□□ C) 局域网、城域网和广域网　　D) 星形结构、环形结构和总线结构

(30)下列域名中，表示教育机构的是

□□ A) ftp.bta.net.cn　　B) ftp.cnc.ac.cn

□□ C) www.ioa.ac.cn　　D) www.buaa．edu．cn

(31)下列叙述中，正确的是

□□ A) 激光打印机属于击打式打印机　B) CAI 软件属于系统软件

□□ C) 软磁盘驱动器是存储介质　□D) 计算机运算速度可以用 MiPs 来表示

(32)下列等式中，正确的是

□□ A)1KB＝1024×1024B　　B) IMB＝1024B

□□ C)1KB；10241L　　D)1MB＝1024×1024B

(33) 微型计算机的内存储器是

□□ A) 按二进制位编址　　B) 按字节编址

□□ C) 按字长编址　　D) 按十进制位编址

(34) 操作系统的五大功能模块为

□□A) 程序管理、文件管理、编译管理、设备管理、用户管理

□□D) 硬盘管理、软盘管理、存储器管理、文件管理、批处理管理

□□C) 运算器管理、控制器管理、打印机管理、磁盘管理、分时管理

□□D) 处理器管理、存储器管理、设备管理、文件管理、作业管理

(35) 如果设汉字点阵为 16×16，那么 100 个汉字的字型信息所占用的字节数是

□□ A) 3200 B) 25600 □ C)16×1600 D)16×16

(36) Windows98 中利用“查找”窗口不能按

□□ A) 文件中所包含的文字查找 B) 文件创建日期查找

□□ C) 文件所属类型查找 D) 文件属性查找

(37) Windows 98 中，下列关于“关闭窗口”的叙述，错误的是

□□ A) 用控制菜单中的“关闭”命令可关闭窗口

□□ B) 关闭应用程序窗口，将导致其对应的应用程序运行结束

□□ C) 关闭应用程序窗口，则任务栏上其对应的任务按钮将从凹变凸

□□D) 按 Alt+F4 键，可关闭应用程序窗口

(38) 在“我的电脑”各级文件夹窗口中，如果需要选择多个不连续排列的文件正确的操作是

□□ A) 技 A1t+单击要选定的文件对象

□□ B) 按 Ctrl+单击要选定的文件对象

□□ C) 按 Shift+单击要选定的文件对象

□□ D) 按 Ctrl+双击要选定的文件对象

(39) 非法的 Window593 文件夹名是

□□ A) x+y B) x—y C) X*Y D) x÷Y

(40) Windows 98 中，不含“资源管理器”命令的快捷菜单是

□A)右单击“我的电脑”图标，弹出的快捷菜单

□B)右单击“回收站”图标，弹出的快菠菜单

□C)右单击桌面任一空白位置，弹出的快捷菜单

□D)右单击“我的电脑”文件夹窗口内的任一驱动器，弹出的快捷菜单

(41) 在“Windows 帮助”窗口中，若要通过按类分的帮助主题获取帮助信息应选择的标签是

□□ A)主题 B)目录 C)索引 D)搜索

(42) Windows 98 缺省状态下进行输入法切换，应先

□□ A) 单击任务栏右侧的“语言指示器”

□□ B) 在控制面板中双击“输入法”

□□ C) 在任务栏空白处单击鼠标右键打开快捷菜单，选“输入法切换”命令

□□ D) 按 Cbl 十．键

(43) 在 Word 97 编辑状态下，对于选定的文字不能进行的设置是

□□ A) 加下划线 B) 加着重号 C) 动态效果 D) 自动版式

(44) 在 Word 97 编辑状态下，对于选定的文字

□□ A) 可以移动，不可以复制

B) 可以复制，不可以移动

□□ C) 可以进行移动或复制

D) 可以同时进行移动和复制

(45) 在 word 97 编辑状态下，若光标位于表格外右侧的行尾处，按 Enter(回车)键，结果

□□ A)光标移到下一列

B) 光标移到下一行，表格行数不变

□□ C) 插入一行，表格行数改变

D) 在本单元格内换行，表格行数不变

(46) 关于 word 97 中的多文档窗口操作，以下叙述中错误的是

□A) Word 的文档窗口可以拆分为两个文档窗口

□B) 多个文档编辑工作结束后，只能一个一个地存盘或关闭文档窗口

□C) Word 允许同时打开多个文档进行编辑每个文档有一个文档窗口

□D) 多文档窗口问的内容可以进行剪切、粘贴和复制等操作

(47) 在 word 97 中，若要计算表格中某行数值的总和，可使用的统计函数是

□□ A) Sum B) Total C) Count D) Average

(48) 在 Word 97 中，下述关于分栏操作的说法，正确的是

□□ A) 可以将指定的段落分成指定宽度的两栏

□□ B) 任何视图下均可看到分栏效果

□□ C) 设置的各栏宽度和间距与页面宽度无关

□□ D) 栏与栏之间不可以设置分隔线

(50) 在 Excel 97 中，关于工作表及为其建立的嵌入式图表的说法，正确的是

□□ A) 删除工作表中的数据，图表中的数据系列不会删除

□□ B) 增加工作表中的数据，图表中的数据系列不会增加

□□ C) 修改工作表中的数据，图表中的数据系列不会修改

□□ D) 以上三项均不正确

(51) 在 Excel 97 工作表中，单元格 C4 中有公式“＝A3+3CS5”，在第 3 行之前插入一行之后，单元格 C5 中的公式为

□□ A)＝A4 十＄C＄6　　B) A4 十＄C35

C) A3 十＄C＄6　　D)＝A3 十＄C35

(52) 在 PowerPoint 97 的幻灯片浏览视图下，不能完成的操作是

□□ A)调整个别幻灯片位置

B)删除个别幻灯片

□□ C)编辑个别幻灯片内容

D)复制个别幻灯片

(53) 在 PowerPoint 97 中，设置幻灯片放映时的换页效果为“垂直百叶窗”，应使用“幻灯片放映”菜单下的选项是

□□ A)动作按钮　　B)幻灯片切换　　C)预设动画　　D)自定义动画

(54) 统一资源定位器 URI 的格式是

□□ A)协议：iP 地址或域名／路径／文件名

□□ B)协议://路径／文件名 .

□□ C)TCP／IP 协议

□□ D)http 协议

(55) 下列各项中，非法的 IP 地址是

□□ A)126．96．2．6　　B)190．256．38．8

□□ C)203．113．7．15　　D)203．226．1．68

二、填空题(每空 2 分，共 20 分)

请将每一个空的正确答案写在答题卡[1]一[10]序号的横线上，答在试卷上不得分。

□ (1) _____语言是计算机唯一能够识别并直接执行的语言。

□ (2) 将指令中的操作码翻译成相应的控制信号的部件称为_____器。

□ (3) windows 98 中，名字前带有“_____”记号的菜单选项表示该项已经选用，在同组的这些选项中，只能有一个且必须有一个被选用。

□ (4) Windows98 中，由于各级文件夹之间有包含关系，使得所有文件夹构成一_____状结构。

□ (5) 在 word 97 编辑状态下，常用工具栏中的按钮：_____代表的功能是打印预览。

□ (6) 在 Word 97 编辑状态下，_____当前对齐方式是左对齐，如果连续两次单击格式工具栏中的按钮，得到的对齐方式应该是居中。

□ (7) 在 Excel 97 工作表中，当相邻单元格中要输入相同数据或按某种规律变化的数据时, 可以使用_____功能实现快速输入。

□ (8) 在 Excel 97 工作表的单元格 D6 中有公式“＝b2+C6”，将 D6 单元格的公式复制到 C7 单元格内，则 C7 单元格的公式为_____。

□(9) 在 PowerPoint 97 中，打印演示文稿时，“打印内容”栏中选择_____，每页打印纸最多能输出 6 张幻灯片。

□ (10) 电子邮件地址的格式是：用户标识_____<主机域名>。

APPENDIX B

Pre-Experiment Questionnaire

(English Version)

DIRECTION: This questionnaire is designed to gather your background information, such as, your language proficiency, and your familiarity with the reading passages. Please provide the information about yourself by putting a cross in the box provided(□).Read each question carefully and try to answer *ALL* the questions. You have half an hour to finish the questionnaire.

1. What is your gender?

☐ Male ☐ Female

2. What is your age?

☐18 ☐19 ☐20 ☐ 21

3. College Entrance Exam Score in English subject:

☐Less than 30 ☐ 31-60 ☐ 61-90 ☐ 91-120 ☐120-150

4. Are you familiar with the topic of Passage One?

☐ Yes ☐ No

5. Are you familiar with the topic of Passage Two?

☐ Yes ☐ No

6. Are you familiar with the topic of Passage Three?

☐ Yes ☐ No

7. Are you familiar with the topic of Passage Four?

☐ Yes ☐ No

☺ *Thank you very much for your participation!* ☺

Pre-Experiment Questionnaire

(Chinese Version)

问卷调查指南:

1．问题1至3 是关于个人信息的调查。

2．问题4至7 是关于对所要读的文章是否熟悉。

3．请在你所选的选项前的方框里打×。

4．请回答全部问题。

5．该问卷将需要半小时完成。

1．性别　　□男　　□ 女

2．年龄（岁）　　□18　　□19　　□20　　□ 21

3．高考的英语成绩是多少？

□30分以下　　□ 31-60分　　□ 61-90分　　□ 91-120分　　□120-150分

4．你对第一篇文章的内容熟悉吗？

□熟悉　　□ 不熟悉

5．你对第二篇文章的内容熟悉吗？

□熟悉　　□ 不熟悉

6．你对第三篇文章的内容熟悉吗？

□熟悉　　□ 不熟悉

7．你对第四篇文章的内容熟悉吗？

□熟悉　　□ 不熟悉

谢 谢 合 作!

APPENDIX C

READING COMPREHENSION TEST

Name_____

Group_____

Directions: There are four passages in this test. Each passage is followed by 10 multiple-choice questions. Choose the ONE you think is the best answer. You are not allowed to ask questions concerning the test content and to use any dictionaries.

Passage One

Many families in the United States have a larger income now than ever before, but people are finding it difficult to make ends meet anyway. Almost everyone is wondering, "What happens to all my money? I never seem to have anything left to put away."

Why isn't a dollar worth as much as it used to be? One dollar is always worth the same amount, that is, 100 cents. But the value of a dollar is how much it can buy. The value of money depends on the cost of living. Economists say that the cost of living is the money that a family must pay for the necessities of life such as food, housing or rent, clothes, and medical expenses. For many years now, the cost of living has increased greatly, so the value of the dollar has decreased. When a dollar has a low value, you cannot buy as many things with it.

No one fully understands why the cost of living keeps increasing, but economists believe that workers and producers can make prices go up. As workers earn more money, they have more to spend, so they demand more goods. If there is a great demand for certain goods, the prices of these goods go up. At the same time, if there's a shortage of goods, the price also go up. For example, if everyone wants to buy more and more gas, the prices of gas goes up. When companies withhold gas from buyers, they can also make the price of gas go up.

Families need to know what happens to their money. They need to make their income meet the cost of living, so many people plan a family budget. A budget is a list of monthly expenses. If your expenses add up to more than your income, you must find ways to save money. Maybe you're spending too much on entertainment. Or if you're spending too much on clothes, you may want to sew your own clothes. Budgeting helps you spend your money wisely as the cost of living increases.

Choose the best answer for each question

1. What has troubled many families in the United States?
   A. A not-large-enough income. B. Nothing is left over to put away.
   C. The increasing cost of living. D. A shortage of certain goods.
2. Which is the factor to determine the value of the dollar.
   A. The government B. The cost of living
   C. The economist D. The bank
3. Why does the cost of living keep increasing?
   A. There are always shortages of goods
   B. The workers are getting lower and lower pay.
   C. The government makes no interference.
   D. People demand more and better goods.
4. According to the writer, _____ fully understand(s) why the cost of living keeps increasing.
   A. some people B. few people C. only economists D. no one
5. Which of the following is true?
   A. Housewives needn't know anything happening to the market.
   B. People are most concerned about the value of money.
   C. There seems no need for everyone to know about the rising cost of living.
   D. The prices will go up if more goods are produced
6. According to the passage, when people find it hard to make ends meet, they _____.
   A. find ways to save money
   B. do extra work to earn more money
   C. try some other means of making money
   D. lodge a protest against the high cost of living

7. Budgeting helps _____.

A. one to make his income meet the cost of living

B. the government to battle the rising cost of living

C. merchants to produce more goods

D. the workers to earn more money

8. The cost of living is _____.

A. the money that a family must pay for the food

B. the money that a family must pay for housing or rent

C. the money that a family must pay for clothes and medical expenses

D. the money that a family must pay for the necessities of life.

9. What's the meaning of "budget" in line 2 of paragraph 4?

A. monthly expenses of food and houses

B. monthly income

C. monthly expenses

D. monthly expenses of entertainment

10. What is the best title for this passage?

A. A Family Budget B. The High Cost of Living

C. The Value of Money D. The Necessities of Life

Passage Two

Humans are social animals. They depend on groups for survival. An individual human being lost in a wilderness is capable of doing many thins. But he or she will probably be thinking constantly about how much better would be if there were other people around to talk to and to help.

Because humans like to live and work in groups, they form couples and families; villages and cities; work groups, teams, and other organization. Language is the cement that holds these social groups together.

Through language we can share ideas and experiences. The human mouth and throat are so constructed that we can utter a variety of sounds. Language is the device for matching certain combinations of sounds with the symbols for things, idea, and

emotions. Our brains think in symbols- words and sentences- as well as in the images that we receive from our senses. Thus we can turn experiences into symbols and communicate to other people through the use of language. Any one individual, therefore, can learn much more from others than he or she can discover alone. Language enables people to pass ideas from group t group and from generation to generation.

Language is part of culture. Culture, in this sense, means all those customs, skills, and attitudes that are part of the behavior of a particular group. The way you live, what you think, and what you want in life are all affected by the culture of the group in which you are raised. Groups of people live in different ways. They may have different skills, organizations, and art form. Their family life may be completely different from yours.

Human beings are inventive animals. They can even decide to change their cultures in order to meet new situation. They can choose to live in many environments and in a wide variety of ways. Of all living things, only human beings can choose were and how they want to live and then modify the physical environment to help themselves realized these choices. Acquiring the wisdom to make wise choices is the enduring challenge of being human.

Choose the best answer for each question

11. An individual human being lost in a wilderness

A. longs for a life among other people.

B. can do many things

C. keeps talking all the time.

D. Both A and B

12. What is the most important thing that helps humans to form social groups?

A. marriage B. construction C. language D. good behavior

13. Language is the device for_____.

A. uttering a variety of sound.

B.using a set of symbols.

C. receiving a group of images.

D. matching sounds with symbols

14. All the following things can be done with language except _____.

A. produce good health.

B. communicate to other people.

C. pass ideas from group to group.

D. turn experiences into symbols

15. Culture directly affects all the following but _____.

A. your way of life

B. your thinking

C. your senses

D. your needs

16. Family life varies because of the difference in_____.

A. working skills B. culture C. language D. art forms

17. In what sense are humans wise and different from other living things?

A. Humans have a living place

B. Humans can make wise choices

C. Humans move from place to place

D. Humans live in groups

18. Which is the topic sentence in the third paragraph of the passage?

A. The first B. The second

C. The last but one D. None of the above

19. Language helps humans develop a variety of cultures because through language_____

A. humans live and work in groups.

B. humans share their ideas and experiences.,

C. humans pass idea from generation to generation.

D. all of the above

20. The best title for this passage might be _____

A. Language and Culture.

B. The History of Human Beings

C. Humans Are Inventive Animals

D. A Variety of Cultures Help Humans Survive.

Passage Three

There were two widely divergent influences on the early development of statistical methods. Statistics had a mother who was dedicated to keeping orderly records of governmental units (state and statistics come from the same Latin root, status) and a gentlemanly gambling father who relied on mathematics to increase his skill at playing the odds in games of chance. The influence of the mother on the offspring, statistics, is represented by counting, measuring, describing, tabulating (制成表格的), ordering, and the taking of censuses（人口普查） —— all of which led to modern descriptive statistics. From the influence of the father came modern inferential statistics, which is based squarely on theories of probability.

Descriptive statistics involves tabulating, depicting, and describing collections of data. These data may be quantitative, such as measures of height, intelligence, or grade level - variables that are characterized by an underlying continuum - or the data may represent qualitative variables, such as sex, college major, or personality type. Large masses of data must generally undergo a process of summarization or reduction before they are comprehensible. Descriptive statistics is a tool for describing or summarizing or reducing to comprehensible form the properties of an otherwise unwieldy(笨拙的) mass or data.

Inferential statistics is a formalized body of methods for solving another class of problems that present great difficulties for the unaided human mind. This general class of problems characteristically involves attempts to make predictions using a sample of observations. For example, a school superintendent wishes to determine the proportion of children in a large school system who come to school without breakfast, have been vaccinated for flu, or whatever. Having a little knowledge of statistics, the superintendent would know that it is unnecessary and inefficient to question each child; the proportion for the entire district could be estimated fairly accurately from a sample of as few as l00 children. Thus, the purpose of inferential statistics is to predict or estimate characteristics of a population from knowledge of the characteristics of only a sample of the population.

Choose the best answer for each question

21. With what is the passage mainly concerned?

A. The drawbacks of descriptive and inferential statistics

B. Applications of inferential statistics

C. The development and use of statistics

D. How to use descriptive statistics

22. The word "divergent" in line 1 is closest in meaning to

A. different

B. distributed

C. recorded

D. prominent

23. According to the first paragraph, counting and census-taking arc associated with

A. inferential statistics

B. descriptive statistics

C. unknown variables

D. qualitative changes

24. Why does the author mention the "mother" and "father" in the first paragraph?

A. To point out that parents can teach their children statistics

B. To introduce inferential statistic

C. To explain that there are different kinds of variables

D. To present the background of statistics in a humorous and understandable way

25. The word "squarely" in line 8 could best be replaced by

A. solidly

B. geometrically

C. rectangularly

D. haphazardly

26. Which of the following is NOT given an example of a qualitative variable?

A. Gender

B. Height

C. College major

D. Type of personality

27. The word "they" in line 13 refers to

A. variables

B. masses

C. descriptive statistics

D. properties

28. Which of the following statements about descriptive statistics is best supported by the passage?

A. It reduces large amounts of data to a more comprehensible form

B. It is based on probability.

C. It can be used by people with little knowledge of mathematics

D. It measures only qualitative differences

29. The word "unwieldy" in line 15 is closest in meaning to

A. unmanageable

B. unpredictable

C. understandable

D. unreliable

30. According to the passage, what is the purpose of examining a sample of a population?

A. To compare different groups

B. To predict characteristics of the entire population

C. To detect differences not observable in the whole population

D. To compile more accurate data

Passage Four

Glass is a remarkable substance made from the simplest raw materials. It can be colored or colorless， monochrome （单色的）or polychrome， transparent，translucent(半透明的)，or opaque. It is lightweight impermeable to liquids，readily cleaned and reused，durable yet fragile，and often very beautiful. Glass can be decorated in multiple ways and its optical properties are exceptional. In all its myriad forms - as table ware， containers， in architecture and design - glass represents a major achievement in the history of technological developments.

Since the Bronze Age about 3,000 B.C.，glass has been used for making various kinds of objects. It was first made from a mixture of silica(硅石)， line and an alkali（碱） such as soda or potash， and these remained the basic ingredients of glass until the development of lead glass in the seventeenth century. When heated, the mixture becomes soft and malleable（可塑的） and can be formed by various techniques into a vast array of shapes and sizes. The homogeneous mass thus formed by melting then cools to create glass，but in contrast to most materials formed in this way (metals, for instance), glass lacks the crystalline(晶状体球蛋白) structure normally associated with solids， and instead retains the random molecular structure of a liquid. In effect， as molten glass cools， it progressively stiffens until rigid， but does so without setting up a network of interlocking crystals customarily associated with that process. This is why glass shatters so easily when dealt a blow. Why glass deteriorates(瓦解) over time， especially when exposed to moisture，and why glassware must be slowly reheated and uniformly cooled after manufacture to release internal stresses, induced by uneven cooling.

Another unusual feature of glass is the manner in which its viscosity（粘度） changes as it turns from a cold substance into a hot, ductile（柔软的）liquid. Unlike metals that flow or "freeze" at specific temperatures， glass progressively softens as the temperature rises，going through varying stages of malleability until it flows like a thick syrup. Each stage of malleability allows the glass to be manipulated into various forms， by different techniques， and if suddenly cooled the object retains the shape achieved at that point. Glass is thus amenable to a greater number of heat-forming techniques than most other materials.

Choose the best answer for each question.

31.Why does the author list the characteristics of glass in lines 1-5？

A. To demonstrate how glass evolved

B. To show the versatility of glass

C. To explain glassmaking technology

D. To explain the purpose of each component of glass

32. The word "durable" in hue 3 is closest in meaning to

A. lasting

B. delicate

C. heavy

D. Plain

33. What does the author imply about the raw materials used to make glass?

A. They were the same for centuries.

B. They arc liquid

C. They are transparent

D. They are very heavy.

34. According to the passage，how is glass that has cooled and become rigid different from most other rigid substances?

A. It has an interlocking crystal network.

B. It has an unusually low melting temperature.

C. It has varying physical properties.

D. It has a random molecular structure.

35. The word "customarily" in line 13 is closest in meaning to

A. naturally

B. necessarily

C. usually

D. certainly

36. The words "exposed to" in line 19 are closest in meaning to

A. hardened by

B. chilled with

C. subjected to

D. deprived of

37.What must be done to release the internal stresses that build up in glass products during manufacture?

A. the glass must be reheated and evenly cooled.

B. the glass must be cooled quickly.

C. The glass must be kept moist until cooled.

D. The glass must be shaped to its desired form immediately

38. The word "induced" in line 21 is closest in meaning to

A. joined

B. missed

C. caused

D. lost

39. The word "it" in line 22 refers to

A. feature

B. glass

C. manner

D. viscosity

40. According to the passage. why can glass be more easily shaped into specific forms than can metals

A. It resists breaking when heated

B. It has better optical properties.

C. It retains heat while its viscosity changes.

D. It gradually becomes softer as its temperature rises.

Answers for Reading Comprehension Test

Passage One

1. C 2.B 3. D 4.D 5.B

6.A 7.A 8.D 9.C 10B

Passage Two

11. D 12.C 13.D 14.A 15.C

16.C 17.B 18.A 19.D 20.A

Passage Three

21.C 22.A 23.B 24.D 25.C

26.B 27.B 28.A 29.A 30.B

Passage Four

31.B 32.A 33.A 34.D 35.C

36.C 37.A 38.C 39.B 40.D

APPENDIX D

Metacognitive Awareness of Reading Strategies Inventory

Directions: Listed below are statements about what people do when they read *academic or school-related materials* such as textbooks or library books. Five numbers follow each statement (1, 2, 3, 4, 5), and each number means the following:

- **1** means "I **never or almost never** do this."
- **2** means "I do this **only occasionally**."
- **3** means "I **sometimes** do this" (about **50%** of the time).
- **4** means "I **usually** do this."
- **5** means "I **always or almost always** do this."

After reading each statement, **circle the number** (1, 2, 3, 4, or 5) that applies to you using the scale provided. Please note that there are **no right or wrong answers** to the statements in this inventory.

GLOB 1	I have a purpose in mind when I read.	1 2 3 4 5
SUP 2	I take notes while reading to help me understand what I read.	1 2 3 4 5
GLOB 3	I think about what I know to help me understand what I read.	1 2 3 4 5
GLOB 4	I preview the text to see what it's about before reading it.	1 2 3 4 5
SUP 5	When text becomes difficult, I read aloud to help me understand what I read.	1 2 3 4 5
SUP 6	I summarize what I read to reflect on important information in the text.	1 2 3 4 5
GLOB 7	I think about whether the content of the text fits my reading purpose.	1 2 3 4 5
PROB 8	I read slowly but carefully to be sure I understand what I'm reading.	1 2 3 4 5
SUP 9	I discuss what I read with others to check my understanding.	1 2 3 4 5
GLOB 10	I skim the text first by noting characteristics like length and organization.	1 2 3 4 5
PROB 11	I try to get back on track when I lose concentration.	1 2 3 4 5

SUP 12	I underline or circle information in the text to help me remember it.	1 2 3 4 5
PROB 13	I adjust my reading speed according to what I'm reading.	1 2 3 4 5
GLOB 14	I decide what to read closely and what to ignore.	1 2 3 4 5
SUP 15	I use reference materials such as dictionaries to help me understand what I read.	1 2 3 4 5
PROB 16	When text becomes difficult, I pay closer attention to what I'm reading.	1 2 3 4 5
GLOB 17	I use tables, figures, and pictures in text to increase my understanding.	1 2 3 4 5
PROB 18	I stop from time to time and think about what I'm reading.	1 2 3 4 5
GLOB 19	I use context clues to help me better understand what I'm reading.	1 2 3 4 5
SUP 20	I paraphrase (restate ideas in my own words) to better understand what I read.	1 2 3 4 5
PROB 21	I try to picture or visualize information to help remember what I read.	1 2 3 4 5
GLOB 22	I use typographical aids like boldface and italics to identify key information.	1 2 3 4 5
GLOB 23	I critically analyze and evaluate the information presented in the text.	1 2 3 4 5
SUP 24	I go back and forth in the text to find relationships among ideas in it.	1 2 3 4 5
GLOB 25	I check my understanding when I come across conflicting information.	1 2 3 4 5
GLOB 26	I try to guess what the material is about when I read.	1 2 3 4 5
PROB 27	When text becomes difficult, I reread to increase my understanding.	1 2 3 4 5
SUP 28	I ask myself questions I like to have answered in the text.	1 2 3 4 5
GLOB 29	I check to see if my guesses about the text are right or wrong.	1 2 3 4 5
PROB 30	I try to guess the meaning of unknown words or phrases.	1 2 3 4 5

APPENDIX E

POST-EXPERIMENT READING STRATEGIES QUESTIONNAIRE

The purpose of this survey is to collect information about the various strategies you use when you read either from computer screen or from paper. Each statement is followed by five numbers, 1, 2, 3, 4, and 5, and each number means the following:

'1' means that 'I **never or almost never** do this' when I read.

'2' means that 'I do this **only occasionally**' when I read.

'3' means that 'I **sometimes** do this' when I read. (About **50%** of the time.)

'4' means that 'I **usually** do this' when I read.

'5' means that 'I **always or almost always** do this' when I read.

After reading each statement, ***circle the number*** (1, 2, 3, 4, or 5) which applies to you**.** Note that there are **no right or wrong responses** to any of the items on this questionnaire.

No.	Strategy Items	Scale
1	I have a purpose in mind when I read.	1 2 3 4 5
2	I take notes while reading to help me understand what I read.	1 2 3 4 5
3	I check my understanding when I come across new information.	1 2 3 4 5
4	I take an overall view of the text to see what it is about before reading it.	1 2 3 4 5
5	When I read, I guess the meaning of unknown words or phrases.	1 2 3 4 5
6	I read slowly and carefully to make sure I understand what I am reading.	1 2 3 4 5
7	I review the text first by noting its characteristics like length and organization.	1 2 3 4 5
8	I think about what I know to help me understand what I read.	1 2 3 4 5
9	I underline or circle information to help me remember it.	1 2 3 4 5
10	I adjust my reading speed according to what I am reading.	1 2 3 4 5
11	When reading, I decide what to read closely and what to ignore.	1 2 3 4 5
12	When the text becomes difficult, I pay closer attention to what I am reading.	1 2 3 4 5
13	When reading, I translate from English into my native language.	1 2 3 4 5
14	I stop from time to time and think about what I am reading.	1 2 3 4 5
15	I use context clues to help me better understand what I am reading.	1 2 3 4 5
16	I paraphrase (restate ideas in my own words) to better understand what I read.	1 2 3 4 5
17	I follow the line of what I am reading with my finger or my pen,	1 2 3 4 5
18	When the text becomes difficult, I re-read it to increase my understanding.	1 2 3 4 5
19	I first skim an English passage, then go back and read it carefully.	1 2 3 4 5
20	I try to get back on track when I lose concentration.	1 2 3 4 5
21	When reading, I think about information in both English and my mother tongue.	1 2 3 4 5

POST-EXPERIMENT READING STRATEGIES QUESTIONNAIRE

(Chinese version for Main Study)

该问卷的目的是为了调查你在计算机和纸上阅读时用的阅读策略。每个句子后有1，2，3，4，5，每个数字分别表示以下意思：

1 = 我从没有或几乎没有用过这个策略

2 = 我也只是偶尔用这个策略

3 = 我有时用这个策略

4 = 我通常用这个策略

5 = 我总是或几乎总是用这个策略

序号.	阅　　读　　策　　略	五 点 量 化 级 别
1	我阅读时，带着目的去阅读。	1 2 3 4 5
2	我边阅读边记笔记来帮助我理解文章。	1 2 3 4 5
3	当我碰到新的信息时我会检查我是否理解正确。	1 2 3 4 5
4	我阅读前会对文章的总的大意作个了解。	1 2 3 4 5
5	我阅读时，我会猜测生词或词组。	1 2 3 4 5
6	为了明白我读的文章我读得又慢有仔细。	1 2 3 4 5
7	阅读前，我会首先看文章的长度和结构。	1 2 3 4 5
8	我回想我所知道的来帮助我理解文章。	1 2 3 4 5
9	我阅读时会用划线或圆圈来帮我记住重要信息。	1 2 3 4 5
10	我根据阅读材料来调整阅读速度。	1 2 3 4 5
11	我阅读时，我知道那些该详细阅读，那些该略读。	1 2 3 4 5
12	当文章难于理解时，我会更加专注于所读的文章。	1 2 3 4 5
13	我阅读时，我常常把英语翻译成母语。	1 2 3 4 5
14	我时不时停下来思考我所读的内容。	1 2 3 4 5
15	我利用上下文帮我更好的理解。	1 2 3 4 5
16	我用自己的话复述所要理解的信息。	1 2 3 4 5
17	我用手指或钢笔指着每行阅读。	1 2 3 4 5
18	当我注意力不集中时， 我设法专注于所读 的文章。	1 2 3 4 5
19	当文章难于理解时候，我反复阅读以帮助理解。	1 2 3 4 5
20		
21		

APPENDIX F

SEMI -STRUCTURED INTERVIEW FORM

(English Version for Main Study)

NO…….. **DATE……..** **TIME…….**

Guided Questions	Answer
1. Do you often read English passages in your class and after class?	
2. Do you often use computers?	
3. What do you use computers for?	
4. Do you often read English passages from computer? If yes, how often?	
5. Do you often use reading strategies to help you understand English passages?	
6. Do you think you use different reading strategies when reading from paper and from computer screens? Why?	
7. Can you describe those strategies you use when reading from paper and from computer screens?	
8. What level of learning from material presented on computers do you think you can achieve?	
9. How do you feel when reading from paper and from computer screens ?	
10. Which do you prefer to read, reading from paper and from computer screens? Why?	

SEMI -STRUCTURED INTERVIEW FORM

(Chinese Version for Main Study)

序号 ……..　　日期 ……..　　时间 …….

问　　题	回　　答
2.　你经常在课堂上和课外阅读英语文章吗？	？
2．你经常使用电脑吗?	
3．你通常都使用电脑做什么?	
4．　你经常在计算机上阅读英语文章吗？如果是，频率是多少？	
5．　你经常使用阅读策略帮助你理解英语文章吗?	
6．　两种阅读方式下，你用的阅读策略是一样的吗？为什么？	
7．　具体描述一下在两种阅读方式下，分别使用了那些阅读策略？	
8. 你对呈现在计算机的上的文章的理解程度是多少？	
8．　在计算机上阅读时，你有什么感觉？你觉得舒服吗？	
10．　你喜欢在计算机上还是在纸上阅读? 为什么？	

APPENDIX G

STUDENTS' FILES

- **Nine Students from Computer Group**

Students in LG are CL 8, CL 11, and CL 13:

Student 8 (CL 8) is 19 years old from Shandong Province. She is a first–year student, majoring in Public Service Management at the College of Management of Guizhou University. She has been learning English for 9 years. Her English score for National College Entrance Examination (hereafter, NCEE) was 128 out of 150. She likes to learn English. She often reads English materials such as English Weekly, English novels, etc. She can read English well.

Student 11 (CL 11) is 18 years old from Fujian Province. He is a first–year student, majoring in Mathematics at the College of Science of Guizhou University. He has been learning English for 7 years. The English score for NCEE was 108 out of 150. He thinks that he is not good in English, but he likes learning English as he wants to better his English.

Student 13 (CL 13) is 19 years old from Hunan Province. She is a first–year student, majoring in majoring in Mathematics at the College of Science of Guizhou University. She has been learning English for 7 years. She is good at English and she can read English well as the English score for NCEE was 125 out of 150. She likes to read English inside as well as outside of class. She likes to read some novels in English.

Students in MG are CM 4, CM 5, and CM 6:

Student 4 (CM 4) is 18 years old, from Guizhou Province. He is a first–year student, majoring in Mathematics at the College of Science, Guizhou University. He has been learning English for 7 years. The English score for National College Entrance Examination was 97 out 150. He does not often practice reading in English. He thinks his English is very poor, and he cannot read English well.

Student 5 (CM 5) is 19 years old from Guizhou Province. She is a first-year student majoring in Mathematics at the College of Science of Guizhou University. She has been learning English for 7 years. The English score for NCEE was 116 out of 150. She likes learning English and likes reading English materials, such as English Weekly.

Student 6 (CM 6) is 18 years old from Guizhou Province. She is a first–year student, majoring in Mathematics at the College of Science of Guizhou University. She has been learning English for 7 years. The English score for NCEE was 135 out of 150. Her English is good. She often reads in English and she can read fluently.

Students in HG are CH10, CH 12, and CH 16:

Student 10 (CH 10) is 20 years old, from Shandong Province. He is a first–year student, majoring in Public Service Management at the College of Management of Guizhou University. He has been learning English for 7 years. The English score for NCEE was 118 out of 150. He likes to learn English because he thinks it is an important subject.

Student 12 (CH 12) is 18 years old from Shandong Province. He is a first–year student, majoring in Mathematics at the College of Science of Guizhou University. He has been learning English for 7 years. The English score for NCEE was 57 out 150. He is poor in English and cannot read English fluently.

Student 16 (CH 16) is 19 years old from Ganshu Province. She is a first-year student in the department of Computer Science at the College of Computer Science and Engineering of Guizhou University. She has been learning English for 7 years. The English score for NCEE was 103 out of 150. Her English is not so well but she likes learning English.

- **Nine Students from Paper reading format:**

Students in LG are PL 3, PL 7, and PL 14:

Student 3 (PL 3) is 18 years old from Hunan Province, China. He is first-year student majoring in Mathematics at the College of Science of Guizhou University. He has been learning English for 8 years. His English is very good as his English score for NCEE was 139 out of 150. He likes reading many kinds of reading materials such as newspapers, novels, etc. He can read English fluently.

Student 7 (PL 7) is 19 years old from Jiangsu Province. She is a first-year student, majoring in Mathematics at the College of Science of Guizhou University. She has been learning English for 7 years. The English score for NCEE was 114 out of 150. She cannot read English well. She likes to learn English because she wants to improve her English.

Student 14 (PL 14) is 19 years old from Shandong Province. He is a first–year student in the department of Computer Science at the College of Computer Science and Engineering of Guizhou University. He has been learning English for 6 years. The English score for NCEE was 108 out of 150. He thinks he is not a good reader in English and cannot read fluently because he does not know much vocabulary and was poor in reading skills.

Students in MG are PM 1, PM 17, and PM 18:

Student 1 (PM 1) is 19 years old from Hunan Provincem. He is a first-year student majoring in Mathematics at the College of Science of Guizhou University. He has been learning English for 7 years. The English score for NCEE was 139 out of 150. His English is not so good but he likes learning English.

Student 17 (PM 17) is 19 years old from Fujian Province. He is a first–year student in the department of Computer Science at the college of Computer Science and Engineering of Guizhou University. He has been learning English for 7 years. The English score for NCEE was 106 out of 150. His English is not good and cannot read well.

Student 18 (PM 18) is 18 years old from Fujian Province. He is a first–year student in the department of Computer Science at the College of Computer Science and Engineering of Guizhou University. He has been learning English for 6 years. The English score for NCEE was 121 out of 150. He likes reading English materials because he wants to improve his English.

Students in HG are PH 2, PH 9, and PH 15:

Studen 2 (PH 2) is 18 years old from Shandong Province. She is a first-year student, majoring in Mathematics at the College of Science of Guizhou University. She has been learning English for 10 years. Her English scores for the National College Entrance Examination are 129. She likes to learn English. She thinks she can read English well.

Students 9 (PH 9) is 20 years old from Guizhou Province. He is a first-year student, majoring in Mathematics at the College of Science of Guizhou University. He has been learning English for 8 years. The English score for NCEE was 78 out of 150. He is poor in English and he cannot read well, but he wants to improve his English.

Student 15 (PH 15) is 18 years old from Shandong Province. He is a first–year student, majoring in Computer Science at the College of Computer Science and Engineering, Guizhou University. He has been learning English for 7 years. The English score for NCEE was 107 out of 150. He thinks his English is poor, and cannot read very fluently.

APPENDIX H

An Extract of Semi-structured Interview

(The translated version from Chinese into English**)**

Information about interviewee

Student 17: in paper group with moderate level of computer literacy

Gender: Male

Time: 9:30 -9:45a.m. December 9th, 2008

Place: Yufu Building, Guizhou University, China

Teacher =T (Chunzhi You)

Student =S (Qiu Nengjun)

T: Good morning.

S: Good morning, Miss You. How are you?

T: I am fine, thanks, and you.

S: I am fine too, thank you.

T: Today I will give you an interview about the reading task and reading strategy questionnaire you have done for collecting data for my thesis, Can you remember?

S: Yes, but I didn't do it well .

T: Don't worry about it. It will not be graded.

T: Today I will record the interview in order to analyze it. Is that all right with you?

S: Ok, no problem.

T: Can we start now?

S: yes, please.

T: What's your name and where are you from?

S: I am Qiu Nengjun, from Shang Hang city, Fu Jian Province.

T: How many years have you learned English?

S: I have been learning English for 7 years.

T: Do you often read English passages in your class and after class?

S: Yes, I do, I read English passages in the text book in class,…um…But not often after the class. um..just sometimes.

T: You see, now we take the multimedia web-based English course, so my question is **How often do you use computers?**

S. I don't use it often, maybe twice a week or three times a week.

T: What do you use computers for? Study or do something else?

S. as I do not have a computer on campus, I use it in school computer labs, I don't use it for language learning, except for doing assignments online, and sometimes I go to the net-bar to play computer games, surf the Internet and check emails.

T: Do you often read English passages from computers? If yes, how often?

S: (Yes) I do. Not often. Two times a week when we have English class.

T: Do you often use reading strategies to help you understand English passages?

S: er… I often do this, I use some common strategies.

T: You mean?

S: Such as guessing words, underline key words….

T: Do you use different reading strategies when reading from paper and from computer screen? I mean**,** you use the same or different strategies?

S: No difference. For me, if it is not a test, for example, for the unknown words, I can consult the words immediately right away and easily on line. you don't need to

check on paper dictionary page by page. As to other strategies, I use the same strategies on two modes**”**

T: Can you describe those strategies you use when reading from paper and from computer screen?

S: General, I read with purposes , I.. um…firstly read through the whole passage, Then, er…. go back to the text and read it in detail. When I meet with new information, I usually got a general idea about what I am reading to help my comprehension. On paper, **I can underline, while on the computer screen I will read the wrong lines, because it is unnatural to follow the lines on computer screens.**

T: As to unknown words?

S: Normally, I use clues and guess the meaning of the words or phrases. Sometimes, I may look up some unknown words and …. I adjust my reading speed according to what I am reading.

T: Do you use dictionary?

S: yes, I just look up those very difficult words, er…. I mean completely new words. Not all the words.

T. As to the **level of learning from material presented on computers, what do you think you achieve**?

S: oh, it is hard to say… I think comprehension from computers is not better than from paper.

T: How do you feel when reading from paper or from computer screens? Do you feel comfortable?

S: When reading on computer, it is not comfortable, especially for eyes. In terms of comprehension, I have to read the same sentences several times on line. I mean, More time is cost.

T: Are you accustomed to reading on computer? **Do you prefer to read, from paper or from computer screens? Why?**

S: Reading…on computer?

T: Yes.

S: To some degree, I prefer reading on computer. Er... it is very quick to use online dictionary for the new words. In this respect, er… I like this kind of mode,

T: Do you think it is different between the two kinds of reading. I mean read from paper and from computer screens?

S: yes, it (reading from computers) will affect reading speed, then affect reading comprehension. But it is now regarded as learning tools, not only a surf-the-net, check-the-e-mail tools, I can do homework on computers, and…umm…I think, for me, it is efficient and convenient to read and write on computers.

T: You mean... you are used to this kind of reading mode?

S: Yes, right. But of course, there is a difference between the two modes of reading. Maybe.. because of habit.

T: Anything else?

S: No. That's all.

T: Well, thank you very much for your coming and cooperation. Good bye

S: My pleasure, bye.

CURRICULUM VITAE

Chunzhi You was born in Guiyang, Guizhou Province of China. She received her Bachelor Degree of Arts in English Linguistics and Literature from Foreign Languages Department, Guizhou University in 1987. In 2001, she obtained her Master of Arts degree in Linguistics and Literature from Southwestern Normal University of China (currently, Southwestern University). She received her Ph.D in English Language Studies in 2010 from Suranaree University of Technology (SUT), Nakhon Natchasima, Thailand. Chunzhi You has been teaching English in the College English Department at Guizhou University for 15 years. She is currently an associate professor of the College of International Studies at Guizhou University, China. Her academic areas of interest mainly lie in on-line English reading, online English reading strategies and CBT (computer-based testing). She can be contacted at chunzhiyou@yahoo.com.cn.