EXPLORING INTERNATIONAL ESL STUDENTS' ON-SCREEN READING BEHAVIORS WITH TWO ACADEMIC READING PURPOSES

DISSERTATION

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By

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Abstract

This study explored international ESL graduate students' on-screen reading behaviors in academic settings. Students' on-screen reading preference, tendency, frequency and strategy were investigated and compared between two academic purposes: reading for course preparation and reading for writing papers. This study also examined possible factors affecting students' on-screen reading behaviors, namely students' perception of on-screen reading, computer familiarity and second language proficiency.

The results showed that students had low preference and tendency toward reading academic texts on a computer screen. However, they spent more hours per week reading for academic purposes on a computer screen as comparing to reading for leisure purposes. They also were willing to read more pages on a computer screen for academic purposes than for leisure purposes. In addition, students reported using more general reading strategies when reading on a computer screen than technology-involved strategies. When comparing the students' on-screen reading behaviors between the two purposes, the students did not differ in their preference and tendency toward on-screen reading. They, however, spent significantly longer hours on on-screen reading for writing papers than for course preparation. The students also were willing to read more pages on a computer screen for writing papers than for course preparation. In terms of strategy use, students reported using strategies more frequently when reading for writing papers than for

course preparation.

With regard to factors affecting students' on-screen reading behaviors, students' perceptions of on-screen reading had the strongest association with their on-screen reading behaviors. Moreover, students' negative perceptions of on-screen reading seemed to influence their on-screen reading behaviors more than their positive perceptions. The second factor, students' computer familiarity, did not seem to have a strong correlation with students' on-screen reading behaviors. Finally, students' second language proficiency seemed to weigh differently on their on-screen reading behaviors between the two reading purposes. Second language had a positive and significant correlation with their on-screen reading behaviors in the reading for writing papers condition, but not in reading for course preparation condition.

The study also investigated students' attitude toward reading for the two purposes. The students overall considered reading comprehension and understanding terminology as the most important values when reading for either academic purpose. However, using reading strategies and taking notes were reported as more important when reading for writing papers than for course preparation. Being able to share what they have read with others, on the other hand, was considered more important when reading for course preparation than for writing papers. Despite the different attitudes found between the two reading purposes, these differences did not seem to associate with the students' on-screen reading behaviors.

Understanding students' on-screen reading behaviors and identifying factors affecting the behaviors may help educational practitioners better prepare international

graduate students to read academic texts on a computer screen effectively. It is also important to remember that the findings of the current study need to be interpreted cautiously in consideration of the limitations of the study. Finally, this study suggested continuous research to examine students' on-screen reading behaviors using different groups, contexts and research designs. Moreover, identifying other factors that may affect students' on-screen reading is necessary for future research.

Dedication

Dedicated to my parents for their endless love and support

Acknowledgements

I hope my personal academic work can bring a contribution to learners and students whose first language is not English in either a language classroom or other academic contexts. This five-year period has been a challenging but fruitful journey for me. This entire section could be filled with acknowledgements to the incredible support and friendships that were a vital part of the realization of my academic journey.

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Vita

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Fields of Study

Major Field: Education

Area of Study: TESOL

Minor Fields: Foreign & Second Language Literacy, Research Methods

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CHAPTER ONE

INTRODUCTION

1.1. Introduction

In line with the increasing popularity of computers in many areas of life, teachers have been incorporating them into instruction in a variety of ways at different grade levels. Advocates claim that technology makes learning easier, more efficient and more motivating. In the field of second language acquisition (SLA), many researchers (e.g., Armstrong & Yetter-Vassot, 1994; Ashworth, 1996; Evans, 1993; McVicker, 1992) have pointed out that technology enhances language learning by providing comprehensive input (Krashen, 1984, 1985, 1993) and valuable opportunities for interaction that promote acquisition. As such, language teachers today are encouraged to use technology in their classrooms. The American Council on the Teaching of Foreign Languages (ACTFL), for example, in the recent Standards for Foreign Language Learning (1996, quoted in Kramsch & Anderson, 1999) suggests that

> Access to a variety of technologies ranging from computer-assisted instruction to interactive videos, CD-ROM, the Internet, electronic mail, and the World Wide Web, will help students strengthen their linguistic skills . . . and learn about contemporary culture and everyday life in the target country. (p.31)

The use of electronic texts is one of the most recent applications of technology. Several

kinds of electronic texts now influence education, such as CD-ROM, hypertext and hypermedia or multimedia computer technology (Herron & Moos, 1993). In addition to applications of these kinds of texts for language teaching and learning purposes, research in electronic literacy is proliferating rapidly as well. Indeed, it may be that new ideas for applications of technology are produced more rapidly than they can be evaluated. Yet, despite this proliferation, little research has explored how English-as-a-second-language (ESL) students actually use and read electronic texts across various academic contexts, rather than language classrooms alone, despite indications that students do increasing amounts of electronically-based academic reading. This study, therefore, investigated students' on-screen reading behaviors, with a focus on two common academic purposes—reading to prepare for a course and reading to write papers—in an attempt to broaden understanding of ESL students' experiences with electronic texts. Possible factors that explain ESL students' on-screen reading behavior were explored as well.

1.1.1. Studies in On-Screen Reading

In line with the increasing popularity of digital libraries, digital reading is forcing students to change their views toward sustained reading of print on paper (Armstrong & Warlick, 2004; Brown, 2001; Parrot, 2003). In other words, readers today need to overcome old reading habits related to traditional print-based texts while, at the same time, acquiring and exploiting new, innovative approaches that account for the nature of electronic texts. As Murphy, Long, Holleran and Esterly (2003) have stated, "The strategies requisite for comprehending traditional printed text are not the same strategies required to comprehend computerized texts" (p.528). Several studies have shown that

students can probably read as well on screen as they do on paper if they are taught the necessary strategies (Altun, 2000; Charney, 1987; Cho, 1995; Kol & Schcolnik, 2000; O'Hara & Sellen, 1997). Some researchers, furthermore, suggest that digital texts, specifically hypertexts, motivate students in terms of individual extensive reading (Coiro, 2003; Collombet-Sankey, 1997; Liou, 1997; Kasper, 2000; Reinking & Rickman, 1990). Reinking and Rickman (1990), for example, found that students using electronic texts were much more willing to read word definitions than students using printed texts. Some key advantages that screen-based texts are thought to provide include the options of using easier-to-read large font sizes (Brunner & Tally, 1999; Burk, 2001; Reinking & ChanLin, 1994) and, in many cases, economic efficiency (Abdullah, & Gibb, 2006; Mercieca, 2004), since texts need not be printed out.

In addition, some researchers of on-screen reading have stated that there is no major difference as far as reading comprehension is concerned between on-screen reading and conventional print-based reading under certain circumstances, such as:

1. Reading appliances, such as background information (Anderson-Inman & Horney, 1998; Davis, 1989), glossaries (Jacobs, 1994; Lomicka, 1998; Lyman-Hager, 2000; Reinking, 1987, 1988, & 1994; Reinking & Schreiner, 1985) and information about pronunciation of unfamiliar words (Chun & Plass, 1996), can be accessed more easily through the Internet or a computerized reading program than with a hard copy. These reading appliances are designed to facilitate readers' understanding and hence increase readers' comprehension when reading electronic texts.
2. Improving screen technology eliminates many readability difficulties. Studies have shown that if the quality and properties of the computer screen are made similar to

those of paper, reading performance will be nearly equivalent to that with paper (Gould, Alfaro, Barnes, Finn, Grischowsky, Minuto et al., 1987; Mills & Weldon, 1987; Muter & Maurutto, 1991; Noyes & Garland, 2003).

3. With increased familiarity of using computers, readers are more efficient at reading and obtaining information from a screen-based presentation (Krauss & Hoyer, 1984; Meyer & Poon, 1997; Park, 1995). Researchers, furthermore, suggest that, with the increasing frequency of digital-text, younger readers can tolerate spending more time reading screen-based materials than older individuals (Liu, 2005).

Nevertheless, the frequency of young adults reading digital texts in an academic context has been challenged by several survey studies (Abdullah & Gibb, 2006; Anuradha & Usha, 2006; Bennett & Landoni, 2005; Chu, 2003; Ismail & Awang Ngah, 2005). For instance, Abdullah & Gibb (2006) found that before their study, approximately 60% of the students had never used an e-book. Moreover, among those students, more than half were not even aware of the availability of e-books. A possibility emerging from these studies is that the increasing exposure of on-screen reading for everyday purposes among young adults is not necessarily tied to an increasing amount of on-screen reading for academic purposes. This phenomenon can be explained by the unique nature of academic reading.

1.1.2. Reading Studies in English for Academic Purposes

The ability to read academic texts is considered one of the most important skills that university students need to acquire. Reading researchers make it clear that there is a distinction between reading for everyday purposes and reading for academic purposes.

Each day, people read the newspapers, magazines, recipes, TV guides, etc. On the other hand, it may be that students use different reading strategies to understand different types of reading materials (Burns & Sinfield, 2003). This academic reading, according to Li and Munby (1996), "requires in-depth comprehension, which is often associated with the requirement to perform identifiable cognitive and procedural tasks, such as taking a test, writing a paper or giving a speech" (p.200). Moreover, Nambiar (2005) claims that academic reading involves much more than identifying main points and understanding unfamiliar words. Learners find that they have to associate their reading with their own individual schema or background knowledge in order to arrive at a suitable degree of understanding of the text. Much of the time, Nambiar adds, a problem occurs when the learners have difficulty in relating what they read to their background knowledge (p.4). In this sense, academic reading apparently requires more cognitive and metacognitive knowledge than pleasure reading. Learners need to know how to read academic texts and learn from them, and the challenge of doing so increases when they must cope with both print-based and screen-based texts, as is commonly the case at present.

For international ESL students studying in U.S. universities or colleges, they will likely face more academic-reading challenge compared to their American counterparts. As Kennedy (2001) has pointed out, "If individuals wish to enter the professional communities represented by the domains they study in, they will need access to both the knowledge and skills of the profession and the language and discourse through which those skills and knowledge are communicated, in this case English" (p.31). In other words, international ESL students are required to adapt to the literacy demands of another language and the academic culture of a certain discipline. Not only do these students

require access to English for understanding assigned reading materials, but they are also expected to be familiar with professional and academic genres in their disciplines. Reading, therefore, is considered one of the most essential skills when one wants to be successful in academia, and a large number of studies have demonstrated a strong positive correlation between reading proficiency and academic success (e.g., Lawson & Hogben, 1998; Lewis, 2000; Macaro, 2001; Nakatani, 2005; Seo, 2000; Shih, 1992).

In the field of English for Academic Purposes (EAP), reading is often linked to writing (Carson & Leki, 1993; Flowerdew & Peacock, 2001; Hirvela, 2001). As Carson and Leki (1993) have noted, "Reading can be, and in academic settings nearly always is, the basis for writing" (p.1). In practical terms, this kind of reading to write activity is most associated with college-level work. University students are frequently required to write from sources, such as textbooks and journal articles, and it is this kind of academic literacy that can be especially challenging for newly arrived international students as they adjust to the demands of Anglophone universities. As expressed by Flower (1990), "Academic papers are typically written in the context of a rich rhetorical situation that includes not only the conventions of academic discourse, but the expectations of the instructor, the context of the course, and the terms of the assignment" (p.35).

Therefore, reading is viewed as a key tool to be used in helping novices learn how to write academic discourse. The quality of academic writing can be impacted significantly by how well an individual reads academic texts, since the writing is likely in response to what and how well a text has been read (Hirvela, 2001). In other words, how well a student reads is a key factor in how well s/he writes academically. As a result, reading and writing go hand-in-hand in the EAP field, and it is these skills that are stressed in

EAP courses provided by ESL programs. Because academic reading is purposeful, considerable emphasis is placed on teaching reading strategies that international students need to develop to be successful in academia. Reading strategies that have been investigated previously include using existing knowledge to make sense of new material (Zvetina, 1987); skimming, scanning, recognizing text structure and organization (Block, 1986; Carrell, 1985, 1992; Carrell, Pharis, & Liberto, 1989); and note-taking and dealing with academic vocabulary (Parry, 1991; Shen, 2003). Moreover, researchers (e.g., Huang, Chern & Lin, 2009; Sheorey & Mokhtari, 2001) investigating how skillful reading takes place generally agree that skillful readers use more global strategies than unskillful readers. Because of the high demands for cognition and metacognition in academic reading, the issue of the environment in which students read (print-based or screen-based) is an especially important one.

1.1.3. Studies of On-Screen Reading in an Academic Setting

The changing nature of the reading environment (from print to electronic) has brought forth new avenues for and challenges in the field of reading research. In the Internet age, with its proliferation of information needed for academic purposes, students are exposed not only to conventional text presentations but also to electronic texts. Educational practitioners are witnessing increased availability of academic and professional texts (both books and articles) on the Internet, and digital libraries are becoming increasingly common and accessible. Moreover, libraries in many U.S. universities try to offer more access modes within a campus network, such as Blackboard or WebCT for electronic texts to support course offerings (Brown, 2001; Kol &

Schcolnik, 2000). Publishers also view digital texts as a potential new revenue source. For instance, the National Academies Press, according to Lynch (2001), has been offering their publications for free on the Internet for several years. According to Kol and Schcolnik (2000), university students are increasingly reading on the screen because of the increased use of digital libraries. Due to these developments, reading from a computer screen is generally assumed to be increasingly common and important for students and professionals. It is expected that electronic literacy will largely supplant "paper" literacy for many everyday, as well as academic, purposes.

Furthermore, researchers have argued that, although young adults spend more time reading electronic materials, they tend to skim and browse for information on the Internet rather than reading intensively (Horton, Taylor, Ignacio & Hoft, 1996). This reading behavior is suboptimal because people are less engaged in intensive reading and lack the ability to read deeply and to sustain a prolonged engagement in reading (Liu, 2005). O'Hara and Sellen (1997), through their observation of the reading processes of ten readers using either on-line or paper texts, found that the benefits of hard copy far outweigh those of on-line textual displays. They claim that major advantages which paper texts offer include supporting annotation while reading as well as quick navigation through and flexibility of spatial layout. These variables allow readers to deepen their understanding of the text, extract a sense of its structure, plan for writing, cross-refer to other documents, and interweave reading and writing (p.199). Texts presented on a computer screen, on the other hand, limit the range of reading strategies (Duchastel, 1986). As a result, people often prefer print texts from the Internet for more intensive reading rather than reading directly on-screen. Similar results were found by Rho and

Gedeon (2000) in a survey they conducted. The results showed that "readers take an overview of a Web-based academic article from the screen, print it out, and then read the printed article" (p.237). However, this study did not explain why students chose this reading pattern.

Previous literature suggests that reading strategy is an important indicator of the level of students' preference toward reading on screen or hard copy. Within this context, Murphy et al. (2003) assert that "students require more sophisticated strategic processing abilities when attempting to read and comprehend hypertext" (p.328). Therefore, they are inclined toward the use of printed documents for careful reading. Similar results have been supported by a number of other studies (e.g., Abdullah, & Gibb, 2006; Altun, 2000; Liu, 2005; Mercieca, 2004; Ramirez, 2003). Other common reasons for students' print-based text preferences reported in previous work can be summarized as follows:

1. Print-based texts are more convenient than screen-based ones (Bernhardt, 1993; Dillon, 1992; Mercieca, 2004). As Bernhardt (1993) has pointed out, a paper text is detached from the physical world, which means that a reader can carry books or magazines and read them in any situation or at any time. In comparison with paper texts, digital texts cannot be separated from the technology that creates the display (p.153). Even though some argue that electronic books can be portable due to the development of new technologies (e.g., iPod, Palm Pilot, and Pocket PCs), those electronic devices eventually require an outside power source (Manes, 1999), thus limiting access to them.
2. Students reading print texts are more likely to continue reading at one sitting than students using screen-based texts (Abdullah & Gibb, 2006; Bernhardt, 1993;

Mercieca, 2004). Participants in Mercieca's (2004) study, for example, responded that reading from a screen after a while made them "suffer from eye strain" (p.5), a problem they did not associate with print-based texts.

3. Ease of access to pertinent information can be comparatively easier with the use of print texts (Haas & Hayes, 1986; Kol & Schocolnik, 2000; Selfe, 1989). For example, Kol and Schocolnik's (2000) study showed that participants have better scanning skill when reading on paper than on screen. A possible explanation for this, according to Kol and Schocolnik, is that although readers can use the Find function to search for a key word on an electronic text, the Find function does not take readers directly to the desired location. While scanning on paper, on the other hand, readers go directly to that section of the text in which they expect to find the relevant information and thereby avoid unnecessary steps while reading (p.74).

1.1.4. Additional Perspectives

Compared to those who grew up reading mainly print-based texts, students in this recent technology-oriented era are likely to spend much more time reading screen-based texts as well as to use computers for non-academic purposes. Hence, they are more familiar with computers and would seemingly be more willing to read on-screen texts for longer periods of time than those who did not develop their reading habits based on screen-based texts. However, when it comes to academic reading, factors other than computer familiarity and on-screen reading habits seem to determine whether students prefer to read a text on the screen. Several studies have investigated factors that affect students' preference for reading on screen (Abdullah & Gibb, 2006; Haas & Hayes, 1986;

Kol & Schcolnik, 2000; Lyman-Hager, 2000; Mercieca, 2004; Selfe, 1989). They have found that some students prefer reading digital texts on screen because they can enlarge the font size, which makes reading easier. Some choose to read on screen so that they do not have to spend money printing out or buying texts. Furthermore, some prefer reading texts on a computer so that they can access other references immediately. On the other hand, some students limit their reading on screen to paragraphs and by habit print out paper-based hard copies for longer, extended periods of reading. They choose to print out digital texts for careful reading because they can apply reading strategies that help them comprehend the texts and relocate the information they need more easily. Others prefer printing out digital texts so that they can carry the materials wherever they go.

1.2. Statement of Purpose

Although a number of studies have investigated the impact of technology on reading patterns, computers in particular, the findings of these studies have been mixed and inconclusive. In other words, previous research in this area has not produced information that explains definitively or convincingly what actually happens behaviorally when students read academic texts on a computer screen. This shortcoming can be explained in part by the various reading purposes at hand in reading, including academic reading. What reading research has done is to confirm that reading behaviors are strongly guided by reading purposes (Brown, 2001; Farr, Pritchard & Smitten, 1990; Flower, 1990; Narvaez, van den Broek, & Ruiz, 1999). However, even within the same academic context, students may read with different purposes. Therefore, participants involved in

previous studies might have had different purposes for reading academic texts, which may have further influenced their on-screen reading preferences and level of engagement.

Additionally, researchers have focused on different text formats when investigating students' preferences for reading on screen or in print. Most of the studies concerning students' reading preference focus specifically on the text type of electronic books (or e-books). On the other hand, studies examining the benefits of on-screen reading focus on hypertexts, multimedia and computerized/mediated reading texts. There is, then, considerable diversity in the scope of such research. Due to the complex nature of the on-screen reading environment, it is difficult to assemble all these studies under one umbrella and reach a general understanding or consensus regarding students' on-screen reading behaviors in an academic context.

Finally, many factors seem to contribute to students' engagement in reading on the screen. It appears to be impossible to single out any one dominant factor. Most previous studies tended to explore factors individually. Therefore, it is difficult to integrate factors from each study into a general portrait of electronic reading. As a result, on-screen reading research is still underdeveloped, as opposed to print-based reading research. However, it appears that in most Anglophone colleges and universities, professors tend to assume that students have the ability to use on-line sources and read academic texts on a computer screen effectively and thus expect them to operate successfully with digital libraries. Whether students are as capable of such reading as faculty members expect is not clear, especially when international students are included in the mix. While it may be safe to assume that most domestic students from an Anglophone background are computer literate and comfortable with electronically-based academic literacy activity,

this is not necessarily the case with international students, who come from a wide range of countries and backgrounds with varying degrees of economic prosperity, technological infrastructure and access, and emphasis on technology within their educational systems. As a result, how well prepared they are to meet the electronically-based academic literacy demands of Anglophone universities is difficult to predict. Therefore, there is a great need to explore such students' on-screen reading behaviors in an academic context.

Furthermore, previous on-screen reading research has targeted participants whose first language (L1) is English. There is still little attention paid to students whose first language is not English. As EAP researchers have pointed out, second language readers face linguistic barriers as well as academic discipline challenges (Flowerdew, & Peacock, 2001; Francis, & Hallam, 2000; Tierney, & LaZansky, 1980). From the linguistic perspective, international students have to acquire a certain level of second-language proficiency, English in this case, to study successfully in Anglophone universities or colleges. In addition to the linguistic challenges they face, in their academic reading international students encounter a variety of textual genres that are shaped by the norms and values of the disciplines they come from, particularly at the undergraduate level, where students move between general education and disciplinary major courses. For international graduate students the range of text types is more limited due to the fact that their focus is on their chosen disciplinary field, but within that field there will be different text types that they must read effectively. Research investigating L1 readers in academic contexts contributes a great deal to the L2 reading field, but it cannot fully represent L2 readers' needs and experiences, especially with respect to the newer domain of electronic texts. Therefore, there is a great need to investigate what happens when international

students read academic texts on-screen, including the reading techniques they employ and their reading behavior as they engage different purposes for such reading.

In this study, graduate students were selected for investigation because they presumably engage on-line sources and on-screen reading more frequently and more intensively than undergraduate students due to the nature of graduate level study, where the academic literacy demands are likely to be quite extensive. In addition, graduate students are assumed to be even more committed to their academic work than undergraduate students due to their desire to specialize in a specific field of study. As noted by Gardner and Barnes (2007), graduate students have high expectation and are more serious about their professional development than undergraduate students. Moreover, many studies (e.g., Karim & Hasan, 2007; Mazzeo, Druesne, Raffeld, Checketts & Muhlstein, 1991; Powers & O'Neill, 1993) have been conducted using undergraduate students across disciplines and countries, while relatively little research has targeted graduate students. Thus, in order to better understand L2 students' reading behaviors in an academic context, research on graduate students is particularly important at this point in time.

In addition, most reading research to date has focused on academic reading that relates to writing but ignores reading for the purpose of course preparation. Yet, a considerable amount of academic work is based on reading assigned tasks for course preparation purposes. That is, students are commonly assigned reading that will, in one way or another, be the basis for class sessions, especially at the graduate school level. Therefore, to gain a more complete picture of reading for academic purposes, the present study dealt with two main reading objectives: a) reading for course preparation, which

means students read to understand a lecture, or to participate in class discussion, and b) reading for writing, which focuses on reading for that will inform writing, such as composing papers. The final motivation underlying the present study was the lack of research examining multiple variables impacting on-screen reading. Most on-screen reading research has focused on investigating students' on-screen reading patterns relative to one factor, such as presentation quality, hypertext structure, text types and text format on a computer screen. Single factor studies, while valuable, do not provide sufficient insights when comparisons can be conducted across multiple variables. Due to the complexity of on-screen reading behaviors, several variables that may influence students' on-screen reading behaviors were considered in this study. Consequently, the present study expands the focus on students' behaviors as related to on-screen reading in an academic setting.

1.3. Significance of the Study

Undoubtedly, new areas of functionality and preference for electronic texts will come to the fore and create new reading habits and expectations for dealing and interacting with text as electronic texts become dominant in the academic world. These new forms of reading will gradually become as natural as the different activities readers now take for granted, such as searching an online catalog, watching a cassette video or browsing the Web. By knowing what and how graduate students actually read on the screen, teachers of EAP courses will be able to provide international students more informed strategies for reading and learning in an academic context. As Armstrong and Warlick (2004) have pointed out, it is crucial for teachers and educators today to "teach

the students literacy skills that reflect the information environment of the present. . ." (p.1). Many L2studies have shown that technology facilitates language learning. However, reading for academic purposes is different from that for language learning. In this case, only through investigating the circumstances under which graduate students read academic texts on the screen can reading researchers make sense of on-screen reading behaviors occurring specifically in the academic context and provide the basis for improve pedagogical practices in EAP courses.

Another area of significance for this study is the better understanding it can bring to the dearth of reading research in the EAP area. As mentioned earlier, most of the studies in EAP focus on academic writing or reading-writing connections (e.g., Gajdusek, 1988; Hirvela, 1990; Oster, 1985; Parry, 1996; Spack, 1985; Vandrick, 1997). A common theme in their work is that literature-based reading and writing experiences offer students valuable preparation for the wide range of academic literacy requirements found at the undergraduate university level. Simply investigating reading-to-write activities is valuable but cannot capture the whole picture of reading for academic purposes. Therefore, more reading research is needed to better understand the complex nature of reading in an academic context. The present study investigated academic reading in other circumstances, especially non-literary, and hence contributed more insights into reading for academic purposes.

Furthermore, the present study contributes not only to better understanding of international students as readers but L1 students as well. Academic discourse is known, collectively, as a different genre than other forms of discourse, and one which challenges not only international students but also native-English-speaking students. Many studies

have looked at academic literacy among L1 students (e.g., Gee, 2001; Lea & Street, 2005). This study adds to knowledge gained from previous literature by focusing on the on-screen reading environment within two specific purposes (reading for course preparation and reading for writing). Although this study focused on L2 students, some of its findings can be applied to the experiences of L1 students as well.

Finally, by considering other associated factors together rather than simply isolating and considering one single factor, this study more accurately represents the complex and dynamic nature of on-screen and academic reading environments. For those teaching in higher education settings, in particular, the results of this kind of study will empower them to assist students in making sense of this environment as a fundamental skill for academic reading by providing them with a more comprehensive picture of academic reading.

1.4. Research Questions

Based on the motivations and purposes described earlier, this explanatory mixed methods study (focused primarily on quantitative results) investigated the current on-screen reading behaviors among graduate students within two academic reading purposes, reading for course preparation and reading for writing papers, relative to the following research questions:

1. What are the selected international graduate students' on-screen reading behaviors concerning their preferences, tendencies, frequencies and strategies employed in academic contexts?
2. Is there any difference in international graduate students' on-screen reading

behaviors between the two reading purposes?

3. When considering three key factors—students' perception of on-screen reading, degree of computer familiarity, and second language proficiency—what are the factors that contribute the most to an individual's on-screen reading behaviors?
4. Is there any association between students' attitudes toward different reading purposes and their on-screen reading behaviors?

1.5. Definitions of Key Terms

- English as a Second Language (ESL): ESL could be a course, a discipline, and a field of research. An ESL learner is defined in this study as a native speaker of a language other than English who acquires and uses English in the context where English plays institutional and social roles in the community.
- International students: Students who have been born and have completed up to high school education in their home countries and have come to the U.S. to pursue undergraduate or graduate education. They are more likely viewed as bilingual and biliterate or possibly multilingual and multiliterate. Because they have been educated before coming to the U.S., they generally possess a strong foundation of L1 literacy.
- English for Academic Purposes (EAP): A branch of English for Specific Purposes (ESP), an EAP course is designed to teach English with the specific aim of helping learners to study and use that language to achieve specific academic purposes. The subject of study in such a course is not the English language per se, but rather its uses in particular academic contexts, particularly the literacy skills of reading and

writing. Students (undergraduate and graduate) need English language and communication skills for access to both subject knowledge and content (Kennedy, 2001, p.25); they also need to be sensitized to the specific demands of various academic disciplinary communities, and EAP courses provide this information and the ability to act upon it.

- On-screen reading: On-screen reading refers to the act of reading texts in an electronic or digital mode, and which are viewed via a screen, such as a computer monitor. Computer-presented texts may be viewed online or offline, and may be in the format of hypertext or a static text (e.g., PDF, JPG files).
- Print-based reading: Print-based reading refers to the act of reading texts in a paper-resented mode. Paper-presented texts can be traditional hardcopy or materials printed out from digital texts.
- Students' on-screen reading behaviors: Students' on-screen reading behavior in this study include: a) students' on-screen reading preference, b) tendencies toward on-screen reading, c) the length of hours per week spent reading on a computer screen, d) the maximum number of pages one is willing to read on a computer screen, and e) the frequency of on-screen reading strategy use. On-screen reading preference is defined by the mean score calculated from the level of students' agreement on four Likert-type scale items concerning the two reading purposes of reading for course preparation and reading for writing. Tendency toward on-screen reading is defined by the mean score calculated from the level of students' agreement on four Likert-type scale items relative to the two reading purposes just described. On-screen reading strategy use was investigated using a scale with 21 items adapted from

Sheorey and Mokhatari's (2001) study and defined by the mean score from the 21 frequency scale items. The higher the mean score was, the more strategies students applied when reading on screen.

- Attitudes toward reading purposes: Defined as an individual's feeling about reading causing that reader to approach a reading situation (Alexander and Filler, 1976). Students' attitudes toward reading for two academic purposes were measured by their opinions about the importance of reading within the two purposes.
- Perceptions of reading on a computer screen: In this study this was understood as the manner in which an individual intuits the advantages and disadvantages of on-screen reading. The participants' perceptions were measured by their level of agreement with 13 items.
- Computer familiarity: The concept of computer familiarity has been variously defined as use of computer (Jegede & Okebukola, 1992; Levin & Gordon, 1989), computer experience (Miller & Varma, 1994; Powers & O'Neill, 1993), frequency of use (Karim & Hasan, 2007), attitude toward computers (Moon, Kim & McLean, 1994), and access to computers (Okinaka, 1992; Stephens & Rouland, 1993). This study operationalized computer familiarity by drawing elements from these definitions. That is, an individual's computer familiarity was defined as the frequency of their use of computers, frequency of reading (on computer) for leisure, degree of computer experience, and level of comfort toward using a computer. Computer familiarity was measured by 9 self-assessment items.
- Academic reading: Academic reading involves reading texts related to school tasks in university classes. In this study, academic reading was limited to two reading

purposes: 1) reading for the purpose of course preparation, and 2) reading for the purpose of writing papers. According to Lorch et al.'s (1993) connotative definition, reading for course preparation is viewed as reading with a less specific goal (since how the reading will actually be used is not necessarily known in advance), while reading for writing papers is defined as reading with a specific and well-defined purpose. In this study, reading for course preparation was defined as when students read any required or optional materials assigned for the purpose of understanding a lecture or participating in a class discussion. Reading for writing papers was defined as when students read materials related to assigned written projects (such as papers of various kinds). The materials could be assigned by the course instructor and/or self-selected by the students.

- Second language (L2) proficiency: L2 proficiency refers to a student's ability to use L2 (English in this study) to comprehend written texts. In this study, second language proficiency was defined in two parts. The first part of the definition considered the number of years students had been a graduate student, studied in an English-speaking country, lived in an English-speaking country, and learned English. The second part of the definition considered students' self-assessed competence in four items regarding L2 literacy proficiency and L1 literacy proficiency.

1.6. Basic Assumptions

Since the data were collected mainly from a questionnaire and follow-up interviews, it was assumed that participants would not deliberately lie or try to give socially acceptable answers. It was also assumed that the participants would be capable of

describing their experiences with reading academic texts on a computer screen on the questionnaire and during follow-up interviews. Finally, it was assumed that the English proficiency level of the participants was advanced enough to overcome the language threshold[1].

[1] Language threshold: General level of second language ability that allows a reader to understand a text fluently according to the reader's purpose. Above the threshold, a reader is able to call on strategic reading processes (both first language and second language) effectively. (Grabe, W., & Stoller, F.L., 2002, p.50)

CHAPTER TWO

REVIEW OF LITERATURE

2.1. Introduction

Two schools of thought will be covered in this chapter. Studies concerning reading on a computer screen will first be presented. Then issues related to second language reading and English for academic purposes will be discussed. The first section, literature about on-screen reading, will follow a chronological approach. Early work regarding electronic texts tended to be concerned more with how the quality of the presentation on a computer monitor affects readers' reading performance. As technology has advanced, the quality of on-screen presentation is no longer such an important issue. Researchers have shifted their attention to the relationship between hypertext and reading behaviors, among other issues. In the section on second language reading and English for Academic Purposes, studies will be presented categorically based on the issues that are viewed as essential in the field. A general review of different second language reading theories will first be discussed, followed by a review of some concerns and issues related to second language reading for academic purposes. In the final section of this chapter, studies investigating on-screen reading behaviors in academic settings will be discussed.

2.2. Studies of On-Screen Reading

Along with the increasing frequency and range of computer use, the readability of texts on computer screens has become an increasingly important issue in the reading research field. A document presented on a computer screen can be static (prepared and stored in advance) or dynamically generated (in response to user input). The former approach can include documents in the Word format or electronic publishing of books and journal articles in the PDF format. The latter approach includes computerized information retrieval occurring in library searchers, electronic mail, and retrieval of information from online technical manuals. In this section, studies concerning reading of static texts on a computer screen will be discussed first, followed by studies concerning reading hypertext in an online environment.

2.2.1. Studies on Reading Static Screen-Based Texts

Many studies have compared a text presented either on a computer monitor or in traditional print format with respect to differences in reading outcomes within these two modalities. Research in the 1980s and early 1990s concerning reading performance from computer monitors focused on reading efficiency and effectiveness in reading static screen-based texts (e.g., Dillon, 1992; Garland, & Noyes, 2004; Gould, & Grischkowsky, 1984; Mayes, Sims & Koonce, 2001). A common theme among these studies was to investigate how the characteristics of screen-based texts potentially affect readers as they extract information from screens (Mills & Weldon, 1987). Most of the early work focused on outcome measurements of reading, such as efficiency and effectiveness.

Reading efficiency includes reading speed and accuracy, while reading effectiveness includes reading comprehension.

2.2.1.1. Studies of On-Screen Reading Efficiency

Reading speed

The most common experimental finding among these studies was that silent reading from a screen is significantly slower than reading from paper-based texts (Gould & Grischkowsky, 1984; Mayes et al., 2001; Mills & Weldon, 1987; Muter, LatrŽmouille, Wright & Lickorish, 1983). Dillon (1992) reviewed the literature on reading speed and concluded that evidence suggested a performance deficit of between 20% and 30% when reading from a screen. Several experimental studies have produced the same results. Muter et al. (1982), for example, had thirty-two participants read continuous text for two hours, with half of the participants reading from a videotext terminal and the other half from a book. The results showed that although conditions had no effect on reading comprehension, participants in the videotext condition read 28% slower than those in the book condition. Participants in the videotext condition read at a rate of 159 words per minute, whereas print-based participants read at a rate of 222 words per minute. These results may have been due to the different density of text information in the two conditions. In the video condition, there were approximately 120 words per page, whereas the print-based text in the book condition was displayed with approximately 400 words per page.

Research by Kruk and Muter (1984) provided a further investigation of this issue. Kruk and Muter replicated Muter et al.'s (1982) study, but with additional attention paid to determining which of two factors, a) the amount of information on a page, or b) the

relatively slow time (9 seconds) necessary to fill a screen, contributed to the slower reading from a video screen. Similar results to Muter et al.'s study were found; that is, the text was read significantly more slowly (24%) in the video condition (171 words per minute) than in the book condition (226 words per minute). When examining the density of information displayed per page in the two conditions, the researchers found that a text with more information per page was read significantly faster than that with less information per page. The results of these two studies suggest that the differences in reading rate between the computer screen and book conditions were due, at least in part, to differences in the density of information displayed. In fact, a text displayed in a book condition tends to contain more information than that displayed on a computer screen and thus makes reading from a video screen slower.

Wright and Lickorish (1983) and Gould and Grischkowsky (1984) studied the speed of proofreading a text for errors from both cathode ray tube (CRT)[3] and paper conditions. In Wright and Lickorish's (1983) study, thirty-two participants were asked to proofread a text for errors from either CRT or paper conditions. The results showed that not only did participants detect fewer errors in the CRT condition, but they also worked significantly slower in the CRT condition compared to the paper condition. Readers read 30 to 40% slower on average in the CRT condition.. Gould and Grischkowsky's (1984) study yielded similar findings. In this study, Gould and Grischkowsky had twenty-four participants proofread texts by circling or pointing out misspellings in both the CRT and paper conditions. The participants worked for one day with the computer screen and one day with paper. The performance measurements revealed that participants proofread

[3] In the literature, terms for describing a computer screen include cathode ray tube (CRT), visual display terminal (VDT), visual display unit (VDU), and so on. (Mills & Weldon, 1987, p.331)

significantly more slowly (about 22% slower) on a computer screen than on paper. However, a problem which appeared in both studies was that the texts in the experimental conditions were not presented identically. In the former study, texts in the CRT condition were displayed as white characters on a black background, while the texts in the latter were presented as green characters on a dark background. Both displays were unfamiliar and unusual to most of the participants and thus may have impacted on the speed of their processing while reading. This, in turn, might have impacted on the amount of errors that readers in the CRT condition could detect.

In contrast to these studies, some studies reported no significant differences in reading speed between two presentation formats (Askwall, 1985; Cushman, 1986; Switchenko, 1984). For example, Muter and Maurutto (1991) examined whether there was a difference in speed between CRTs and normal book conditions for either reading or skimming. Twenty-four participants were randomly allocated to either the reading task or skimming task. In addition, all participants read or skimmed under two conditions, book and CRT. Half of the participants read or skimmed three stories from the book on the first trial and half from the CRT in a strictly alternating order. The results showed that there was no significant difference between the book and CRT conditions with respect to reading speed. The researchers explained that the increase in reading speed in t he CRT condition in comparison to earlier research may be attributable to the quality of the screen and the clarity of the characters (p.263). On the other hand, skimming speeds proved to be significantly different between the book and CRT conditions. Skimming in the book condition was 41% faster than skimming in the CRT condition. This, according to Muter and Maurutto, may have been attributable to the format of the textual display (shorter line

lengths in the book condition), the density of text information, and a speed-accuracy trade-off.

Accuracy

In experimental investigations of reading from screens, the term accuracy often refers to an individual's ability to identify errors in a proofreading exercise (Dillon, 1992, p.130). There is evidence which suggests that reading from a computer screen is less accurate than reading a print-based text (Creed, Dennis and Newstead, 1987; Gould & Grischkowsky, 1984; Wilkinson & Robinshaw, 1987; Wright & Lickorish, 1983). For instance, Gould and Grischkowsky (1984) required their participants to identify misspellings of four types: letter omissions, substitutions, transpositions, and additions, randomly inserted at a rate of one per 150 words. The results showed that slightly more misspellings were missed on the CRT (33%) than on paper (30%). However, the difference was not significant. Wilkinson and Robinshaw (1987) argued that the task used in Gould and Grischkowsky's study hardly equated to true proofreading but was merely identification of spelling mistakes. Therefore, Wilkinson and Robinshaw tried to avoid spelling or contextual mistakes and used errors of five types: missing or additional spaces, missing or additional letters, double or triple reversions, misfits or inappropriate characters, and missing or inappropriate capitals. Significantly poorer accuracy for such proofreading tasks on screens was reported. Furthermore, Creed et al. (1987) compared proof-reading performance across three modes of presentation: VDU, a photograph of the VDU display, and paper. Additionally, they classified errors into three types: visually similar errors (e.g. "e" replaced by "c"), visually dissimilar errors (e.g. "e" replaced by "w"), and syntactic errors (e.g. "gave" replace by "given"). This error classification was

developed in response to what they saw as the shortcoming of the more typical accuracy measures, which provided only gross information concerning the factors affecting accurate performance. Their findings indicated that proof-reading accuracy was significantly worse on a VDU than on paper. Moreover, visually dissimilar errors were significantly easier to detect than error types. Creed et al. explained the findings as indicating that character font may be a major factor in the poor performance with the VDU.

2.2.1.2. *Studies of On-Screen Reading Effectiveness*

One more important concern when researchers investigate screen-based reading is the effect of presentation medium on comprehension. Studies which measure comparative levels of comprehension, based on number of correct answers, suggested few differences existed between the two media, computer screen and paper (Cushman, 1986; Kak, 1981; Muter et al., 1982; Mayes et al., 2001). However, some researchers did find differences in comprehension between these two medium under certain conditions. Belmore (1985), for example, asked twenty undergraduates to read passages from both paper and a computer screen. Overall results showed that students read significantly longer and comprehended less with computer-presented texts than with paper-presented texts. Moreover, Belmore observed a marked reduction in comprehension and increase in reading time when the participants were required to read in the screen condition first compared to those who were required to read a print-based text first. The differences, according to Belmore, were due to the participants' lack of familiarity with computers and reading from screens (p.13).

In addition, Garland and Noyes (2004) compared learning outcomes from computer-presented material and printed material. The learning outcome was measured as the number of correct answers produced in each reading environment. Moreover, the nature of memory retrieval indexed by memory awareness ratings was measured as a dependent variable. Initial allocation of fifty participants to the two conditions was matched as far as practicable in terms of age, gender and computer experience. Although no difference was found in correct scores between the two presentation modes, significantly higher levels of 'know' compared to 'remember' responses were found in the participants reading from printed text. The researchers concluded that if the materials provided were visually matched in the two presentation modes, there was no longer a decrement in performance. However, presentation of material on CRT monitors might influence learning outcomes, in particular those involved in memory organization and retrieval, due to the reason that learning from printed material had less interference with the process of schematization, and consequently allowed for more readily applied knowledge.

2.2.1.3. Studies of Readability of Texts on a CRT Screen

Previous work has yielded inconsistent findings in the area of screen reading. Some researchers have asserted that these findings may be partly due to the properties of CRT screens, which further affect the readability of texts presented on a computer screen. Factors such as text display format (Campbell, Marchetti & Mewhort, 1981; Trollip & Sales, 1986), luminance, contrast and color (Bauer & Cavonius, 1980; Radl, 1980), and density of a text (Kolers, Duchnicky & Ferguson, 1981; Kruk & Muter, 1984; Muter et al., 1982; Muter and Maurutto, 1991) may make reading more difficult from a computer screen than from paper. For instance, Campbell et al. (1981) studied the effect on reading

speed of two different methods of producing right justification in computer-printed text. One type of right justification was fixed character spacing. The other type, variable character spacing, distributed any extra space proportionally both between and within words of the line. The results showed that variable character spacing produced significantly faster reading speed than fixed character spacing. It also produced faster reading speed than unjustified text. Trollip and Sales (1986) also found that reading speed was reduced significantly for college students with right-justified computer-generated text that was printed on paper. Reading comprehension, however, was not affected by right justification.

Whether texts should be presented as light characters on a dark background (positive contrast) or dark characters on a light background (negative contrast) is one of the foci in the domain of screen reading research. In a study by Bauer and Cavonius (1980), twenty-three participants were required to read in three conditions: a) high luminance, negative contrast, b) low luminance, positive contrast, and c) high luminance, positive contrast. The results showed that 26% fewer errors were made with dark characters on a light background than with light characters on a dark background. The poorest performance was with high luminance of light characters on a dark background. Bauer and Cavonius concluded that positive polarity reduced optical distortion and increased visual acuity, contrast sensitivity, speed of accommodation and depth of field. In addition, Radl (1980) studied the effect of different character colors on a dark background on a computer screen in a letter-transcribing task. The character colors were white, yellow and green. Other character colors were produced by using yellow, orange, or a number of filters in combination with the color characters. The results showed that

performance and preference varied depending on the different colors of characters. The preference rating yielded larger effects than the performance measure, but the effects for the two measures were parallel. The best performance occurred with the most preferred character color: yellow with an amber filter. The next best performance occurred with yellow characters with an orange filter. From the results of this study, Radl concluded that the brightness and contrast for the characters seemed to be more important than the colors. The evidence in this study suggested that a large majority of users prefer positive polarity (dark character on a light background).

Researchers investigating how the density of a text on a computer screen affects its readability have examined such effects as characters per line, line length, and number of lines per screen page. For example, Kolers, Duchnicky, and Ferguson (1981) investigated the effect of space between lines on reading performance. Eye movements were recorded from twenty participants as they read both scrolled and non-scrolled texts with two different spacings (single versus double spacing) from a 23-inch television monitor slaved to a VDT. The results showed that single spacing produced more fixations per line; in other words, fewer words were read per fixation. Total reading time was slightly longer with single spacing than with double spacing. Even though double spacing required twice as much screen space as single spacing to display the same amount of text, it reduced the amount of fixation (by 3%) and hence decreased total reading time (by 2%). The researchers concluded that double spacing was slightly better for presenting text than single spacing. Similar results were observed by Kruk and Muter (1984). They found that close inter-line spacing may impair reading because of vertical masking, and because return sweeps were more difficult.

In addition, Kolers et al. (1981) studied the effect of line length on eye movements in reading scrolled and un-scrolled text from a color TV monitor. Texts were presented with both 40 and 80-characters-per-line extended the full width of the screen. The results showed that doubling the number of characters per line (by halving their width) increased the number of fixations per line from 4.82 to 8.00. However, the total number of fixations per passage was decreased with eighty characters per line. Moreover, the number of words extended per fixation was larger, the duration of each fixation was longer, and the total reading time was shorter. In other words, it appeared that with eighty characters per line more information was extracted from the text with each fixation and reading was more efficient.

Duchnicky and Kolers (1983) replicated this work and found that their ten participants read texts of 80-characters-per-line faster than those with 40-characters-per-line by 30%. However, comprehension of the passages did not differ as a function of number of characters per line. Duchnicky and Kolers (1983) further investigated the effect of line length. They found that for both sets of characters (40 and 80), longer line lengths resulted in faster total reading times for the passage. Reading speed increased 28% from one-third-screen width to full-screen width. Full-screen widths and two-third-screen widths were read significantly faster than one-third-screen widths.

A study by Dyson and Kipping (1998) yielded similar results. They found that longer line lengths (about 75 and 100 characters per line) were read faster than very short lines. Rayner and Pollatsek (1989) also reported that reading short line lengths seemed to be particularly inefficient because if the lines were too short, readers could not make use of much information in each fixation. However, this did not necessarily mean that the

longer the line lengths are, the more efficiently a reader reads. If line lengths are too long, according to Rayner and Pollatsek (1989), the return sweep to the beginning of the next line will be difficult. Walz (2001) also pointed out that left-to-right scrolling, which is unusual, increased the difficulty and tiresomeness in reading and hence may not be conducive to effective reading. Finally, Duchnicky and Kolers (1983) examined how the number of lines per screen page affected reading speed. Texts were displayed with either 1, 2, 3, 4, or 20 lines on the VDT. The results showed that reading speed increased 9% where the number of lines displayed was increased from 1 to 20 lines. Moreover, 4 and 20 lines of text were read faster than 1 and 2 lines of text.

Previous literature comparing computer screens with paper readability focused mainly on optical effects that might be due to the quality of technology and materials available during that period of time. In other words, if the quality and properties of the computer screens could be made more similar to those of paper, the differences in readability would disappear (Mills & Weldon, 1987; Muter & Maurutto, 1991). Gould et al. (1987) have shown that specific high-resolution computer displays can produce reading performance nearly equivalent to that with paper. Noyes and Garland (2003) found that neither reading speed (for a single page of text), nor study speed (the learning material read at a "normal" speed for the intention of learning) differed between the CRT or printed conditions. Finally, Muter and Maurutto (1991) used "enhanced" formatting of text presented in the CRT condition and compared that with the paper condition in terms of reading outcomes. The results showed that there was no significant difference among different conditions in terms of reading speed, comprehension score, or effective reading rates. Those findings suggested that the differences between paper-based and computer-

based reading could account for the features of computer screens of the 1980s. It was assumed that there would be no single variable that accounts for the obtained differences in performance between CRTs and paper if the quality of CRT screens is similar to the printed text. In this sense, it would appear that closely matched materials eliminate differences in both reading speed and comprehension. Consequently, with a more modern system, including a large, higher-resolution screen with dark characters on a light background, researchers generally assume that reading from a computer can be as efficient as reading from a print-based text.

2.2.2. Studies on Electronic/Hyper-Text Reading

As mentioned earlier, research concerning reading screen-based texts is not limited to the presentation of static texts. Along with the development and improvement of computer technologies, such activities as browsing through the World Wide Web and communicating through the Internet have become daily activities in many parts of the world and among many students. How these dynamic text environments affect readers' reading behaviors has become a focus of more recent research. One of the most often discussed forms of dynamic electronic texts is hypertext. Before reviewing studies concerning hypertext reading, it is important to understand the characteristics of hypertext which make it differ from printed-texts.

2.2.2.1. Definition of the Hypertext

The term hypertext was first coined by Ted Nelson in the 1960s (Altun, 2000). Referring to hypertext as a form of electronic text, Nelson (1978) explains "…by hypertext, I mean non-sequential writing-text that branches and allows choices to the

reader, best at an interactive screen. As popularly conceived, this is a series of text chunks connected by links which offer the reader different pathways" (p.5). According to Rada (1989), hypertexts have three attributes that separate them from conventional printed texts: 1) a database consisting of distinct textual units; 2) a semantic network connecting the textual units; and 3) electronic tools for moving flexibly through the network (p.164). From the definitions mentioned, one can recognize several distinguishing features of hypertext: network systems, nonlinear structures, and interaction.

Network systems

Information in hypertext is organized as a network in which nodes are text chunks (e.g. lists of items, paragraphs, pages) and links are relationships between nodes. Even though the content of a text itself does not change much from a printed text to hypertext, the presentation interface in the hypertext environment is structured in a way that makes intertextuality easier than ever before. Reinking (1994) has claimed that "the simultaneous availability of powerful means to restrict and to expand a reader's access to text is a unique characteristic of electronic texts" (p.7), especially hypertext. Lynch (2001) also has pointed out that digital forms are presented as databases to be searched or browsed. Through the network system of hypertext, a reader is able to locate specific information in a primary text or in other ancillary texts that may be accessed from a large database.

Researchers have drawn attention to how this network system impacts on the academic world. Yankelovich, Meyrowitz and van Dam (1985) claim that electronic document systems, in some cases, are more powerful or appropriate than paper books for

meeting the range of information needs of scholars within the academic community for two reasons:

1. Webs and links allow scholars to connect related references immediately. The process of adding additional reading material and information will help scholars integrate all scholarly work and enrich their understanding of their content areas.
2. Electronic document systems help scholars create connections. Faculty and students are able to view one another's work easily, send and receive personal electronic messages, and jointly edit documents without the limitations related to working with print-based texts. These types of communication foster "on-line communities" of researchers or students and enhance the ability of scholars to make meaningful connections (p.16-17).

Sellen (2002) has also observed the impact of the network system on academics. Students and faculty nowadays need to locate sources scattered across formal academic journals and other resources. The network system of hypertext allows readers to navigate through information resources easily and rapidly. However, this requires students and faculty to acquire new knowledge about computer file structures, to understand the concepts of thesaurus constructions, and to develop the ability to construct effective search strategies in order to conduct their research.

In addition, this network system provides electronic documents with the potential to utilize multimedia capabilities. While comparing electronic and printed texts, Lemken (1999) claims that an electronic document consists of several media types (e.g., video, audio, interactive embedded application) which are beyond what a printed text can consist of (text, pictures and diagram). These electronic media may be presented all

together in one text unit, or they may be separate but linked to the origin (p. 2). Yankelovich, Meyrowitz, and van Dam (1985) view this media capability as the greatest advantage of electronic documents (including hypertext) over paper ones. They stated that

> By combining a variety of media, electronic books can provide not only static images, but also dynamics (e.g., computer animations and computer-controlled video sequences), interactivity (e.g., ability to move objects, change and edit objects, and change states), and sound (e.g., computer-generated or audio disk recordings). These features all help in creating better audiovisualization. (p.17)

Sellen (2002) shares a similar viewpoint, saying that the concept of static word literacy has changed into "multimedia literacy" because the static written texts can be connected with visual and aural texts through networks. Moreover, the networks increase the speed and efficiency of the dissemination of multimedia texts. The combination of the new tools of electronic multimedia publishing and electronic networks for dissemination, as a result, redefines the value and legitimacy of conventional written text.

Nonlinear structures

Many researchers (Shapiro & Niederhauser, 2004; Spiro & Jehnh, 1990; Tripp & Robby, 1990) claim that the most basic feature of hypertext is its nonlinear structure, which attempts to overcome the inherent limitations of the traditional print texts, their linearity in particular. According to Britt, Rouet and Perfetti (1996), the nonlinear structure of hypertext can be organized through top-level structures (i.e., table of contents, indices) or through direct links between passages. This nonlinear structure, furthermore, has reshaped traditional concepts of reading processes, which were based on the world of

print texts. Slatin (1990), for example, points out the different order or directionality between traditional text and hypertext, which in turn leads to the use of different reading processes. In the traditional reading context, reading is assumed to be a sequential and continuous process from beginning to middle to end. The author determines how readers proceed to the text in accordance with his or her understanding of the subject matter and the reader. The reader is expected to follow the route which has been carefully laid out for the sole purpose of ensuring that reader does indeed get from the beginning to the end in the way the writer wants him or her to get there (p. 871). Reading in hypertext, however, is understood as a discontinuous or nonlinear process. As Rouet and Levonon (1996) have noted, pages in hypertext are organized in a network rather than a predefined sequence which is normally seen in print-based materials. Therefore, readers can control the reading processes in hypertext as opposed to following the path predefined by the author of print-based texts. Bernhardt (1993) defines hypertext as nonlinear text by saying that hypertext allows texts of various sorts to be combined into large text bases and allows readers to move freely across various sorts of information in their own preferred way. In other words, text in the hyper- environment can be loosely structured, built by association, linked in networks or multidimensional matrices (p.164). McDonald and Stevenson (1998) explain that the apparent advantages of nonlinear, or network, structures are: 1) these types of structures are intended to make information more accessible to the reader; and 2) the network structure allows nonlinear access to the information contained in a text. Readers can choose to follow a variety of paths through the document, thus increasing their control over the sequencing of information.

Interactive between readers and texts

Since hypertext documents contain automated cross-references to other documents, hypertext readers are able to actively choose their own path by selecting a link that causes the computer to load and display the linked documents and make them available to the readers upon demand. In other words, hypertext readers interact with a set of texts in their desired ways as opposed to simply following the text from beginning to the end, as in print-based texts Thus, the experience of reading in hypertext becomes an interactive process of constructing meaning (Bernhardt, 1993; Curry, Haderlie, Ku, Lawless, Lemom & Wood, 1999, McNabb, 1997; Patterson, 2000). However, this does not mean that readers do not actively construct meaning while reading in print. Bernhardt (1993) explains that readers in the printed-text environment might choose to read from the beginning to the end, or to read the beginning chapter and then jump to later chapters or even read the ending first. However, these are not common or appealing choices, since print-based texts are written with the understanding or assumption that they will be read in a linear way. Thus, other orders of reading disrupt the author's intentions and impair the reading process. Thus, readers have limited choices in terms of approaching print-based texts. A hypertext reader, on the other hand, has to make constant decisions about where to go and what to do,, with little or no guidance provided by the texts themselves. In doing so, the reader is forced to construct not just mental representation of the work, but a physical representation as well, through concrete manipulations of the text (Bernhardt, 1993, p.156).

Furthermore, Curry et al. (1999) claim that hypertext is more reader-driven than a traditional text. Unlike a traditional text, where a person interacts with it by following an

already-decided organizational scheme, hypertext is more user-driven in that the person interacting with the text is able to access parts most relevant to that particular user, and in the order that reader prefers. When reading a traditional text, readers may simply play the role of "receiver of information" (Michalak & Coney, 1993), while readers in the hypertext environment become active users or browsers who either enter the document in research of specific information or simply wander through the materials and pick up pieces of information as interest dictates (Slatin, 1990). The process of reading in hypertext makes reading an interactive process of constructing meaning, in that readers have choices to make about which links to pursue.

2.2.2.2. Advantages of Reading from Hypertext

Along with the observations of the characteristics of hypertexts, researchers have investigated how these characteristics impact on an individual's reading behaviors and reading processes. They have also proposed a number of benefits of this type of reading. Many of the proposed benefits of hypertext can be categorized into two domains: active engagement and sufficient input.

Active engagement

According to Landow (1992, 1997), the act of choosing which links to follow requires readers to take an active approach to reading, in that they must navigate the terrain of a hypertext, constructing their own unique texts in the process. A good deal of scholarly work has observed a positive correlation between active involvement and one's reading comprehension (Jonassen, 1986; Reinking, 1994; Shapiro, 1998, Winne, 1995, 2001). For example, Jonassen (1986) explains that through interaction with texts, readers are able to read information in a manner that is meaningful to them. Reinking (1994),

furthermore, states that hypertexts provide readers with more opportunities for individualized approaches to creating connections among complex and interrelated texts. In this case, readers are able to create their own scaffolding for textual information and hence may learn better. In addition, hypertexts are assumed to stimulate learning because they encourage the structuring and restructuring of knowledge depending on the learner's reactions in exploring a specific application (Jonassen & Grabinger, 1990). Ramirez (1997) argues that one learns better when she or he actively participates in the learning process. Active participation helps learners activate their preexisting knowledge, or schema. In so doing, learners are able to connect the new facts and concepts with what has existed in their schemata in a constructive way.

A study by Shapiro (1998) provided empirical support of these ideas. In the study, Shapiro investigated how the nature of the hypertext system structure promoted active learning. Each of the seventy-two college undergraduates participating in the study was assigned to work with one of three hypertext systems: a highly structured hierarchical system, an unstructured hierarchical system, and a linear (no hierarchical) structured system. After studying material within one of these systems, the participants were asked to write an essay, answer 30 short-answer questions, and draw a concept map of the topics using pencil and paper. The essay results showed that participants reading in the unstructured condition performed better than those in the highly structured and linear conditions. A possible reason, according to Shapiro, was that "the less structured system required a deeper level of processing of the information, which made learners stay oriented in the system in order to make sense of the material" (p. 25). Shapiro concluded

that putting the learner in a position to actively engage the content of a text makes it more understandable and cohesive and thus could improve learning outcomes.

Sufficient input

A number of empirical studies have found that the instant support available in a hypertext system enhances readers' reading comprehension by providing information about vocabulary and background information. Reinking (1988) studied thirty-three fifth and six graders in terms of their reading comprehension in four conditions: printed passages without assistance, computer-displayed passages without assistance, computer-displayed passages with assistance in which students were free to choose, and computer-displayed passages with assistance in which students were required to view all options. Students were asked to read passages in one of the four conditions and to take a six-item multiple-choice test following the presentation of each passage. Data consisted of the scores on the comprehension test, reading times, and a passage preference questionnaire. The results showed that comprehension increased when a computer was used to expand readers' options for acquiring information from a text or to control their processing of text (p. 495). However, there was no significant difference between participants who read passages in printed form and those who read computer-displayed passages without assistance. Reinking concluded that computers may enhance comprehension because they provide readers opportunities for deeper or more efficient cognitive processing of text. However, this study was criticized for its lack of details regarding what information was included in the provision of computer assistance.

Thus, Reinking and Rickman (1990) replicated Reinking's (1988) study with a more specific focus in terms of assistance provided through the computer. Reinking and

Pickman aimed to investigate whether using online or offline assistance made students greater gain knowledge of word meaning and in comprehension. Sixty sixth-grade students were asked to read two science passages with a total of thirty-two difficult words in them and to complete ten multiple-choice comprehension items. Students were assigned into four treatments conditions. In two of the conditions, the students read the passages on printed pages accompanied by either a standard dictionary or a glossary comprised of the target word. In the remaining two conditions, the students read the passages on a computer screen that provided either optional or mandatory assistance with the meanings of the target words. The data were collected from a 32-item vocabulary test. The results showed that students reading computer-mediated texts scored higher on the comprehension text than did those reading the text offline in the condition where the students were required by the computer to view the definitions of every target word. The results suggested that using computers to present the meanings of difficult words may affect positively students' vocabulary learning and comprehension because of the increased attention to the target word in computer-optional definition conditions.

Similar results are found in the domain of second and foreign language reading. Leffa (1992) studied fifty-five Computer Science undergraduate students whose first language was not English on their understanding of authentic English passages and reading speed with the support of either an electronic glossary or a traditional bilingual dictionary. Each participant read five passages in both conditions and then was asked to translate the passages into their first language, Portuguese. By comparing mean scores in the two modes, the findings favored the electronic glossary as more useful to help the students comprehend an authentic text. In other word, students were able to retrieve more

meaning from the text using the electronic glossary. As for time taken for reading the text, results showed that students read faster in the electronic glossary mode than in the traditional dictionary mode. Similar results were observed in another study by Leffa (1992) on Portuguese college freshmen with a beginning English proficiency level. A group of 20 university students from different departments were randomly assigned to read two different short passages (about 100 words each) in two modes: electronic glossary and traditional dictionary. The comprehension task was to translate the original English text into Portuguese, using either the traditional dictionary or the electronic glossary. The findings indicated that the electronic glossary enabled beginners to obtain more meaning in less time and hence allowed for beginners to read with more comprehension than with a traditionally bilingual dictionary.

In addition to vocabulary knowledge, students can also benefit from supplementary information such as background knowledge, illustrations, or an explanatory animation through hyperlinked multimedia. In a series of studies conducted by Anderson-Inman and colleagues (Anderson-Inman & Horney, 1998, 1999; Anderson-Inman, Horney, Chen & Lewin, 1994; Horney & Anderson-Inman, 1995), electronic texts when used as a supportive tool were shown to improve comprehension for at-risk readers. For instance, Anderson-Inman and Horney (1999), in a one-year qualitative study, investigated how purposefully designed electronic supportive texts, called ElectroText, helped a 12-year-old hearing impaired student improve his reading comprehension and increase his motivation to learn. Anderson and Horney observed that the participant showed a pattern of interacting with illustrative sources and a pattern of paying careful attention to both the text he was reading and the resources embedded in that text to

support his comprehension. In other words, the participant searched out resources to match his educational expectations in the electronic reading environment. Anderson-Inman and Horney concluded that reading in an environment where supplemental information was provided through hypertexts made study more acceptable and enjoyable. The authors concluded that students such as this participant whose history shows them to be at risk of failing in traditional tasks could become successful readers in this type of reading environment (p.163).

2.2.2.3. Disadvantages of Reading from the Hypertext

Not all researchers support the advantages hypertext brings to reading and learning. Several researchers have pointed out the disadvantages of reading and learning in a hypertext environment (e.g., Conklin, 1987; Halasz, 1988; Hansen, Doring, & Whitlock, 1978). They state that the most common disadvantage stemming from the nature of hypertext is its disorganization resulting from its nonlinear character.

Disorganization

An often quoted argument is from Conklin (1987), who argues that because the components of the hypertext are not always spelled out, there is a significant danger that the reader will get lost or become disoriented. Conklin, further, names these two common problems Lost-in-Hyperspace Phenomenon and Cognition Overhead (p.38). These problems are also observed by Walz (2001). Walz claims that the limited size of the computer screen often necessitates the use of scrolling and the presentation of text in frames. Both of these characteristics of hypertext place an increased processing load on the reader's working memory. Breaking text into frames inhibits the reading process, in that what is read in one frame must be remembered when moving to new frames if the

information across multiple frames is to be integrated. Niederhauser, Reynolds, Salmen and Skolmoski (2000) observed this problem in an empirical study investigating whether different hypertext-based navigation features would affect student learning. Forty-three undergraduate students were asked to read the hypertext materials and complete multiple-choice and essay posttests as part of their regular course assignments. The hypertext structure was designed to allow readers to adopt individual strategies for navigating through the text in the sense that readers were able to choose to read through each topic either by moving systematically as one would do with a traditional text or by making use of hypertext features—compare and contrast and the topic map. The results showed that students who made extensive use of the compare and contrast linking capabilities in the hypertext tended to be less successful. In other word, students who "criss-crossed" tended to learn less than those who limited their use of hypertext linking capabilities and read the material in a more sequential manner instead (p. 249). Niederhauser et al. (ibid.) explained that using hypertext may place too great of a burden on the reader because it increases cognitive load. As a result, the increased cognitive load associated with reading in a hypertext environment may interfere with learning.

However, many researchers (e.g., Edwards and Hardman, 1989; Ramirez, 1997; Rouet and Levonon, 1996) have observed a differential interaction effect between the navigation difficulty and reading proficiency or computer experience; that is, this cognitive load affects negatively novice readers or computer users more than experienced readers or computer users. Edwards and Hardman (1989), for example, noted that even highly skilled readers of print texts have "navigational" problems as they move around within hypertext networks due to a lack of familiarity with t he hypertext environment.

Ramirez (1997) and Rouet and Levonon (1996) assert that a novice reader may find him/herself disoriented or completely lost in hyperspace due to the lack of necessary schema to deal with the richness, immensity, and sometimes disparate information inherit in hypertext. Results corroborating this result are found in some empirical studies (Cho, 1995; Gray, 1990; Schroeder, 1994). Gordon, Gustavel, Moore and Hankey (1988) found that the learners in the hypertext condition reported a feeling of disorientation. Presumably, the resulting feeling of disorientation prevented learners from creating a coherent mental representation that would allow them to store information with greater effectiveness. Gordon et al. then concluded that a poor structure can mitigate learning by disorienting learners.

Furthermore, Gray (1990) investigated navigation patterns of 10 hypertext readers who were asked to read a 68-unit hypertext with the goal of answering questions. Think aloud protocols were recorded for collecting readers' selections in the hypertext during navigation. Gray observed some shared navigation problems among the participants, such as being unable to recognize what had and had not been read, and an inability to find the information they needed. In addition, when asked to draw a representation of the hypertext structure, participants tended to reproduce conventional patterns such as sequences, simple hierarchies, and tables. Therefore, Gray concluded that analogies with conventional structures may help readers, especially novice ones, read in a hypertext environment. With some training, Gray recommended, hypertext learners might become able to deal with loosely structured materials.

Additionally, Cho (1995) investigated the nature of cognitive processes readers used in two different hypertext systems: learner-controlled and program controlled. In this

qualitative study, 20 undergraduate novice users were asked to read passages ffrom these two different hypertext systems. Cho found that novice users showed similar cognitive processes in the two different environments. However, participants' lack of experience in hypertext may have caused them to be confused and disoriented about the operation of the program throughout reading. These results suggest that there seems to be a significant cognitive load on the reader when reading a hypertext due to the multiple paths for navigation that exist in such a text, especially for readers who are less familiar with this text type.

2.3. Studies on Computer Familiarity

The previous studies mentioned above focused on the nature of hypertext and its relationship with reading performance. Some researchers, however, argue that the problem of disorganization is mainly due to readers' lack of familiarity with reading in this new text form, not the hypertext structure itself. Readers who grow up using computers may not have the same difficulty as those who did not grow up using them (e.g., Cope & Kalantzis, 2000; Leu, 2002; McNabb, 1997; Reinking, 1998; Thomas, 1997; Tyner, 1998; Wade & Moje, 2000). Thus, computer experience seems to be a major factor that will affect a reader's on-screen reading behaviors and performance. Several studies have investigated the relationships between computer experience and other variables, such as age, gender and attitude (e.g., Kay, 1992; Levin & Gordon, 1989; Loyd & Gressard, 1984; Marcoulides, 1988; Miller & Varma, 1994).

2.3.1. Age and Gender

A number of studies have examined age and gender differences relative to the computer experience and computer attitudes of readers (e.g., Czaja & Sharit, 1993; Rogers et al., 1996; Rousseau & Rogers, 1998; Shashaani, 1994; Woodrow, 1994). Comber, Colley, Hargreaves and Dorn (1997), for example, investigated the computer experience and attitudes of secondary school students. A total of one hundred seventy-eight students (127 male and 131 female) within the 11-18 age range participated in this study. The participants were divided into two age groups: younger (11-12 years) and older (15-16 years). Students answered questions related to their computer use, experience and attitudes for several computer applications: word processing, music, programming, maths/calculations, drawings/graphics, and computer games. After comparing different genders in the frequency of using a computer and their computer attitudes, the researchers found that males had greater experience with computers and had greater liking for computing than girls in all kinds of computer applications. In other words, males used computers more frequently and had wider general experience of computing when compared to females. The survey also revealed age differences in the use of computers; that is, the older group was less inclined to use computers. Shashaani (1994) studied gender-differences in regard to computer experience and the relationship between computer attitudes and computer experience in high school students. The study found significant gender-differences favoring boys in computer experience, computer class participation, amount of computer usage, and computer ownership. In addition, boys had more favorable attitudes toward computers than girls.

However, other studies have shown that gender-differences in relation to attitudes and computer anxiety have been reduced or disappeared when exposure to computers has been controlled (Chen, 1986; Chambers & Clarke, 1987; Campbell, 1989). In a survey of 1,138 high school students, Chen found that male students had greater computer experience as compared to female students, were more interested in computing, and had more confidence in their ability to work with computers. However, when the amount of computer experience was controlled, the gender differences in terms of computer interest, but not in computer confidence, were reduced.

Rousseau and Rogers (1998) examined age-related trends in computer utilization. A total of five hundred twenty-one faculty members at a southeastern university in the United States responded to a questionnaire regarding their use of computers in general and a specific computer application, the online library system at the campus library. The data showed that the older faculty members used computers as frequently as the younger faculty. However, this did not mean that they were equally comfortable with computers. The older faculty members reported that they used fewer types of applications and felt less comfortable using online library system as compared to the younger faculty members. Although the older faculty members did not report being as confident in using the system as the younger faculty, they were the age group most interested in receiving training in using the system. As for examining gender differences in technology and computer use, the data showed no real differences regarding the number of technologies used, nor in the frequency of computer use. The only difference was that males had reported using more computer applications overall. However, the difference was not significant.

Some studies have reported that young adults read faster than older adults or suffer less from higher-speed presentation rates (Czaja & Sharit, 1993). For example, Czaja and Sharit (1993) examined age differences in reading performance under both paced and unpaced conditions. In the paced condition, participants read the text in the computer-paced presentation, while participants in the unpaced condition read in the self-paced computer presentation. The results showed that older adults demonstrated more fatigue and stress under the paced rather than unpaced conditions because task pacing increased perceptions of mental challenge, time pressure, and ratings of workload. Similar results were found in the study of Meyer and Poon (1997). In this study, age-related differences were compared in efficiency of reading comprehension from texts that were presented on a computer screen (in computer-paced and self-paced conditions) and from those presented as conventional printed text. An efficiency rate was calculated for each participant based on the amount of correctly remembered information per minute spent reading. The results showed that methods of presentation through computers did not affect young adults' learning, but they handicapped older adults. Moreover, older adults were more efficient when learning from the traditional media of the printed page. In addition, different attitudes toward computers were observed between the two age groups. Young adults had more positive attitudes toward computers than older adults. In other words, the older adults displayed more dislike for reading from a computer screen. The older adults spent more time reading from print rather than from a computer monitor. Meyer and Poon concluded that young and older adults differed in their familiarity with the computer, and familiarity had been shown to reduce the drain in processing a task among older adults.

In sum, the literature has shown that older adults consistently report less computer experience than younger adults. Moreover, older adults seem to have less positive attitudes toward computers and spend more time to complete a computer-based reading task. However, the associations between genders and computer attitude were not consistent in previous literature.

2.3.2. Attitude

A number of researchers have investigated the impact of attitude on computer usage (e.g., Chen, 1986; Hartwick & Barki, 1994; Robichaux, 1994; Rosen, Sears & Weil, 1987). The underlying assumption of these studies is the attitude-behavior theory (Fishbein & Ajzen, 1975), which argues that attitudes lead to certain behavioral intentions and, in turn, affect the actual behaviors. Al-Khaldi and Al-Jabri (1998) also state that the attitudes of students toward computers are significant determinants of behavior that may influence computer utilization. In their study, Al-Khaldi and Al-Jabi (ibid.) measured and analyzed the relationships between computer attitude and it components (anxiety, confidence, liking, and perceived usefulness) and utilization of computers among three hundred undergraduate students in a Saudi Arabian university. Three indicators were used to measure the utilization of computers: a) intensity of use, b) frequency of use, and c) diversity of software packages used. Two hundred thirty-eight undergraduate students answered and returned the questionnaire. The results showed all attitude components to be significantly associated with computer use. However, only two parts of the components (liking and confidence) significantly affected computer utilization.

Nevertheless, the relationship between attitude and computer use is recursive. It has been demonstrated that computer experience also has a direct effect on computer attitudes, as well as on computer-related confidence. In a study by Gardner, Dukes and Discenza (1993), a model investigating the causal relationships among computer use, computer confidence, and computer attitudes was tested by using 723 fifth through ninth-grade students. The findings confirmed the hypothesis that experience with computers had direct, causal effects on attitudes about computers. Gardner et al., hence, suggested that increased computer usage caused increases in computer self-confidence, which in turn caused favorable attitudes toward computers (p.438). Moreover, some researchers (e.g., Gressard & Loyd, 1987; Shashaani, 1994; Woodrow, 1994) found that degree of computer usage strongly affects computer attitude. Shashaani (1994), for example, while surveying 1,730 high school students, found positive correlations between computer experiences and computer attitudes. She then suggested that more exposure to computers was associated with more positive attitudes toward computers. The amount of computer usage was positively related to all aspects of computer attitudes. Using computers more frequently improved users' confidence in their ability to work with them. A similar result was found in a study by Woodrow (1994), who investigated the computer-related attitudes of 421 grade eight students and found that computer experience generated positive computer-related attitudes. In conclusion, computer attitudes have been positively correlated with both computer experience and computer confidence.

Summary

In the first part of this chapter, research related to reading on a computer screen and reading in a hypertext environment has been presented. Research investigating reading static texts on a computer screen focuses on how a screen-based text affects a reader's reading efficiency and effectiveness. Studies investigating hypertext reading concern how the characteristics of hypertext impact on learning and reading behaviors. Moreover, factors that affect on-screen reading behaviors have been discussed, including: 1) density of the text information, 2) display formats; 3) hypertext network system, 4) demographic background, and 5) computer experience and attitudes.

As mentioned, many studies have examined on-screen reading behaviors. Several common themes those studies share can be summarized as follows:

1. Most of the on-screen reading studies were conducted in experimental environments or language classrooms.
2. Most of the studies focused on native-English speakers. Only a few studies focused on non-native English speaking students as their target population.

2.4. Second Language Reading Research

When discussing second language readers, the most fundamental problem every second language reader faces is the language issue. Koda (1996) states that L2 reading is different from L1 reading because L2 reading process is cross-linguistic, involving two or more languages. Moreover, L2 readers differ from their English-as-the-first-language counterparts in at least two fundamental ways: (a) they have already acquired sufficient

literacy competent in their first languages; and (b) they learn to read their second language(s) in diverse social and instructional contexts and for a wide variety of purposes.

This unique experience hence makes research in second language reading different from first language reading. When investigating L2 reading, researchers need to consider L1-L2 interactions and L1 influences on L2 literacy performance. Two schools of thoughts widely discussed in L2 reading field are the Linguistic Interdependence Hypothesis (LIH) and Linguistic Threshold Hypothesis (LTH).

2.4.1. Linguistic Interdependence Hypothesis (LIH)

According to Kern (2000), investigation of L2 reading began in the 1970s in part in response to Goodman, who had argued that "the basic process of reading is universal, involving the formation, testing, modification, and confirmation of hypotheses based on features of the text itself as well as the reader's prior knowledge" (p.118). Cummins (1979) further adopted this stance, stating that "once one develops an ability to deal with 'cognitive academic' or 'context-reduced' uses of language, that ability does not need to be reacquired in a new language" (p.23-24). In this sense, literacy abilities are seen as transferable from one language to the other because they are interdependent at some fundamental core. This concept is called the "Interdependent Hypothesis" or the "Linguistic Interdependent Hypothesis (LIH)."

A numbers of studies carried out using miscue analysis as the key research instrument (e.g., Barrerra, 1981; Mott, 1981; Rigg, 1977) in the comparison of reading in two languages (e.g., Cziko, 1976; Swain, Lapkin, & Barik, 1976; Tucker, 1975) as well as in L2 reading have supported this universalist position. For instance, Carson, Carrell,

Sibberstein, Kroll and Kuehn (1990) conducted a study which examined the relationship between first and second language reading and writing abilities. A total of 48 native speakers of Chinese and 57 native speakers of Japanese studying at four U.S. universities were recruited. Participants were asked to write an essay and to complete a cloze passage in both their L1 and L2. Reading and writing scores were correlated across languages and within one language. The data showed that there were stronger relationships between reading abilities across languages than between writing abilities for both groups. In other words, reading ability transferred more easily from L1 to L2 than did writing ability. However, the patterns of transfer were different between the Chinese and Japanese. For the Chinese, the reading-writing relationship was strongest in L2, while for Japanese the relationship between reading and writing was strongest in L1. The results indicated that interlingual transfer could occur, but the strength and nature of the relationship differed from each group, either due to levels of L2 proficiency or other background differences.

Wade-Woolley's (1999) study presents further evidence for effects of cross-linguistic transfer on L2 reading. The article reported an experiment investigating similarities and differences in basic word recognition processes of second language readers between two groups with different L1 orthographies (Japanese and Russian). 16 adult participants from each language group participated in this study. All participants were given standardized and experimental tasks, including reading comprehension and vocabulary subtests of TOEFL (Test of English as a Foreign Language), a word reading subtest of WRMT (Woodcock Reading Mastery Test), a word attack subtest of WRET, a spelling recognition subtest of PIAT (Peabody Individual Achievement Test), orthographic knowledge, pseudoword repetition, and phoneme deletion. The results

revealed that the two ESL groups showed equal proficiency in L2 in all areas that were tested in this study except specific phonological and orthographic processes. This may have been due to the differences between participants' L1 orthographies. The Russians were more adept at manipulating sublexical phonological segments, whereas the Japanese were more accurate at recognizing legitimate spelling patters in English (p.462). The study concluded that both groups had the ability to integrate orthographic and phonological knowledge for reading in English and relied on different strategies provided by their L1. This study suggested that different language-speaking ESL adults may bring processing strategies specific to their L1s to the task of reading new and familiar words in the L2.

In addition, Jiang and Kuehn (2001) focused on examining the relationship between adult bilinguals' academic language skills in L1 and L2 and the positive transfer from L1 to L2. 22 low-intermediate ESL students enrolled at a community college in California volunteered for this study. Participants were placed into two groups: late-immigrants (at least 10 years of L1 education before arriving the U.S.) and early-immigrants (fewer than 10 years of education in the U.S.). An academic language assessment instrument was used to measure students' English academic language proficiency at the beginning and the end of a fall semester. In addition, a language use questionnaire and interviews were used for collecting individual demographic and perceptions data. The analysis of the differences between two groups showed that the students with higher L1 academic language proficiency could transfer skills and strategies that facilitated their development of L2 academic language proficiency, despite not having had formal instruction in an L2 educational context (p.429),thus supporting

the LIH. Additionally, interview data provided further evidence for the LIH; that is, more late-immigrant students used cognitive strategies in both L1 and L2 to solve new word problems than did the early ones. The researchers concluded that students in the late-immigrant group were able to outperform the early-immigrant in vocabulary and some reading-related tasks, despite low L2 educational experience.

Even though the previous studies support Cummins' claim that "experience with either language is capable of promoting the proficiency that underlies the development of academic skills in both languages" (p.33), Cummins himself was aware of the limitations of the standard universalist perspective. He then put forward the notion of a "threshold level of L2 competence" (1979, p.23), which posits that L2 readers have to attain a certain baseline proficiency in the target language in order for their linguistic interdependence to be fully realized by allowing better access to their L1 literacy resources.

2.4.2. Linguistic Threshold Hypothesis (LTH)

According to the LTH perspective, a sufficient degree of second language linguistic proficiency must first be achieved in order to read in a second language. A lack of second language linguistic knowledge ultimately "short-circuits" successful access to the first language reading knowledge. In other words, a given amount of second language grammatical and linguistic knowledge is necessary in order to draw meaningfully from first language reading knowledge. Within this hypothesis is the belief that language is the key factor in reading activities. In other words, in order to read a language, one has to "know" the language. Thus, the question of whether L2 reading is a language problem or a reading problem became the main focus of subsequent research through this perspective.

It was Alderson (1984) who posed the crucial question above and who came to the tentatively qualified conclusion that "it appears to be both a language problem and a reading problem, but with firmer evidence that it is a language problem, for low levels of L2 competence, than a reading problem" (p.24). When learning to read in L2 at an early stage, readers cannot as easily use knowledge or intuitions from L1 reading experiences as they can when they become more proficient in the L2. In other words, whether a reader has reached the threshold level may be the deciding factor in success or failure in L2 reading. This threshold hypothesis was later supported by a number of studies that showed that people who are proficient readers in their native language are often unable to apply their well-developed reading skills when reading in a second language.

Bernhardt and Kamil (1995) tested native English speakers who were learners of Spanish to investigate both the LIH and LTH. 147 adult Spanish learners with three L2 proficiency levels at the United States Air Force Academy participated in this study. All participants were asked to read three versions (one in Spanish and two in English) of the reading comprehension section of ABLE (Adult Basic Learning Examination). The analysis revealed that 28 per cent of the variation in the Spanish scores could be accounted for by L1 reading. When second language proficiency level was taken into consideration, the contribution of the L1 increased an additional 10 per cent. The results indicated that L1 reading ability was a very important variable in second language reading achievement, as stated in the LIH. However, L2 proficiency seemed to be a more powerful predictor of L2 reading ability, as the LTH claimed. They concluded that "second language reading is not merely an impoverished version of L1 reading, but it is

indeed a process that requires some unique reading capacities and lexical and grammatical flexibility [in L2]" (p.31).

Lee and Schallert (1997) also investigated the contribution of L2 proficiency and L1 reading ability to L2 reading ability in terms of the threshold hypothesis of language proficiency. By examining 809 third-year middle school and first-year high school Korean students whose age ranged from 14 to 17, the researchers wanted to test two hypotheses: 1) The relationship between L2 proficiency and L2 reading will be stronger than the relationship between L1 reading and L2 reading; and 2) learners with low levels of L2 proficiency will show little relationship between their L1 and L2 reading ability, whereas learners with higher levels of L2 proficiency will show a positive relationship between their L1 and L2 reading performance. The results showed that the participants demonstrated noticeably different patterns of relationships between L1 and L2 reading based on their level of L2 proficiency. Students with high L2 proficiency were able to exploit their L1 reading skills and strategies when reading in the L2, whereas those with low L2 proficiency relied less on L1 reading strategies. In short, only when L2 readers reached a certain L2 proficiency level were they able to transfer their L1 reading skills to L2 reading.

This study was replicated by Brisbois (1995) and Schoonen, Hulstijn, and Bossers (1998) with a specific focus on the domain of L2 knowledge. Brisbois (1995) examined the relationship between L1 reading, L2 knowledge (L2 grammar and L2 vocabulary), and L2 reading among 131 native English speaking students enrollrf in French courses at the U.S. Air Force Academy. The students were given five tests, including the Nelson-Denny Reading test for English reading comprehension, French grammar, French

vocabulary, recall protocol for English reading comprehension, and French reading comprehension. By using six multiple regression analyses, this study demonstrated the importance of L1 reading and L2 knowledge to L2 reading comprehension. However, the results showed that L1 reading contributed substantially more to the upper level group. In other words, the upper level students' superior L2 knowledge led to the ability to use both L1 and L2 knowledge in the L2 reading process. Beginners, on the other hand, could not transfer L1 skills and strategies to L2 reading due to less language knowledge in both languages.

Finally, Schoonen et al. (1998), investigating the relationship between reading comprehension and vocabulary knowledge in both L1 and L2 among Dutch students, found results that supported Brisbois' study. 488 students of grades 6, 8 and 10 were recruited. Students' reading comprehension, vocabulary knowledge, and metacognitive knowledge in both languages were measured and correlated. The findings indicated that foreign language (FL) vocabulary played a much more important role in predicting FL reading comprehension in grade 8 than in grade 10, whereas metacognition played a more important role in grade 10 than in grade 8. The study supported both Cummins' (1979) Interdependence and Threshold Hypotheses, which, put together, stated that L1 knowledge can transfer, but only after learners attain a threshold of L2 knowledge.

2.4.3. Other factors

The studies which have been discussed so far considered only two variables—L1 reading skills and L2 proficiency—in L2 reading. Other factors, however, may impact L2 reading ability as well. L2 reading becomes more complicated when researchers consider

other factors, such as orthographic systems and reading tasks. For example, in one of Carrell's (1991) studies, Carrell noticed some other factors that may influence second language reading ability while examining the statement, "L2 Reading = L1 Reading + L2 Language Proficiency" (p.161). In this study, 45 native speakers of Spanish and 75 native speakers of English read two reading passages in each of the two languages (Spanish and English) and then answered multiple-choice comprehension questions. The results showed that both L1 reading ability and L2 proficiency had significant effects on second language reading ability. However, the proportion of the two factors—L1 reading ability and L2 proficiency—varied in L2 reading ability due to other factors, such as learners' first language and the learning environment.

2.4.3.1. Representational Unit in Orthography

A representational unit in a word refers to the linguistic unit that is presented by a grapheme (Akamatsu, 2002). According to the nature of the representational unit, orthographic systems can be categorized into three types: logography, syllabary and alphabet. Numerous studies have looked at how orthographic differences between two languages affect a second language reader's reading performance (Gass, 1987; Koda, 1999; Sasaki, 1991). Koda (1999), for example, investigated the differences of L2 orthographic sensitivity among adult second language learners with diverse first language backgrounds (Korean and Chinese). A total of 40 ESL learners (20 Korean and 20 Chinese) were recruited from beginning-level intensive English classes at a university in the U.S. Participants were tested on their L2 intraword structural sensitivity by using an orthographic acceptability judgment test and on their intraword awareness by using decoding tests. The resulted showed that the Korean ESL learners benefited from their L1

processing experience, and extended their L1 intraword structural sensitivity to another unrelated alphabetic system, thus demonstrating the impact of L1 processing experience on L2 intraword sensitivity. However, this effect of L1 processing experience was evident only when component letters appeared in unfamiliar positions. In other words, the Chinese and Korean ESL learners did not differ in their judgment of orthographic acceptability when dealing with high-frequency letter-strings, but the Korean learners scored significantly higher than the Chinese in rejecting low-frequency illegal strings. Koda concluded that L1 alphabetic experience promoted L2 intraword structural sensitivity among ESL learners.

Research by Akamatsu (2003) supports Koda's (ibid.) conclusion. She examined the cross-linguistic effects in word recognition with contextual clues. Specifically, this study investigated whether L1 orthographic features (Persian, Chinese and Japanese) affected word recognition in the context of reading a passage in English as a second language. 49 fluent ESL readers (18 Chinese, 16 Japanese and 15 Persian) were selected. All participants were also skilled readers in their first language. Unlike most of the studies using single-word tasks and pseudowords or nonwords in their measurements, this study used 110-150 word passages (contextual clues) and case manipulation to examine L2 readers' intraword sensitivity. The result showed that fluent ESL readers with a nonalphabetic L1 background were less efficient in processing the constituent letters in an English word than those with an alphabetic L1 background. This again supports the concept that L1 orthography has effects on the development of L2 reading skills.

2.4.3.2. Transparency of the Orthography

In addition to representational unit, L2 reading researchers are also interested in the transparency of the orthography and how that impacts an individual's decoding skills. The degree of transparency of the orthography depends on the regularity in sound-symbol correspondence. This is often referred to as orthographic depth. An orthography that represents its phonology following regular grapheme-phoneme correspondences is called a shallow orthography. On the contrary, a deep orthography has a more complex or opaque relation of spelling to phonology. In L2 reading research, several studies have applied the basic concepts of the orthographic depth notion. This Orthographic Depth Hypothesis (ODH), according to Grabe and Stoller (2002), holds that a reader, when looking at a word, will be able to sound out the word more or less easily depending on the transparency of the orthography. In other words, a reader may transfer more L1 reading skills when processing words if his/her L1 orthographic system is similar to the L2.

An often cited study by Frost, Katz, and Bentin (1987) provides evidence for the ODH. Frost et al. (ibid.) conducted three experiments in one study which examined three variables, including lexical factors, word frequency, and word recognition strategies. A total of 144 undergraduate students studying in three different universities in three different countries (48 from the Hebrew University in Israel, 48 from the University of Connecticut, and 48 from the University of Belgrade in Yugoslavia) participated in this study. Reaction time was used to measure the participants' naming performance. Experiment 1 revealed that the lexical status of the stimulus (high-frequency words, low-frequency words, and nonwords) significantly affected naming in Hebrew (the deepest of

the three orthographies). This effect was only moderate in English and nonsignificant in Serbo-Croatian (the shallowest of the three orthographies). Moreover, only in Hebrew did lexical status have similar effects on naming and lexical decision performance. Experiment 2 revealed that semantic priming effects in naming were larger in Hebrew than in English and completely absent in Serbo-Croatian. Experiment 3 revealed that a large proportion of nonlexical tokens (nonwords) in the stimulus list affected naming words in Hebrew and in English, but not in Serbo-Croatian (p.113). In conclusion, in all three experiments, different lexical factors affected naming systematically in the agreement with the order predicted in ODH. The study, hence, was interpreted as providing strong support for the Orthographic Depth Hypothesis.

Chikamatsu's (1996) study also provided evidence supporting the ODH. In this study, Chikamatsu (ibid.) attempted to test two hypotheses: 1) word recognition strategies were depend upon type of orthography; and 2) L1 orthography effects in word recognition are transferred in L2 word recognition. She examined 45 American and 17 Chinese college students learning Japanese kana (a syllabic script) at a U.S. university. Participants were asked to decide whether or not they recognized an item as a Japanese word in a lexical-judgment test. Reaction time was used to measure four effects, including language, visual familiarity, word length, and script. The results showed that the Chinese participants slowed down more dramatically in the visual unfamiliar word conditions relative to the familiar conditions than did the native English speaking participants. As for the effect on word length, the native English participants slowed down more than the Chinese as word length increased. These phenomena indicated that the Chinese participants depended more on visual information in words than did the

English participants. Furthermore, the English participants depended more on phonological information in words than did the Chinese participants. The researcher concluded that each language group showed different word recognition strategies in L2 Japanese kana word recognition that reflected each group's L1 orthography.

2.4.3.3. Reading Tasks

Koda (1989) argued that the L1-L2 interaction seemed to be affected by the cognitive and linguistic requirements of the particular reading task. In her study examining the effects of L1-L2 orthographic distance on L2 reading proficiency, Koda found that learners with L1 backgrounds related to the L2 performed better than those with unrelated L1 backgrounds. Moreover, perhaps more important, the performance difference between the two groups widened considerably on complex tasks as compared to on simple processing tasks. A study by Bernhardt and Kamil (1995) supported this stance. By examining the interaction between linguistic background and task types in L2 reading performance, Bernhardt and Kamil found that both L1 reading ability and L2 language proficiency significantly affected foreign language reading comprehension. Moreover, the language threshold was not an issue for a lower order cognitive task in the L2, whereas on a higher order task, limited L2 proficiency short circuited the transfer of L1 reading ability to the L2 context (p.470). However, when reading for meaning, knowledge of the target language was a far more important factor than native language reading ability. In conclusion, the role of the language threshold may vary in reading tasks of different cognitive complexity and in learners' different levels of L2 knowledge.

Taillefer (1996) agrees that both L1 reading ability and L2 language proficiency influence foreign language reading comprehension. However, the relative importance of

the two factors in L2 reading seems to depend on the nature of the reading task. In her study, 53 French university students in social science, with similar L1 (French) reading ability but varied L2 (English) language proficiency, participated. Two reading tasks (easy and difficult) were given to the participants in order to measure different reading styles (scanning, search reading, skimming and receptive reading). She found that the differences in the nature of text types resulted in the use of different reading styles.

Summary

Reading in a second language is a complex process. It involves not only a reader's second language proficiency but his or her first language as well. Thus, reading scholars have viewed differently how an individual reads in a second language. Reading scholars supporting the Linguistic Interdependent Hypothesis (LIH) believe that once one acquires reading competence in one language, he or she can transfer that competence when reading in a second language. Complementing this perspective, scholars supporting the Linguistic Threshold Hypothesis (LTH) they believe that a sufficient degree of second language linguistic proficiency must first be achieved in order to for one to read in a second language and activate his/her first language knowledge. In addition to the first language, other factors discussed in this section that impact second language reading include orthographic systems in languages and the nature of reading tasks.

However, the picture of second language reading becomes more complex when researchers put contexts into consideration. Reading scholars have claimed that reading behaviors in the academic context are different from that in casual reading context. In other words, the registers or genres of academic disciplines are different from those of

"general English." Students may do well in 'reading lessons' in general English, but have difficulty in reading in their subject areas (Flowerdew, & Peacock, 2001; Shih, 1992). As a result, investigation of reading for academic purposes is considered as an important area of research in both first language and second language reading studies.

2.5. Studies on Reading in English for Academic Purposes

2.5.1. Characteristics of English for Academic Purposes

Reading in academic contexts requires readers to read with specific purposes and strategies, which involve integrating a reader's prior knowledge and language proficiency (Burns & Sinfield, 2003; Li & Munby, 1996). Shih's (1992) explanation provides an overview of characteristics of reading in academic settings:

> In academic content classes, students must not only comprehend texts, but over the long term, critically react to the content (e.g., in class discussion some time after reading an assignment), recall main points and details when tested (perhaps several week after initial reading), and synthesize information from reading with other related information, such as from lectures, discussion, and independent reading. (p.290)

Li and Munby (1996) also point out that academic reading is unique in several ways. First, the materials being read are specialized in certain academic domains, such as Computer Science, Education, and Biology. Most of the time, they are assigned to students as requirements instead of for pleasure reading. Second, academic reading requires in-depth comprehension because readers aim at reading to learn. In other words, readers read these materials with the intention of being able to perform tasks such as

taking a test, writing a paper, discussing in class, or giving a presentation. Third, due to the need for in-depth comprehension in academic reading, readers are expected to engage reading strategies for effective learning. Academic reading is demanding for native-speaking students and can be even more challenging for L2 students who are educated in their native languages and different cultures and educational systems. Therefore, how to assist L2 readers to read in an academic context is considered as essential in the EAP field.

In fact, the majority of studies interested in L2 literacy in academic contexts have focused on writing competence. Only a small portion of EAP research has focused mainly on reading. Within those reading studies, three perspectives will be discussed in the following subections: 1) metacognition, 2) text genre; 3) reading-to-write process.

2.5.2. Reading Research on Metacognition

The term metacognitive refers to "one's knowledge concerning one's own cognitive processes and products or anything related to them" (Flavell, 1970, quoted in Li & Munby, 1996, p.199). In other words, learners have knowledge about their cognitive processes and are able to use that knowledge to choose the most efficient strategies for problem solving. For years, practitioners in EAP classrooms have tended to focus on teaching L2 students reading strategies due to the believe that effective reading strategies are considered as a necessary element for readers to be successful in academia (Dheib-Henia, 2003; Jenks, 2002). For example, in an experimental study, Dheib-Henia (2003) found that metacognitive strategy training improved the 62 undergraduate biology students' familiarity with and proficiency in reading research articles and also the effectiveness of retrospection as a method for evaluating the participants' reading

behaviors. Jenks (2002) also proposed the importance of teaching specific reading strategies that can facilitate students' purpose, comprehension and memorization while reading.

In addition, research has shown that students can read more successfully and overcome most of the difficulties they experience when reading a foreign language text if they apply effective reading strategies (Adamson, 1990, 1991; Barnett, 1988; Carrell, 1985; Dheib-Henia, 2003; Eskey, 1986; Jenks, 2002; Kern, 1989; Marton et al. 1984). For example, Barnett (1988) analyzed the impact of effective L2 strategies (text-level and world-level) and perceived strategy use on reading comprehension. Barnett hypothesized that readers who used certain problem-solving strategies and who perceived that they used effective strategies would understand more of what they read than those who did not use reading strategies. After using two-way ANOVA to analyze three types of scores (comprehension, strategy-use and perceived-use scores) from 278 fourth-semester French students, the researcher found that students who effectively considered and remembered context as they read understand more than those who employed this strategy less. Moreover, students' perception of strategy had a significant impact on comprehension. In other words, students who read through context better were more likely to perceive that they used effective strategies, and they also comprehended better. In addition, students who were taught strategy use showed a significantly greater ability to read through context than did their more traditionally taught peers (p.157). Barnett (1988) thus suggested that more pedagogical emphasis on reading strategies was necessary to help L2 students improve their reading comprehension.

In addition to general reading strategies, several researchers have focused on investigating specific reading strategies, such as recognition of text structures. Carrell (1985), for example, demonstrated the efficacy of teaching a text structure strategy for expository texts. Hamp-Lyons (1985) also found positive effects of a "text-strategic" approach. In conclusion, as Chiseri-Strater (1991) has noted, texts and reading assignments are shaped by individual disciplines, courses, professors and students. In order to successfully comprehend academic texts, students need to learn the text structure in that discipline. As a result, being able to recognize text structures is considered as an important strategy in academic reading.

2.5.3. Reading Research in Text Genres

In addition to the emphasis of strategies L2 readers use to understand texts, Saljo (1984) has pointed out that type of text is also an important factor when it comes to academic reading. Many researchers have noticed that difficulties L2 readers face when reading academic texts are not necessarily due to insufficient L2 proficiency. Rather, those difficulties relate to the specific genre in academia. As Flowerdew and Peacock (2001) have observed, "each academic discipline differs in its ways of arguing for a particular point of view, interpreting data, considering different sides of an argument and drawing conclusions" (p.187). In other words, the features of the target genres are shaped by the norms and values of the target discipline. How L2 readers understand academic texts, hence, is not simply at the linguistic level but at a more specific level which involves the socially constructed nature of the written texts. Tierney and LaZansky (1980) also claim that reading relies on a tacit 'contractual agreement' of shared conventions and

assumptions between readers and writers. When the reader has different conventions or assumptions from the writer of a given text, the contract breaks down and comprehension can suffer. Eskey (1986) further explains that the mismatch of the conventions or assumptions between the reader and writer may be because of different culture values:

> The literate second language reader is a product of a culture which may have very different ideas about reading from those that the unwary teacher takes for granted. Such a student may have completely different conceptions of what reading is, how it should be done, and what it normally is used for from those of the teacher in what might be called the standard American academic setting. (p.4)

The concept of genre has been fruitful in EAP writing studies, but has not been applied as much in reading studies per se (e.g., Bhatia, 1993; Connor, 1996; Flowerdew, 1993; Leki, 1992; Thompson, 1994). In most of the genre studies, texts are seen as instruments of communicative purpose and action within discourse communities. As Krashen in 1984 suggested, "it is reading that gives the writer the 'feel' for the look and texture of reader-based prose" (p.20, quoted in Eisterhold, 1990, p.88). In 1993, Johns argued for the importance of teaching advanced students to synthesize information from multiple texts in EAP contexts. She suggested that EAP practitioners should construct their instructional materials and lessons based on tasks that reflect what students need in authentic academic settings in that tasks require a combination of reading and writing together. In line with Johns' (1993) viewpoint, reading and writing are considered as intertwined and inseparable language tools. Literacy scholars have proposed that the ability to integrate writing and reading is especially important at the graduate level. As a result, studies

regarding reading for academic purposes pay a lot attention to the reading-to-write type of reading.

2.5.4. Research in Reading-to-Write

As Flower (1990) has proposed, reading to write and reading to do something else are different because purposes push the reading process into distinctive shapes. Sticht (1977) has also claimed that people who are reading to do something read much differently from people reading to learn something. People who read to compose may research information and then structure and recall the information they have learned in order to apply that information to the task at hand. As a result, instructional practitioners concerning literacy skills in EAP emphasize this type of reading process. Hirvela (2001) as argued that that literature-based reading and writing experiences offer students especially valuable preparation for the wide range of academic literacy requirements found at the university level, particularly from the reading-to-write point of vierw. Grabe (2001), further, points out that the reading-to-write approach often includes summarizing information from texts and integrating information from texts for longer writing tasks. It also includes the notion that writers go back to texts and read in different ways as they seek specific information and adapt reading strategies to match task expectations for the writing (p.22).

A number of practitioners have also advanced the notion that using literatures in ESL writing instruction improve L2 writers' compositions by connecting reading and writing (e.g., Gajdusek, 1988; Hirvela, 1990; Oster, 1985; Parry, 1996; Spack, 1985; Vandrick, 1997). Spack (1985), for example, considers literature as a means of helping ESL students to expend their linguistic and intellectual repertoire. Through literary texts,

students are able to understand how and why a writer of English writes. By learning that, ESL students can become independent, confident and powerful writers in English. Gajdusek (1988) supports this notion, saying that literature help ESL readers establish frameworks of the information assumed by the writer or conveyed by the piece, which they can then use in their compositions. A literary text provides the context in which low-proficiency L2 students learn how a language is used regarding grammar, vocabulary and structures. Moreover, a literary text helps advanced L2 students learn about academic cultures in which academic literature has its special and unique discourse.

Spack (1985) and Gajdusek (1988) discuss using literature mainly from a pedagogical perspective. Carson's (2001) study of academic tasks involving reading and writing goes beyond the previous research. She examined academic tasks across levels and disciplines by including multiple sources of data collection involving interviews with students and faculty and analysis of textual products and tasks. She pointed out that there were interactions between reading and writing across many disciplines and that this interaction was even greater when applied in a local sense; that is, relative to specific tasks and academic disciplines. The results of her analysis suggested that students needed to be prepared for the specific reading and writing skills accompanying assigned academic tasks. In addition, although integrating reading and writing skills in EAP courses is important, other language skills, speaking and listening, should be combined as well.

Put together, academic reading involves a number of specific difficulties (Grellet, 1981). If second language speakers wish to enter the professional communities represented by the domains, they will need access to both the knowledge and skills of the

profession (content training) and the language and discourse through which those skills and knowledge are communicated, in this case English. As a result, for those L2 students studying in the U.S. universities or colleges, they will face more challenges than domestic students do when reading the second language, English, in an academic setting.

Due to the unique nature of an academic context, researchers have viewed differently the issues related to academic reading. Previous studies have focused on reading strategies, genres and reading-writing connections. While reading strategy research has been fruitful in reading research, genre-based research and reading-writing interactions focus primarily on writing. Very little empirical work reports L2 students' reading and understanding alone (Francis & Hallam, 2000; Hallam & Francis, 1998). In fact, researchers in the EAP field view reading as a spring-board to writing tasks and learning for writing. In this sense, reading research is still under-developed as compared to writing in the EAP field. The same result is true of the studies investigating students' literacy behaviors in a digital environment. The majority of the studies have been focusing on ESL students' writing behaviors in digital environment (e.g., Braine, 1997; Li, 2000; Warschauer, 2007). Research concerning reading in the digital environment is still underdeveloped.

2.6. On-Screen Reading Behaviors in Academic Contexts

Many studies have investigated the applications and the advantages of technology in language classrooms (e.g., Chun & Brandl, 1992; Cunningham, 1998; Hult, Kalaja, Lassila & Lehtisalo, 1990; Kramsch & Anderson, 1999; Liu, 1994). Most of the work focuses mainly on pedagogical benefits of technology use in a language classroom

environment. For instance, Kramsch and Anderson (1999) proposed that multimedia technology could provide authentic cultural contexts that are important for language learning. In reading studies, some have discussed how computer technology enhance vocabulary learning (Liu, 1994) and reading comprehension (Hult et al., 1990). In the academic context, however, on-screen reading behaviors are limited to some extent.

A few studies conducted in university settings have shown what people do with the electronic offerings. Wilson (2003), for example, investigated issues surrounding e-book reader design in general as well as to examines opinions on the use of e-book readers in an academic setting. Five e-book readers were compared in this experiment: a SoftBook, a Rocket eBook, a Jornada 548, an eBookMan 900 and a Palm Vx. Over a period of three months, each of 18 participants was lent one device with a book of his or her choice to download for approximately 14 days. About half of the participants reported that they would read a variety of material on an e-book reader, such as novels, textbooks, reference books, non-fiction, maps, journal articles, etc. When asked if they would use an electronic book for work in an academic environment, half said they would not. Several users reported that they enjoyed reading fiction on their e-book device but said they would not enjoy reading textbooks or papers in this manner. The weaknesses of this study, as Wilson (2003) reported, are 1) relatively small number of participants 2) no control over other factors that may intervene during the experimental period, and 3) the e-book devices are not commonly used. As a result, it is difficult to generalize the findings of this study to a regular academic context.

A study by Abdullah and Gibb (2006) overcomes some of the weaknesses of the previous work. Abdullah and Gibb (ibid.) surveyed 14,142 students in terms of their

awareness and level of usage of e-books in a British academic library. The e-book in this study was defined by three categories: textbook, reference book, and manuals or instructional books. Even though the response rate was low (1372 responses), the overall number of respondents was considered large. The respondents consisted of undergraduate and graduate students who were spread across disciplines. The findings showed that even though the majority of the students (72%) were familiar with the term e-book, they were not aware of its availability from the library. In addition, more than half of the respondents (60%) had not used an e-book before. Among those who had used an e-book, the main reason of their using e-books was because e-books were freely available from the library and from the Internet. However, most students read e-books for pleasure and leisure instead of for academic purposes, which confirms the findings in Wilson's (2003) study. Moreover, the most popular reading method was on screen (94%), although students also liked to print them out (35%). For those who had not used e-books, "not aware of e-books availability" and "prefer printed books" were the top two reasons why they had not. Also notable among reasons for not choosing to read e-books among the non-users was that they could not underline, make notes or highlight the e-book as they could print-based texts.

Similar reading patterns were found in a survey study conducted by Rho and Gedeon (2000) and Mercieca (2003). By using one email-based questionnaire and one Web-based questionnaire with 23 respondents (out of 130) from the first survey and 34 (out of 150) from the second, Rho and Gedeon (2000) found that even though readers viewed the Web as a resource to find academic articles, they seldom read the entire article from the screen. Instead, the readers took an overview of a Web-based academic

article from the screen, printed it out, and then read the printed article. In addition, the readers considered the two frames layout from the window the best configuration among the options of single window, two frames, and cascades because they could use indexes in context which increased their reading efficiency. Additionally, Mercieca (2003) surveyed how students currently engaged with their use of digital text. The researcher found that students in the survey sample were reluctant to use and buy electronic textbooks due to perceived difficulty in reading electronic texts on a screen. In a follow-up study, Mercieca (2004) interviewed fourteen Business school students about their opinions on comparing print-based text with three online presentation formats: PDF, Microsof e-book reader format and onion HTML formats. As shown in the previous study, students in this study also reported that the printed page was their preferred way to read the text. The main reason was because "paper-based reading assisted in their content interpretation with that they could highlight and annotate the text" (p. 6). When participants were asked what would make them read on screen, two key criteria were "saving money" and "content integration." Moreover, integration of the textual material into the learning environment seemed to be the main motivation for on-screen reading. Since the presented three e-book formats (PDF, Microsoft e-book reader and HTML) were seen as ways to provide a direct duplication of the printed content, the participants did not see a major advantage in reading the text on a screen as opposed to reading it from the printed page.

In addition to exploratory research, a few experimental studies have been conducted to compare the differences between reading on paper and reading on screen. For instance, O'Hara and Sellen (1997) looked at the differences of reading processes between reading

on paper and reading on screen. 10 volunteers participated in this study; 5 were assigned to the "paper" condition and 5 were assigned to the "on-line" condition. Participants were asked to write a summary after reading, followed by an interview. Each session was videotaped. The researchers compared these two conditions in three categories: annotation while reading, movement within and between documents, and spatial layout. This study revealed that the benefits of paper far outweighed those of on-line tools in support of reading for the purpose of writing. The authors explained that "The critical differences have to do with the major advantages that paper offers in supporting annotation while reading, quick navigation, and flexibility of spatial layout. These, in turn, allow readers to deepen their understanding of the text, extract a sense of its structure, plan for writing, cross-refer to other documents, and interleave reading and writing" (p.340).

Murphy et al. (2003) compared the effects of reading a persuasive text in a multimedia environment to the effects of reading a persuasive text in traditional print form. A total of 131 undergraduate students participated in this study. Participants were asked to read two persuasive articles and respond in three experimental conditions: 1) read a traditional linear text and respond in a pencil-and-paper format, 2) read a linear computerized text but respond in a pencil-and-paper format, and 3) read a computerized text and respond on the computer. Students' prior topic knowledge as well as change in knowledge and beliefs were compared using repeated MANOVA. The results revealed that even though both knowledge and beliefs within groups changed significantly after reading the texts, the difference between each group was non-significant. In addition, the reaction results showed that students generally reacted similarly regardless of

presentation formats. The only difference in students' reactions to the text attributable to their group was that students in the paper group found the texts more understandable than respondents who read the texts in a computerized form. Murphy et al. (2003) explained that this may have been due to different strategies requisite for comprehension in different forms. Finally, students' computer familiarity did not correlate with their knowledge and belief change. Murphy et al. concluded that persuasive messages presented in a linear computerized form were equally as persuasive as those presented in a traditional paper form. Thus, it would appear that linear paper texts and linear computerized texts influence changes in learner variables to a similar degree and in a similar fashion.

Put together, previous work concerning students' on-screen reading behaviors and performance in academic contexts reveals that students would rather read for pleasure on screen than read for academic purposes. One of the reported reasons for this pertains to whether an individual is able to apply reading strategies while reading. Lynch (2001) proposed a tentative conclusion:

> They [students] use the online (or other computer-based version) to browse, to do quick checking, to decide what they do and do not want to read carefully. But if the piece is over a few screens in length, *they print the article for reading.* In essence, they are using paper - a mature, robust, and exquisitely effective viewing technology - as their preferred user interface for reading. Print still seems to be the medium of choice for longer texts intended for linear reading. (4 June 2001)

Summary

In the second part of this chapter, studies concerning 1) second language reading, 2) English for academic purposes, and 3) on-screen reading in academic contexts have been presented. As can be seen, second language reading is a complex process involving linguistic, cognition and metacognition factors. L2 reading becomes more complex when it is for academic purposes. International ESL students, when entering universities in an English speaking country, face challenges not only from the language aspect but also from the aspect of learning the genres of academic disciplines. In order to be successful in academia, ESL students need to acquire sufficient second language proficiency as well as understand the genre and culture in that particular academic discipline they belong to. On top of those challenges, reading in a digital environment seems to further burden some ESL students in terms of cognitive load. Previous studies generally showed that students still prefer to read academic texts in a hardcopy format because of the convenience of strategy use. However, previous work that investigated students' preference toward on-screen reading in an academic text seemed to neglect other factors that might impact on preferences. Due to the complexity of L2 reading in the academic context, it is necessary to investigate ESL students' on-screen reading behaviors while considering other possible factors all together, which was the purpose of this study.

CHAPTER THREE

METHODOLOGY

3.1. Introduction

The objectives which guided the present study were to: 1) elicit information on international graduate students' on-screen reading preferences, tendencies, frequency, and reading strategies employed with respect to two academic reading purposes: reading for course preparation and reading for writing papers; 2) examine whether the students' on-screen reading behaviors differed according to reading purposes; and 3) investigate factors that may have contributed to their on-screen reading preferences, tendencies, frequency, and reading strategies employed. The present descriptive study employed an "explanatory mixed methods design" (Creswell, 2008, p.560). In this approach, "quantitative data and results provide a general picture of the research problem; more analysis, specifically through qualitative data collection, is needed to refine, extend, or explain the general picture" (Creswell, 2008, p.560). The characteristics of this type of mixed methods design are: 1) the researcher places a priority on quantitative data collection and analysis, and a small qualitative component follows in the second phase of the research; 2) the researcher collects quantitative data first in the sequence, followed by the secondary qualitative data collection; and 3) the researcher uses the qualitative data to refine the results from the quantitative data (Creswell, 2008, p.560). In this approach, the

presentation and analysis of results thus focuses primarily on the quantitative data. That is the approach taken in Chapter 4 and Chapter 5 of this study.

In the present study, the quantitative were collected first by inviting international graduate students to respond to a questionnaire (questionnaire see Appendix A; invitation letter see Appendix C). Qualitative data were then used to extend, elaborate on, and explain the first (quantitative) database. The qualitative data were collected through six semi-structured, open-ended interviews. The qualitative approach was intended to obtain more detailed, specific information that could be gained from the results of statistical tests. The quantitative and qualitative data were analyzed separately. Table 3.1 presents a brief overview of the quantitative and qualitative data collection procedures used in the present study.

	Sampling method (number of participants	Data collection		Data analysis
		Time	Data source	
First phase (primary): Quantitative data	Convenience samples (N = 168)	June to September, 2008	Questionnaire responses	Descriptive statistics; Correlational statistics; SEM
Second phase (secondary): Qualitative data	Purposeful samples (N = 6)	October and November, 2008	Semi-structured interviews; Audio recordings; Note-taking	Theme-based

Table 3.1: An Overview of the Quantitative and Qualitative Data Collection

This chapter describes the procedures used for conducting the quantitative and qualitative approaches in the study. The quantitative domain of the study will be

presented first, including procedures used to recruit participants, to design the questionnaire, to collect data and to analyze data. The qualitative procedures are described in the second part of the chapter.

3.2. First phase: Quantitative Data Collection

3.2.1. Research Design

This study was designed to explore international graduate students' on-screen reading behaviors in academic contexts and investigate possible factors that may have contributed to those reading behaviors. With this intention in mind, the present study featured two latent dependent variables (LDV): students' on-screen reading behaviors when reading for course preparation and on-screen reading behaviors when reading for writing papers (Table 3.2). Graduate students' on-screen reading behaviors were considered as a collective concept, which included the four observed variables of reading preferences (PRE), reading tendencies (TEN), hours of reading on a computer screen (HR), maximum number of page one is willing to read on a computer screen (PG), and reading strategies (STG). Reading preferences were measured using a six-point Likert-type scale. Participants were asked to indicate their level of agreement on four items in Part 1 of the questionnaire. The sum score represents a respondent's on-screen reading preferences. A high score indicates that one has a higher preference for reading academic texts on a computer screen than in a print-based copy. Reading tendencies were examined in two sections of Part 2 of the questionnaire. In section one, participants were asked to indicate their level of agreement on seventeen items using a six-point Likert-type scale. Section two included four open-ended questions related to on-screen reading frequency

and duration. Answers to 4 items (Item 1, 3, 4 & 14) in section one were summed up to indicate an individual's tendencies toward on-screen reading. A higher score indicates a higher tendency toward on-screen reading than toward print-based reading. In section two, the total hours spent per week reading on-screen and the maximum number of pages that students were willing to read academic texts on a computer screen were calculated. Finally, on-screen reading strategies were measured in Part 3 using twenty-one items. Participants rated their level of frequency of reading strategies used on a scale from one to five. The score was summed up to indicate the frequency of one's reading strategy use. A higher score indicates a greater number of reading strategies used when reading on a computer screen.

Latent Dependent Variables	Indicators/observed variables
Reading behaviors in RCP	Preference (PRE)
	Tendency (TEN)
	Hours of on-screen reading per week (HR)
	Maximum page number (PG)
	Strategy employed (STG)
Reading behaviors in RWP	Preference (PRE)
	Tendency (TEN)
	Hours of on-screen reading per week (HR)
	Maximum page number (PG)
	Strategy employed (STG)

Table 3.2: Latent Dependent Variables and Indicators

Three latent independent variables (LIV) under investigation were: students' perceptions of on-screen reading, their level of computer familiarity, and their self-

perceived second language proficiency. Each LIV had observed variables, as shown in Table 3.3.

Latent Independent variables	Indicators/observed variables
Students' perceptions	Positive toward on-screen reading (POSI)
	Negative toward on-screen reading (NEGI)
Computer familiarity	Hours per week of using computer (HRCOM)
	Comfort level of computer (COMFT)
	Frequency of on-screen reading for leisure in L1 (RL1)
	Frequency of on-screen reading for leisure in L2 (RL2)
Second language proficiency	Years in graduate school (Yr1)
	Years of studying in an English-speaking country (Yr2)
	Years of living in an English-speaking country (Yr3)
	Years of learning English (Yr4)
	Level of L2 literacy proficiency (L2Pro)
	Level of L1 literacy proficiency (L1Pro)

Table 3.3: Latent Independent Variables and Indicators

Students' perceptions of on-screen reading were measured in Part 2 of the questionnaire. Items 2, 5, 6, 7, 13, 15 and 17 were used to measure students' positive perceptions of on-screen reading (POSI). Items 8, 9, 10, 12 and 16 were used to measure their negative perceptions of the on-screen reading (NEGI). In addition, level of computer familiarity was measured via seven items in Part 5 of the questionnaire. The questions included hours per week spent on using computers, one's comfort level with computer use, and the amount of one's pleasure reading on-screen in their native language (L1) and second language (L2). Responses to the four questions regarding comfort level were calculated by sum scores ranging from four to sixteen. The higher the score, the more

confidence one had using a computer. L2 reading proficiency was measured in Part 6 of the questionnaire via eight questions (from Item 6 to Item 13). In Items 10 to 13, the participants self-reported their level of L2 literacy proficiency and L1 literacy proficiency, which are two elements necessary to better define L2 literacy proficiency, as previous literature has noted. The sum score of these eight questions was calculated, and it ranged from eight to forty. Figure 3.1 presents the relationships among the latent variables in this study along with the observed variables for each latent variable. Note that two identical structural models for each reading purpose were investigated in this study.

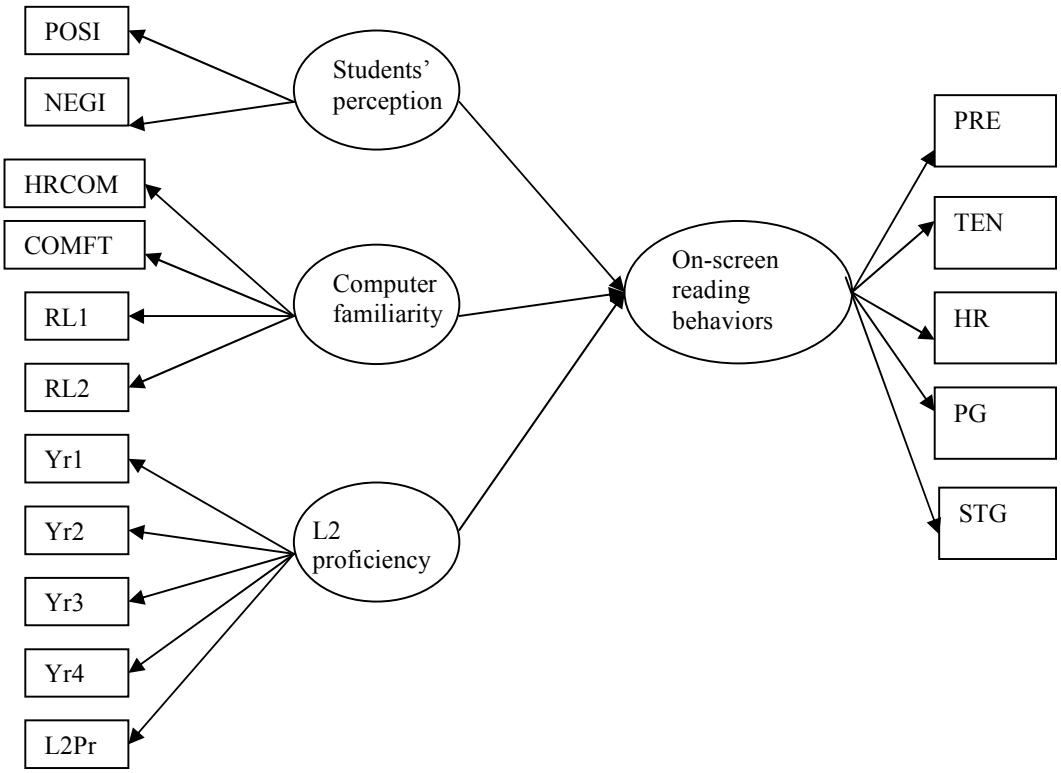

Figure 3.1 Structural Model of International Students' On-Screen Reading Behaviors
Note: Latent constructs are presented in ellipses, and observed variables are presented in rectangles. POSI = positive, NEGI = negative, HRCOM = hours per week of using computers, COMFT = comfort level of using computers, RL1 = casual reading on screen in L1, RL2 = casual reading on screen in L2, Yr1 = years in graduate school, Yr2 = years of studying abroad, Yr3 = years of living abroad, Yr4 = years of learning the target language, L2PRO = self-rated L2 literacy proficiency

3.2.2. Participant Recruitment

The target population of this study was international graduate students (including both masters and doctoral level students) studying in various disciplines and universities in three English-speaking countries: the United States, United Kingdom, and Australia. Specific information about them appears in Chapter 4. A convenience sampling approach was used to select samples in this study. A total of 160 international graduate students (10 subjects for each observed variable[3]) was expected to be recruited mainly through five means: 1) English composition and spoken English classrooms, 2) international student organizations, 3) international churches, 4) regular graduate classrooms, and 5) graduate dormitories.

The primary reason for recruiting graduate students was the nature of graduate education. That is, graduate students take mainly those courses that are related to their chosen disciplinary field and thus are likely to be concentrated on all of their courses, whereas undergraduates are required to take a wider variety of courses, many not related to their disciplinary major (e.g., general education courses). As such, their level of commitment may vary considerably from course to course. Thus, graduate students could be expected to be engaged more deeply in their study than undergraduate students. Furthermore, graduate students are required to do a great deal of reading for their classes and their written work, and are expected to participate actively in class discussions. In addition, they are expected to develop their research ability. In this sense, graduate

[3] Bentler and Chou (1987) suggested that a ratio as low as 5 subjects per variable would be sufficient for normal and elliptical distributions when the latent variables have multiple indicators and that a ratio of at least 10 subjects per variable would be sufficient for other distributions (cited in Schumacker & Lomax, 2004, p.50)

students are expected to learn how to search for information, read research-related materials, and write research papers throughout their lives as graduate students. Thus, the demands on them as readers (in their L2) are heavy, and given current trends in the academic world, that reading would be both print-based and screen-based, the latter in light of the fact that academic journals are routinely available in electronic form. Thus, it seemed reasonable to assume that graduate students would be exposed to both the print and electronic reading environments, and would be likely to have at least some degree of computer literacy. Hence, they would be well suited to respond to the questionnaire used in the study.

3.2.3. Instrument

Quantitative data were collected mainly through an eight-page questionnaire (See Appendix A) consisting of a six-point Likert-type scale (1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree and 6 = Strongly Agree), a frequency scale (1=Never, 2=Occasionally, 3=Sometimes, 4=Usually and 5= Always), an anchor scale (1=not important, 2=little important, 3=somewhat important, 4=important, and 5=very important), open-ended questions, and demographic questions.

3.2.3.1. Questionnaire Development

The questionnaire included six parts. Part 1 attempted to investigate readers' preferences regarding reading on a computer screen relative to two different reading purposes, reading for course preparation and reading for writing papers. With each purpose, participants rated their level of agreement on statements related to their preferences for reading on a computer screen. Item 4 was a reversed question from which

the score was also reversed. This part was relatively short (only four items) so that all respondents would relax and feel motivated to answer upon seeing how short the section was (Ary, Jacobs, & Razavieh, 2002). Part 2 was designed to elicit information regarding 1) students' tendencies toward on-screen reading based on the two reading purposes; 2) students' perceptions of on-screen reading; and 3) students' frequency of on-screen reading. Part 2 included two sections. In the first section, participants responded to the statements on a six-point Likert-type scale (1=Very Strongly Disagree, 2= Strongly Disagree, 3= Disagree, 4= Agree, 5= Strongly Agree, 6=Very Strongly Agree). Among seventeen items, four were reversed items (items 8, 9, 10, and 12). The second section included four open-ended questions related to the frequency and duration of one's reading of academic texts on a computer screen for the two purposes.

Part 3 of the questionnaire inquired into the participants' on-screen reading strategies. Questions in this section were modified from the well-known thirty-item questionnaire, "The Survey of Reading Strategies (SORS)," designed by Mokhatari and Sheorey (2002, p. 10). The SORS questionnaire was adapted from a separate metacognitive reading strategy survey developed for native speakers of English, the Metacognitive Awareness of Reading Strategies Inventory (MARSI). However, the SORS was designed especially for English-as-a-second-language students within the context of academic reading. Sheorey and Mokhatari (2001) reported that the instrument's overall reliability is Cronbach's alpha=.89 (p.436). The modified version in the present study had twenty questions; a number of items from the SORS were dropped because they did not fit within the framework of this study. Three new items were added

(items 7, 9, and 11) to account for the purposes of this study. Adapted and modified items comparing the present questionnaire and the SORS are presented in detail in Table 3.4.

	The present study	SORS	Statements in the SORS
Items adapted from the SORS	2	4	I take an overview of the text to see what it is about before reading it
	12	12	When reading, I decide what to read closely and what to ignore.
	14,	14,	When a text becomes difficult, I pay closer attention to what I am reading.
	15	25	When a text becomes difficult, I re-read it to increase my understanding.
	16	18	I paraphrase (restate ideas in my own words) to better understand what I read.
	18	15	I use tables, figures, and pictures in text to increase my understanding.
	19	20	I use typographical features (e.g., bold face and italics) to identify key information.
	20	13	I use reference materials (e.g., a dictionary, related online sources) to help me understand what I read.
Modified items	1	1	I have a purpose in mind when I read.
	3	8	I review the text first by noting its characteristics like length and organization.
	4, 5, 6	2	I take notes while reading to help me understand what I read.
	8	9	I try to get back on track when I lose concentration.
	10	10	I underline or circle information in the text to help me remember it.
	13	7	I read slowly and carefully to make sure I understand what I am reading.
	17	22	I go back and forth in the text to find relationships among ideas in it.

Table 3.4: List of Items Adapted and Modified from the SORS

Part 4 consisted of twelve questions investigating participants' attitudes toward the importance of reading for the two purposes: reading for course preparation and reading to writing papers. The participants evaluated the importance of the given statements using

the five-point anchor scale described earlier. Part 5 consisted of seven questions regarding participants' level of computer familiarity. Among the seven questions, four were closed-ended multiple choices and three were open-ended questions. The degree of participants' computer familiarity was measured according to their frequency of computer use (item 1), level of comfort of using a computer (items 2 to 5), and the frequency and duration of reading on a computer screen (items 6 and 7).

The last part, Part 6, was a demographic section in which the participants were asked to answer questions regarding their age, gender, schools they were enrolled in, years spent in graduate school, years of studying in an English-speaking country, years of living in an English-speaking country, years of learning English, the level of their literacy proficiency in the target language (i.e., English), and the level of their literacy proficiency in their first language. Researchers have suggested that routine demographic background questions are usually placed toward the end of a questionnaire (Ary, Jacobs, & Razavieh, 2002; Weisberg, Krosnick and Bowen, 1996), and that was the approach adopted in this study. Table 3.5 presents the investigated variables and their corresponding items in the questionnaire.

Latent variables	Observed variables	Items
On-screen reading behaviors	Preference	Part 1, Item 1 to 4
	Tendency	Part 2, section 1, Item 1, 3, 4 and 14
	Frequency	Part 2, section 2
	Strategy	Part 3
Perceptions of on-screen reading	Positive toward on-screen reading	Part 2, section 1, Item 2, 5, 6, 7, 11, 13, 15, 17
	Negative toward on-screen reading	Part 2, section 1, Item 8, 9, 10, 12, 16
Computer familiarity	Hours of using computers	Part 5, Item 1
	Comfort level of using computers	Part 5, Item 2-5
	Frequency of on-screen reading for leisure in L1	Part 5, Item 6 & 7
	Frequency of on-screen reading for leisure in L2	Part 5, Item 8 & 9
Second language proficiency	Years in graduate school	Part 6, Item 6
	Years of studying abroad	Part 6, Item 7
	Years of living abroad	Part 6, Item 8
	Years of learning English	Part 6, Item 9
	L2 literacy proficiency	Part 6, Item 10 to 13.
Attitude	Attitude	Part 4

Table 3.5: Variables and Corresponding Items in the Questionnaire

3.2.3.2. Validity

Validity refers to the systematic errors occurring in the measurement. The validity of this instrument was judged by face validity and content validity. Face validity refers to "the degree to which it seems to measure the appropriate concept on its face (Weisberg, Krosnick and Bowen, 1996, p.94)." Content validity refers to "the degree to which the various items collectively cover the material that the instrument is supposed to cover (Huck, 2000, p.101)." Normally, content validity is determined by having experts carefully compare the content of the instrument against the instrument's claimed domain.

Two types of validity were established at the same time for this questionnaire by a panel of ten experts, which included 1) two professors and three (two English-speaking and one international ESL student) doctoral candidates from the foreign and second language education program at the researcher's university, 2) two professors and two (one English-speaking and one international student) doctoral candidates from the education field, and 3) one professor from the field of statistics (native English speaker). None of them participated in the actual study. With respect to face validity, the experts determined whether the questionnaire appeared to look like it was measuring the desired variables. As for content validity, ten experts were asked to judge the questionnaire items in terms of relevance, clarity and representativeness. These evaluators were also encouraged to give comments. All suggestions regarding the three aspects mentioned were considered for the modification of the questionnaire where necessary. The researcher then considered omitting or replacing some statements if the statements received a significant number of suggestions.

3.2.3.3. Reliability

Reliability refers to the random errors occurring in the measurement. A reliable instrument means it consistently measures what it is supposed to measure. The type of reliability approach used in this instrument was Cronbach's alpha. The Cronbach's alpha (Cronbach, 1951) method is in an attempt to examine the internal consistency of an instrument. If the alpha is less than .70, the content of the items used will need to be altered to achieve the same purpose. The reliability of this instrument was tested in a pilot study conducted in April, 2008. Thirty-one graduate students from American universities were asked to participate in the pilot study. None of the respondents from the pilot

participated in the actual study. The questionnaire was distributed to those graduate students through emails sent in the beginning of April, 2008. Thirty-one questionnaires were completed and returned within two weeks. Reliability results from the pilot study are summarized in Table 3.6. The reliability results collected from the selected sample will be presented later in Chapter 4.

	On-screen reading preference	On-screen reading tendency	On-screen reading strategies
Read for course preparation	.69	.86	.87
Read for writing papers	.73	.88	.90
Overall	.84	.93	.94

Table 3.6: Reliability (Cronbach's alpha) Results

3.2.4. Data Collection Procedures

Data were collected from June to September, 2008. The questionnaire was distributed to 242 international graduate students. Two hundred and one completed questionnaires were received. Among the received questionnaires, only 168 were used as the accepted sample in this study. As mentioned previously, questionnaires were distributed through five means. Questionnaires collected from student organizations, dorms and churches were distributed either by the investigators or by the snow-ball approach. By snow-ball approach, students were encouraged to forward invitation letter to their ESL friends and classmates. For student organizations, the researcher emailed presidents of international students' organizations listed at universities' Web and asked for permission to send out an invitation letter through their list-serve. Permission was

received from the Taiwanese Students Association and Chinese Students Association at the Ohio State University to pose my invitation to their members. The researcher also asked some of her international student friends to send out the invitation to other international students they knew.

In addition, invitations and contact information were posted on bulletin boards in international students' dormitories and departmental buildings. Students who read the invitations and wanted to participate in this study were asked to email the researcher, who then sent out the questionnaire either through email or in hard copy form. In doing so, the researcher was able to keep track of questionnaires that had been sent and could send reminders, if necessary. Questionnaires collected through classrooms were distributed either by the classroom teachers or by the researcher. Students who were willing to participate would complete a hard-copy questionnaire in class and then return it to the researcher upon completion. At the end of the questionnaire, all participants were asked if they were willing to participate in a follow-up interview.

3.2.5. Data Analysis

The survey data were entered and analyzed using SPSS version 16.0 and LISREL 8.7 for Windows. Research Question 1, eliciting information about international graduate students' on-screen reading preferences and behaviors relative to the two academic reading purposes, was addressed using descriptive statistics in order to determine graduate students' reading patterns when they read for the two different purposes. In addition, paired t-test and effect size measurements were used to address Research Question 2, which was designed to look at whether there were any differences between

the two purposes regarding the participants' on-screen reading preferences, tendencies, frequency, and strategies. Research Question 3, which was intended to investigate factors that contributed to those on-screen reading behaviors, was addressed using Structural Equation Modeling (SEM). In order to better explore students' on-screen reading behaviors from different dimensions, multiple observed dependent variables were involved in both dependent variables and independent variables. SEM, which is designed to simultaneously evaluate series regression models, was able to determine which aspects of on-screen reading behaviors were explained by the predictors together as a whole. Statistical analyses were performed using LISREL 8.7 for Windows. The *p*-level set for significance was $p < .05$. The final research question, Research Question 4, concerning students' attitudes toward different reading purposes, was first addressed using descriptive statistics and then subjected to correlational analysis (Pearson product-moment) to examine the relationship between the attitudes and on-screen reading behaviors.

This study followed a four-step approach as recommended by Mulaik and Millsap (2000) to test its SEM models. Step 1 involved conducting an exploratory common factor analysis to "determine the number of factors (latent variables) that fit the variance-covariance matrix of the observed variable" (Schumacker & Lomax, 2004, p.107). Step 2 involved a confirmatory factor analysis (CFA) model that tested certain relations among observed (indicator) and latent variables. CFA is one application of structural equation modeling. Many criteria can be used to evaluate the fitness of a model. Chi-square is one of the most frequently used criteria. Since SEM is used when one wishes to relate various concepts, latent variables and observed variables to test the direction and strength of their

association, a hull hypothesis in such testing is S=∑, where S is the data or observed variance-covariance matrix and ∑ is the reproduced or implied variance-covariance matrix. As such, the test statistic, minimum fit chi-square, needs to be a value such that it fails to reject the null hypothesis. In other words, one may suspect a statistically non-significant value in minimum fit chi-square. However, chi-square is sensitive to the sample size. Hence, practical measures of model fit are considered in a comprehensive assessment of this factor structure. In this study, the goodness-of-fit index (GFI), the adjusted goodness-of-fit (AGFI), Root-mean-square error of approximation (RESEA) and Normed fit index (NFI) were used as global model fit indices.

According to Byrne (1998), RMSEA is one of the most instructive criteria in model testing. This model fit measure estimates the degree to which the theoretical model deviates from the same model with optimally chosen idea parameter values. Byrne (1998) suggests that RMSEA values less than .05 signify a good fitting model. Schumacker and Lomax (2004) suggest that the maximum value of RMSEA should be less or equal to .08. The goodness-of-fit index (GFI) measures the amount of variance and covariance in S (data matrix) that is predicted by the reproduced matrix ∑. A GFI value of .99 indicates that 99% of the S matrix is predicted by ∑, as values close to one approach are a better fit. A GFI value above .95 or at least .90 is suggested. The adjusted goodness-of-fit (AGFI) index is "adjusted for the degree of freedom of a model relative to the number of variables" (Schumacker & Lomax, 2004, p.102). Like GFI, the range of possible AGFI value is from zero to one, with values greater than .90 indicative of good model fits. The last model fitting index utilized in this study was NFI, a measure that rescales chi-square

into a zero (no fit) to one (perfect fit) range. A NFI value above .90 is considered an acceptable fit.

The second criterion in judging the statistical significance and substantive meaning of a theoretical model is to compare a t value of each parameter to a tabled t value of 1.96 at the .05 level of significance. The critical t value is computed by dividing the parameter estimates by a standard error of the parameter (Schumacker & Lomax, 2004, p.81). In most cases, researchers might eliminate parameters that are not significantly different from zero. The third criterion considers the magnitude and the direction of the parameter estimates. In this study, particular attention was paid to whether a positive or a negative coefficient made sense for the parameter estimate.

Step 3 of modeling involves specifying relations among the latent variables in a structural model. The same criteria used to determine acceptable fit in CFA were used to judge the goodness-of-fit in the structural model as well. If the structural model fit is achieved, then the process continues to Step 4, which involves model validation. Researchers can replicate one study by testing and comparing alternative models. The present study, however, did not involve Step 4.

3.3. Second Phase: Qualitative Data Collection

3.3.1. Research Design

The role of qualitative data in this study was to extend, elaborate on, and explain the quantitative data. As noted earlier, in the explanatory mixed methods approach, one data source—usually the qualitative data—plays a secondary role to the other data source. That was the case in this study. The interview was a semi-structured, open-ended type in

which “the interviewer has a general idea of where he or she wants the interview to go, and what should come out of it, but does not enter the interview with a list of predetermined questions” (Nunan, 1992, p.149). By not limiting the interview to an exchange involving the fixed questions, this type of interview enables one to gain an emic (insider) view and in-depth understanding about the topics being investigated, in contrast to the broader etic (outsider) view generated by quantitative data. Thus, this interview method was highly useful in gaining deeper insights into and additional information about the students’ on-screen reading behaviors and the possible factors that may have contributed to those behaviors. Moreover, since one of the purposes of the interview was to obtain additional data to triangulate the results with the survey data, the guiding questions were in accordance with the themes in the research questions as well as the questionnaire. However, because of this purpose, the researcher needed to be aware of the interview bias in that the conversations with the interviewees could be guided by the researcher based on the conceptual themes the researcher intended to elicit.

The interview was conducted more like an informal conversation about various issues related to the interviewee’s on-screen reading behaviors when reading for the two academic purposes. Note-taking and audio recording were used with the interviewee’s permission to collect the interview data. Interviews were conducted either in English or in the interviewee’s first language if the researcher shared the same first language with the interviewees.

3.3.2. Participants

Students were purposefully recruited based on their responses at the end of the questionnaire. Thirty two students expressed their willingness to participate in the interview. However, due to the significant geographical distance between the researcher's location and some of the interested students, only nine students were considered. Among the nine volunteers, six responded to my invitation to participate in the interview. At this stage, the researcher purposefully selected students who showed different on-screen reading preferences and tendencies. Thus, two students were selected because they had very low engagement in on-screen reading behaviors. Two were selected for the opposite reason: a high level of engagement. For the rest, they were selected because one of them had a high preference and tendency toward on-screen reading for course preparation purposes but was low in the reading for writing purpose, while the other one was the other way around.

3.3.3. Data Collection Procedures

Interview data were collected in two months, October and November, 2008. Nine open-ended questions (see Appendix B) were used to gain in-depth and broad information about participants' on-screen reading behaviors when reading for academic purposes. Personal contact with potential interviewees was attempted through email and telephone. Three interviews were conducted in a quiet room in a dormitory for international students. The other three interviews were conducted in coffee shops. The interview locations were chosen by the participants according to what they felt convenient and comfortable with. The interviews were conducted individually according

to the availability of each individual. All participants were informed that the interviews would be audio recorded with their permission. Each interview lasted 45 minutes to one hour.

At the beginning of the interviews, participants were asked to describe the environment of their academic disciplines regarding workload, professors' expectations, and their regular reading behaviors when preparing for courses and for writing papers. Specific questions concerning their on-screen reading behaviors for each academic purpose were then delivered to the participants. After the participants described their on-screen reading behaviors, their reasons for reading or not reading on a computer screen along with several possible factors assumed to influence their on-screen reading behaviors were explored. Participants were free to use their first language or the target language (English). During the interviews, the researcher also jotted down notes in her computer in case the audio recorder was not working properly. After the interviews, the participants were informed that they may be contacted again in order to clarify some of the interview content and when they needed to participate in the member checking process. All participants gave their permission for further inquiry if needed.

3.3.4. Data Analysis

The recorded interview data were transcribed verbatim. There were about 6 hours of recording which generated approximately 50 pages of transcription. The interviews conducted in the interviewees' first language were transcribed in that language first and then translated into English by the researcher. The original and translated transcriptions were presented to the interviewees for the member checking purpose. The interviewees

were free to comment on what they said and, where applicable, the quality of the translations. The data were coded according to the themes which were based on the research questions. The identified recurring themes were first investigated separately from the survey data and later examined in conjunction with the research questions.

CHAPTER FOUR

RESULTS

This chapter presents both the quantitative and qualitative analysis of the data for this explanatory mixed methods study. The first part provides relevant background information about the study's participants. The second part of the chapter presents descriptive results related to each of part of the questionnaire. The third part of the chapter presents results as analyzed through structural equation modeling. The chapter concludes with a presentation of the study's qualitative results as obtained via interviews. The focus in this chapter is on presentation of results. Discussion of them and the themes emerging from comparison of the quantitative and qualitative results occurs in Chapter Five.

4.1. Description of the Study's Participants

Data were collected from international students who were pursuing their graduate degrees in an English-speaking country at the time when the questionnaire was distributed. A total of 242 questionnaires were distributed, and 201 questionnaires were received. The response rate was roughly 83%. Among this sample, one hundred and sixty-eight (110 females, 58 males) participants were selected as the data sample. Although their distribution was not random, efforts were made to draw students from

various ethnic groups and academic disciplines, as described in Chapter Three. This section of Chapter Four presents the characteristics of the study participants in terms of their age, ethnicity, and educational and professional backgrounds.

4.1.1. Age

The questionnaire included an open-ended question asking the respondents to simply write down their age. In analyzing the data, the respondents were categorized into five groups, as shown in Table 4.1. Two respondents did not provide an exact number to this question. Instead, they provided a response like "above 40." The maximum age, hence, could not be obtained from the question. The two participants were categorized in the "41+" age range. As can be seen, 58% of the participants were in their 20s and 38% of the participants were in their 30s. Looked at another way, approximately 87% of the participants were under the age of 35. Students within this age range can be assumed to have grown up in a period when computer-related technology was available to them, so that they were generally quite familiar with contemporary forms of technology, particularly computers. Most were likely to have used computers to some degree for educational purposes prior to coming to the United States to study.

Age range (years)	Frequency	Percent
21-25	34	20.2
26-30	64	38.1
31-35	48	28.6
36-40	15	9.0
41+	7	4.1
Total	168	100.0

Table 4.1: Age Range of the Participants

4.1.2. Ethnicity

The purpose of asking this question was to ensure that the selected participants did not come from countries where English is used as the first or official language. Nine respondents were excluded due to this restriction: two Fijians, two Indians, one American, one Canadian, one Puerto Rican, and two Nigerians. As shown in Table 4.2, Asian students composed the majority of the research participants: approximately 90%. Among the Asian students, Taiwan was the most commonly reported country of origin, followed by China and Korea. One tenth of the study participants were from Latin America and European countries.

	Countries	Frequency	Percent
Asian	Taiwan	80	47.6
	China	39	23.2
	S. Korea	19	11.3
	Indonesia	4	2.4
	Philippines	1	0.6
	Japan	4	2.4
	Thailand	1	0.6
	Saudi Arabia	1	0.6
	Iran	2	1.2
Subtotal		151	89.9
Latin American	Mexico	4	2.4
	Brazil	3	1.8
	Columbia	1	0.5
Subtotal		8	4.7
European	Italy	3	1.8
	Greece	1	0.6
	Kosovo	1	0.6
	Romania	1	0.6
	Turkey	3	1.8
Subtotal		9	5.4
Total		168	100.0

Table 4.2: Ethnicity and Countries of Origin of the Participants

4.1.3. Educational background

In addition, students were asked to describe the degree they were pursuing and the college they were enrolled in. Twenty-four questionnaires were excluded because the respondents identified themselves as undergraduate students. As can be seen in Table 4.3, doctoral students composed approximately 71% of the study's participants.

Degrees	Frequency	Percent
Master	46	27.4
Doctoral	119	70.8
Other/Professional	3	1.8
Total	168	100.0

Table 4.3: Degrees Pursued by the Participants

In terms of academic disciplines, information was elicited mainly from participants studying at Ohio State. Although the intention of this question was to elicit information regarding participants' academic disciplines in which they were enrolled, the question was vague to students outside Ohio State. Most of the respondents in Ohio were able to indicate their academic disciplines. Respondents outside Ohio, however, only provided the name of their universities or colleges as their responses. Therefore, the states or countries of the respondents' schools were reported (Table 4.4). Note that Ohio was the most commonly reported school region among the respondents. About 23% of the questionnaires were collected from other states, including California, Illinois, New Jersey, New York, Pennsylvania, South Carolina, Tennessee, Texas and Washington. Seven responses were collected from outside the U.S., including the U.K. and Australia.

School regions	Frequency	Percent
Ohio	122	72.6
Other U.S. schools	39	23.2
Schools outside the U.S.	7	4.2

Table 4.4: School Regions of the Participants

The majority of the respondents in Ohio identified the academic disciplines they were enrolled in. Disciplines mentioned in the questionnaires are listed as follows in order of the most commonly reported to the least: education (N = 39), nursing (N = 10), electrical engineering (N = 10), agriculture (N = 6), business (N = 5), law (N = 5), architecture (N = 3), arts (N = 2), computer science (N = 2), pharmacy (N = 2), humanities (N = 2), linguistics (N = 2), music (N = 1), mechanical engineering (N = 1), animal science (N = 1), , economics (N = 1), statistics (N = 1), ecology (N = 1), health science (N = 1), biological engineering (N = 1), biology (N = 1) and dentistry (N = 1).

4.1.4. Second Language Proficiency and Exposure to English

The participants were also asked to provide information about the amount of time they had spent as a graduate student, the amount of time they had lived in an English-speaking country in general and for study purposes, and the number of years they had spent learning English (reported in Table 4.5). Moreover, the participants were asked to self report their literacy proficiency in English and in their first language (reported in Table 4.6). Table 4.5 presents the frequency, mean scores, and standard deviations of the four items concerning the various ‘length of time’ categories.

Categories	Years in graduate school (N = 167)	Years of living in an English-speaking country (N = 168)	Years of studying in an English-speaking country (N = 168)	Years of learning English (N = 168)
0-2	99	61	65	1
3-5	54	66	68	10
6-8	13	29	24	15
9+	1	11	11	142
M	2.59	4.27	3.97	14.19
SD	1.93	4.43	3.75	6.40

Table 4.5: Means and Standard Deviations of 'Length of Years' Items

As can be seen, the participants on average had been in graduate school for 2.59 years. Only one tenth of the participants had spent less than a year as a graduate student. Most of the participants had one to five years of experience in studying at graduate school. This experience was considered crucial. In order for the participants to reflect their academic reading behaviors, the more experience they had in graduate school, the more accurate their responces would likely be. In addition, the length of the participants' time spent living and studying in an English-speaking were similar. The average number of years of the participants living abroad was 4.27 and the average number of years studying abroad was 3.97. This similarity may be because the participants were international graduate students. That is, the length of time they had lived abroad would be expected to be very close to the amount of time they had spent studying abroad. The slightly longer length of living abroad than studying abroad may be because international students tend to go to the place they will study in prior to officially entering the school so that they can be accustomed to the living environment. It is also necessary to mention that students here reported a longer time studying in an English-speaking country than studying in graduate school. One possible explanation can be that some students had undergraduate studying experience in an English-speaking university prior to graduate

school. A second possible explanation is that some students may be required to attend ESL courses prior to entering graduate school. Finally, a significant majority of the participants had learned English from 10 to 20 years, and the average for the entire group was 14.19 years.

The participants were also asked to report their self-assessed literacy proficiency on eight multiple-choice questions using a five point scale (5 = excellent, 4 = good, 3 = fair, 2 = not good and 1 = poor). They were asked to do this for both their first (L1) and second (L2) languages with respect to their academic literacy and leisure literacy proficiency. Table 4.6 displays the means and standard deviations of the participants' self-rated literacy proficiency. Overall, the participants rated their second language literacy proficiency at least "fair" (M = 3.92 for academic reading & M = 4.00 for leisure reading; M = 3.42 for academic writing & M = for leisure writing) and rated their first language literacy proficiency at least "good" (M = 4.57 for academic reading & M = 4.44 for leisure reading; M = 4.01 for academic writing & M = 4.15 for leisure writing). Consistent with this, they rated their proficiency in the L1 as better than in the L2 across languages and purposes. In addition, they viewed their reading proficiency as higher than their writing proficiency regardless of purposes and languages. Finally, the participants regarded their leisure literacy proficiency as higher than their academic literacy proficiency.

Items	M	Median
leisure reading in L2	4.00	4
leisure writing in L2	3.57	4
academic reading in L2	3.92	4
academic writing in L2	3.42	3.5
leisure reading in L1	4.57	5
leisure writing in L1	4.15	4
academic reading in L1	4.44	5
academic writing in L1	4.01	4

Table 4.6: Means and Medians of Self-Rated Literacy Proficiency

4.1.5. Computer Familiarity

The data regarding participants' computer familiarity were collected from Part Five of the questionnaire. The participants were asked about the amount of their use of computers per week, their experience and general comfort level with using computers, their comfort level with writing on computers, their comfort level with leisure reading on computers, and the amount of time they spent on leisure reading via a computer in both their first and second languages. Four questions regarding experience and comfort level were presented in a four-point-multiple-choice format (see Table 4.7), and five questions concerning frequency of use and reading for leisure on a computer were presented in an open-ended question format (see Table 4.8).

As shown in Table 4.7, the participants on average rated their experience in using computers between moderate to high (M = 3.57). In fact, none of the participants responded "no experience" for this question, and only 2 people responded that they were only somewhat experienced in using computers. In addition, the participants reported that that they were comfortable overall using computers (M=3.47) and writing on a computer (M=3.51). These results support the previously stated assumption that the study

participants in their 20s and 30s could be considered as a technology savvy generation of graduate students. However, when asked about their comfort level toward reading for leisure on computers, the comfort level decreased (M = 3.18). Additionally, more responses were found in the "not at all comfortable" and "somewhat comfortable" categories than was the case for the other items. The results indicate that even though the participants overall felt experienced and comfortable with using and writing on computers, they did not share the same degree of comfort with respect to reading on a computer screen for leisurely purposes.

Item	Not at all (*f*)	Somewhat (*f*)	Moderate (*f*)	High (*f*)	M	Median
Experience in using computers	0	2	69	97	3.57	4
Comfort with using computers	1	14	58	95	3.47	4
Comfort with writing on computers	2	12	53	101	3.51	4
Comfort with reading leisure on computers	4	35	55	74	3.18	3

Table 4.7: Frequency of Each Item for the Computer Familiarity Variable

Table 4.8 shows the means and standard deviations of the five open-ended questions regarding amounts of time spent using computers. The participants spent on average about 48 hours per week using computers. This breaks down to an average of 6 to 7 hours per day using computers. Regarding reading for leisure, note that the participants overall spent less than two hours per day reading on a computer screen regardless of the languages (L1 or L2) involved when their mean weekly scores for these categories are broken down (M = 12.23 for L1 and 8.12 for L2). However, the participants still spent

more time reading in their first language than reading in English, their second language. Moreover, they were willing to read more pages when they read in their first language as opposed to reading in the second language (M = 21.24 pages per week in L1 and 9.92 pages per week in L2). In other words, the number of pages they were willing to read in their first language was two times higher than that in the second language.

Items	M	SD
Computers hours/week	48.02	25.40
Leisure reading in L2 hours/week	8.12	9.66
Leisure reading in L2 page	9.92	15.74
Leisure reading in L1 hours/week	12.23	12.11
Leisure reading in L1 page	21.24	28.05

Table 4.8: Means and Standard Deviations for Amounts of Computer Use

Summary of Demographic Data

To summarize, the participants were a rather homogeneous group in terms of gender, age, intended degree, and ethnicity. The majority of the study participants were female and in their 20s or early 30s. Most of them were doctoral students with an Asian background. Students were recruited from various disciplines, but education was the most commonly reported academic discipline among the respondents. In addition, a large majority of the participants had spent less than 10 years living in an English-speaking country and less than 5 years in graduate school. In terms of their self-rated language literacy proficiency, even though the students overall rated their L1 literacy proficiency higher than their L2, their somewhat positive rating of their L2 literacy proficiency

suggested that they felt reasonably well prepared for the literacy demands of graduate school in an English-speaking country. In regard to students' computer familiarity, most of the participants rated their comfort level and computer experience high. However, the compute familiarity did not seem to associate with their on-screen reading behaviors either for academic purposes or for leisure purpose. For leisurely reading, the participants reported that they spent only 8 hours reading in L2 and 12 hours reading in L1 on a computer screen. In other words, the students read longer and were willing to read more pages in their first language than in English.

4.2. Descriptive Results from the Questionnaire

In this part of the chapter, results from the questionnaire regarding the participants' attitudes and practices with respect to the study's two conditions—reading for course preparation and reading for writing—will be presented. Descriptive statistics provided an initial overview of the results from each part of the questionnaire. Pair t-test and effect size (*d*) were then used to examine the degree of statistical difference and magnitude in students' responses between the two reading purposes.

4.2.1. Part One of the Questionnaire

As mentioned in Chapter Three, four items in Part One of the questionnaire were designed to elicit the participants' preferences toward reading academic texts on a computer screen for two purposes: reading for course preparation (RCP) and reading for writing papers (RWP). The participants were asked to indicate their level of agreement on four statements. Table 4.9 presents the mean score and standard deviation of each item on

a scale ranging from 1 (strongly disagree) to 6 (strongly agree). Note that the mean scores of the first three items were between 2 and 3 for both purposes, indicating that the respondents slightly disagreed or disagreed with the item statements. In other words, the students overall did not prefer to read academic texts on a computer screen regardless of the two purposes involved. Moreover, the students in general slightly agreed (M = 4.86 in RCP; M = 4.96 in RWP) that they "prefer to print out computer-screen texts on paper."

Students' on-screen reading preferences were compared using paired t-test and effect size. Table 4.9 also presents the results of a paired t-test for each item concerning students' on-screen reading preference. The results showed that there were no statistically significant differences in the mean scores for all 4 items if $p < 0.01$. Only one paired mean difference, Item 2 in preference, was statistically significant, and only barely, at a p-value of 0.05 ($t[167] = -1.98$, $p < 0.05$). In addition, the indicator scores were compared. Because the four items in this variable were intended to measure the same concept and had a high degree of reliability (Cronbach's $\alpha = .87$ in RCP and .85 in RWP), the indicator scores were calculated by summing up the scores of the items belonging to the variables and then dividing the summed score by the number of items. When comparing the t-value of indicator scores between the two purposes, no statistically significant difference was found.

Items	RCP M	SD	RWP M	SD	t	Sig.	d
I prefer to read texts on a computer screen no matter how long they are	2.37	1.27	2.44	1.45	-0.81	.421	0.05
I don't mind reading texts on screen for a long time	2.48	1.30	2.61	1.43	-1.98	.049	0.09
I don't mind reading long texts on screen	2.57	1.36	2.65	1.40	-1.20	.231	0.06
I prefer to print out computer-screen texts on paper*	4.86	1.15	4.96	1.16	1.72	.088	0.09
Indicator scores	9.55	4.32	9.74	4.51	-1.17	.245	0.04

Table 4.9: Descriptive, Paired T-Test and Effect Size Results for Preference

Determining the size of the differences was calculated by referring to the effect size. By computing Cohen's d (which is calculated by taking groups' mean difference and dividing that by the standard deviation), we can determine the magnitude of a mean difference between two dependent groups. In the social science field, the size 0.2 is considered a small effect, .05 medium, and 0.8 large (Weinberg & Abramowitz, 2001). The indicator score for preference was first subjected to the effect size calculation. The overall effect size of preference was 0.04, representing a very small difference between the two purposes. In other words, even though the participants reported slightly more preference toward on-screen reading when reading for writing papers than when reading for course preparation, the difference was very small. When calculating the effect size for each item, the largest *d* was 0.09 for Item 2 and Item 4 in the preference category. Again, the effect size was small based on the criteria employed.

Summary of Results for Part One of the Questionnaire

Overall, results from Part One of the questionnaire showed that the participants did not demonstrate a meaningful preference for reading academic texts on a computer screen. In addition, the results of paired t-test and effect size analyses showed that the low preference for on-screen reading did not differ between the two reading purposes.

4.2.2. Part Two of the Questionnaire

Part Two of the questionnaire included two sections. The first section attempted to measure students' tendencies toward on-screen reading. A total of seventeen items was conceptually categorized into three groups. Group one, consisting of Items 1, 3, 4 and 14, attempted to capture the participants' initial tendency toward on-screen reading. Group two, consisting of Items 2, 5, 6, 7, 11, 13, 15 and 17, was designed to investigate the participants' level of agreement with respect to how they would tend to read texts on a computer screen under given circumstances. Finally, group three, consisting of Items 8, 9, 10, 12 and 16, was designed to investigate the participants' level of agreement as to whether they would not tend to read texts on a computer screen under given circumstances. In other words, the group two and three items were intended to investigate how the participants perceived their use of on-screen reading as a facilitation or hindrance to their on-screen reading tendency for academic purposes. The second section was designed to elicit information about the participants' on-screen reading frequency, namely hours per week the students spent on on-screen reading for the two purposes and the maximum number of pages they were willing to read on a computer screen when reading for the two academic purposes.

4.2.2.1. Students' On-screen Reading Tendencies

Four items (1, 3, 4, and 14) in Part Two of the questionnaire were intended to measure the students' tendencies toward reading academic texts on a computer screen. Table 4.10 presents the mean score and standard deviation for each item. As can be seen, all four mean scores for both purposes were under 4, which indicates that the students overall did not have a strong tendency toward reading texts on a computer screen for either reading purpose. Moreover, when printed texts were available, the participants showed a low tendency toward reading texts on a computer screen for both purposes (Item 1, M = 2.05 & Item 4, M = 2.54 in RCP; Item 1, M = 2.05 & Item 4, M = 2.54 in RWP).

	RCP		RWP	
Items	M	SD	M	SD
1. I read texts on-screen even if there is a printed hard copy available.	2.05	1.25	2.11	1.35
3. I feel comfortable reading texts on a computer screen.	3.27	1.46	3.26	1.45
4. I feel confident reading carefully on a computer screen.	3.18	1.45	3.14	1.46
14. If the assigned texts are available on the Internet and in hard copy, I read the texts on a computer screen.	2.54	1.45	2.51	1.41

Table 4.10: Mean Scores and Standard Deviations for Each Item Regarding On-screen Reading Tendency

When looking at the frequency for each item (Table 4.11), we see that 87.5% of the participants chose Strongly Disagree, Disagree and Slightly Disagree on Item 1 in RCP; 54.2% on Item 3; 57.1% on Item 4; and 76.3% on Item 14. In RWP, 85.1% of the participants chose Strongly Disagree, Disagree and Slightly Disagree on Item 1; 55.4%

on Item 3; 58.3% on Item 4; and 75.0% on Item 14. Note that almost half of the respondents strongly disagreed or disagreed that they would "read texts on screen if there is a printed hard copy available" for both reading purposes. A similar pattern was observed for Item 14. Approximately half of the respondents disagreed with the statement that they would "read texts on a computer screen if the assigned texts are available on the Internet and on hard copy." The respondents, however, showed a rather moderate degree of disagreement on items concerning their comfort level and confidence while reading academic texts on a computer screen. In addition, more than 30% of the respondents reported that they slightly agreed or agreed that they "feel comfortable reading texts on a computer screen" and "feel confident reading carefully on a computer screen." Collectively, the results seem to indicate that the students' low tendency toward on-screen reading may not be associated much with their comfort or confidence level during the computer reading experience. In summary, the students generally did not demonstrate a clear tendency toward on-screen reading for either reading purpose.

Items	SD *f* (%)	D *f* (%)	SLD *f* (%)	SLA *f* (%)	A *f* (%)	SA *f* (%)
RCP						
1	71 (42.3)	54 (32.1)	22 (13.1)	10 (6.0)	7 (4.2)	4 (2.4)
3	21 (12.5)	39 (23.2)	31 (18.5)	40 (23.8)	25 (14.9)	12 (7.1)
4	23 (13.7)	41 (24.4)	32 (19.0)	35 (20.8)	29 (17.3)	8 (4.8)
14	49 (29.2)	49 (29.2)	30 (17.9)	15 (8.9)	20 (11.9)	3 (3.0)
RWP						
1	71 (42.3)	54 (32.1)	18 (10.7)	10 (6.0)	9 (5.4)	6 (3.6)
3	21 (12.5)	38 (22.6)	34 (20.2)	35 (20.8)	31 (18.5)	9 (5.4)
4	25 (14.9)	40 (23.8)	33 (19.6)	34 (20.2)	28 (16.7)	8 (4.8)
14	50 (29.8)	50 (29.8)	26 (15.5)	21 (12.5)	17 (10.1)	4 (2.4)

Table 4.11: Frequency of Each Item

(N=168) The table presents the number and the tendency of the respondents by their choice on each item. Note: SD = Strongly Disagree, D = Disagree, SLD = Slightly Disagree, SLA = Slightly Agree, A = Agree, SA = Strongly Agree.

Table 4.12 presents the results of a paired t-test for each item concerning students' on-screen reading tendency. The results showed that the mean differences for all four items were not statistically significant at a $p < 0.01$. In addition, the indicator scores were compared. Because the four items in this variable were intended to measure the same concept and had a high degree of reliability (Cronbach's $\alpha = .80$ in RCP and .80 in RWP), the indicator scores were calculated by summing up the scores of the items belonging to the variables and then dividing the summed score by the number of items. When comparing the t-value of indicator scores between the two purposes, no statistically significant difference was found. Determining the size of the differences was calculated by referring to the effect size. The indicator scores for tendency were first subjected to the effect size calculation. The same result was found regarding students' tendency toward on-screen reading. The overall effect size for tendency was weak ($d = 0.004$). In addition, the difference in each item between the two reading purposes was also weak.

Items	t	Sig.	d
Tendency 1	- 1.13	.259	0.04
Tendency 3	0.11	.912	0.01
Tendency 4	0.80	.424	0.03
Tendency 14	0.53	.597	0.02
Indictor scores	0.11	.914	0.004

Table 4.12: Results of Paired T-Test and Effect Size on Tendencies

Collectively, the results indicate that the tendency toward on-screen reading between the two purposes did not differ much. When calculating the effect size for each

item, the effect size was small based on the criteria employed. Overall, it appears that there were similar reading patterns across the two purposes among the participants.

4.2.2.2. Students' Perceptions of On-Screen Reading

The rest of the items in Part Two of the questionnaire were intended to collect data regarding the participants' positive or negative perceptions of on-screen reading. A positive perception is defined as the participants' attitude toward on-screen reading as facilitation for stated academic purposes. The negative perception, on the other hard, is defined as the participants' attitude toward on-screen reading as a hindrance for stated academic purposes. The participants rated their degree of agreement on a 6-point scale (1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, and 6 = Strongly Agree). Items 2, 5, 6, 7, 11, 13, 15, and 17 asked whether the participants agreed with various statements positing positive perceptions of on-screen reading. Items 8, 9, 10, 12 and 16 concerned negative perceptions of on-screen reading. Four items (Item 8, 9, 10 and 12) explored the issue from the opposite direction. When these data were analyzed, the researcher treated the descriptive data via their unreversed responses. However, when the data were used for reliability and model testing analyses, the opposite-direction items were transformed into the same direction as the other items.

Table 4.13 presents the descriptive and frequency results regarding the participants' degree of positive perceptions of on-screen reading for the RCP condition. Notice that the participants were affirmative at the "Slightly Agree" level on all items. Items 2, 6, 7 and 17 were concerned with whether the participants agreed that they tended to skim through texts on a computer screen. The respondents agreed or strongly agreed that they previewed the texts on screen (M = 5.05 on Item 2; M= 4.85 on Item 7) and read

parts of the texts on screen (M = 4.68 on Item 17). However, the participants had a rather neutral attitude toward the statement, "skim texts faster on a computer screen than on paper" (M = 3.56). The majority of the participants (63.7%) agreed that they would read on screen to save printing costs. As for the availability of digital references (Items 8 & 10), approximately 75% of the respondents were affirmative about this advantage.

Items	SD	D	SLD	SLA	A	SA	M	SD
2. I take an overview of texts on screen first before I decide whether to print them out	3(1.8)	8(4.8)	7 (4.2)	19(11.3)	53(31.5)	78(46.4)	5.05	1.21
5. I read texts on screen to save printing costs	15(8.9)	27(16.1)	19(11.3)	41(24.4)	43(25.6)	23(13.7)	3.83	1.53
6. I skim texts faster on a computer screen than on paper	20(11.9)	31(18.5)	27(16.1)	29(17.3)	47(28.0)	14(8.3)	3.56	1.55
7. If I only want to get an overview rather than details, I read texts on screen	5(3.0)	5(3.0)	7(4.2)	29(17.3)	69(41.1)	53(31.5)	4.85	1.18
11. I read texts on screen because the layout of the text changes when printed out.	48(28.6)	73(43.5)	26(15.5)	13(7.7)	5(3.0)	3(1.8)	2.18	1.13
13. I read texts on screen because they are freely available on the Internet	9(5.4)	12(7.1)	18(10.7)	35(20.8)	69(41.1)	25(14.9)	4.30	1.34
15. When I need to search for other references while I am reading, I read texts on screen	8(4.8)	16(9.5)	13(7.7)	38(22.6)	65(38.7)	28(16.7)	4.31	1.36
17. When I only need to read parts of the texts, I read on screen	2(1.2)	5(3.0)	14(8.3)	37(22.0)	75(44.6)	35(20.8)	4.68	1.06

Table 4.13: Descriptive and Frequency Results for Positive Perceptions of On-Screen Reading for RCP (N=168). The table presents the number and the tendency of the respondents by their choice on each item. Note: SD = Strongly Disagree, D = Disagree, SLD = Slightly Disagree, SLA = Slightly Agree, A = Agree, SA = Strongly Agree.

Similar results were found with respect to the reading for writing purpose (Table 4.14). The participants agreed or strongly agreed that they previewed and read parts of the texts on a computer screen (M = 5.13 on Item 2; M = 4.81 on Item 7; and M = 4.60 on Item 17). The respondents were affirmative about the influence of the availability of digital references on their on-screen reading tendencies (M = 4.28 on Item 13, and M = 4.42 on Item 15). The majority of the participants also agreed that they preferred to read on a screen to save printing cost (M = 3.74 on Item 6). Here, too, the participants overall showed a neutral attitude toward the item asking if they can skim faster on a computer screen. Even so, "agree" was still the most-chosen category for this item (28%).

Item	SD	D	SLD	SLA	A	SA	M	SD
2. I take an overview of texts on screen first before I decide whether to print them out	4(2.4)	4(2.4)	6(3.6)	19(11.3)	54(32.1)	81(48.2)	5.13	1.15
5. I read texts on screen to save printing costs	17(10.1)	29(17.3)	19(11.3)	37(22.0)	47(28.0)	19(11.3)	3.74	1.55
6. I skim texts faster on a computer screen than on paper	21(12.5)	30(17.9)	32(19.0)	27(16.1)	47(28.0)	11(6.5)	3.49	1.52
7. If I only want to get an overview rather than details, I read texts on screen	6(3.6)	4(2.4)	11(6.5)	24(14.3)	73(43.5)	50(29.8)	4.81	1.21
11. I read texts on screen because the layout of the text changes when printed out.	46(27.4)	71(42.3)	31(18.5)	9(5.4)	9(5.4)	2(1.2)	2.23	1.14
13. I read texts on screen because they are freely available on the Internet	9(5.4)	13(7.7)	20(11.9)	32(19.0)	68(40.5)	26(15.5)	4.28	1.37

Table 4.14: Descriptive and Frequency Results for Negative Perceptions of On-Screen Reading for RCP (N=168). (continued)

Table 4.14 (continued)

15. When I need to search for other references while I am reading, I read texts on screen	8(4.8)	16(9.5)	9(5.4)	35(20.8)	65(38.7)	35(20.8)	4.42	1.39
17. When I only need to read parts of the texts, I read on screen	2(1.2)	9(5.4)	15(8.9)	35(20.8)	74(44.0)	33(19.6)	4.60	1.13

The table presents the number and the tendency of the respondents by their choice on each item. Note: SD = Strongly Disagree, D = Disagree, SLD = Slightly Disagree, SLA = Slightly Agree, A = Agree, SA = Strongly Agree.

On the other hand, the participants also showed an affirmative attitude toward the negative perceptions of on-screen reading for both purposes. Regarding reading for course preparation purpose (see Table 4.15), the majority of the participants agreed that they would not read on a computer screen if a) texts were difficult (M = 4.88), b) they needed to read texts carefully (M = 4.70), and c) they had to re-read texts (M = 3.95).

Items	SD (%)	D (%)	SLD(%)	SLA(%)	A (%)	SA (%)	M	SD
8. If I begin to read on screen and find the texts are difficult, I will print out the texts	5(3.0)	7(4.2)	12(7.1)	17(10.1)	66(39.3)	61(36.3)	4.88	1.26
9. When I have to re-read texts, I do not read them on screen	7(4.2)	29(17.3)	27(16.1)	37(22.0)	39(23.2)	29(17.3)	3.95	1.47
10. I do not read texts on screen because it is easy for me to get lost while scrolling up and down	15(8.9)	42(25.0)	28(16.7)	30(17.9)	35(20.8)	18(10.7)	3.49	1.54
12. When I need to read texts closely, I do not read on screen	1(0.6)	16(9.5)	14(8.3)	24(14.3)	60(35.7)	53(31.5)	4.70	1.29
16. I only print out texts if I need to bring them with me	17(10.1)	39(23.2)	35(20.8)	25(14.9)	35(20.8)	17(10.1)	3.43	1.53

Table 4.15: Descriptive and Frequency Results of Perceptions of Disadvantages of On-Screen Reading for RCP (N=168) The table presents the number and the tendency of the respondents by their choice on each item. Note: SD = Strongly Disagree, D = Disagree, SLD = Slightly Disagree, SLA = Slightly Agree, A = Agree, SA = Strongly Agree.

Regarding the reading for writing papers purpose (see Table 4.16), the positive attitude outweighed the negative attitude, indicating that the respondents agreed that those negative perceptions of on-screen reading caused them to print screen-based texts out. Approximate 67% of the respondents agreed that they tended not to read difficult texts on a computer screen. Moreover, 70% of the participants agreed that they tended not to read texts on screen if they needed to read texts carefully. The same attitude was found for the re-read situation.

Items	SD (%)	D (%)	SLD(%)	SLA(%)	A (%)	SA (%)	M	SD
8. If I begin to read on screen and find the texts are difficult, I will print out the texts	6(3.6)	7(4.2)	9(5.4)	16(9.5)	62(36.9)	68(40.5)	4.93	1.29
9. When I have to re-read texts, I do not read them on screen	9(5.4)	27(16.1)	25(14.9)	31(18.5)	42(25.0)	34(20.2)	4.02	1.53
10. I do not read texts on screen because it is easy for me to get lost while scrolling up and down	17(10.1)	43(25.6)	25(14.9)	31(18.5)	31(18.5)	21(12.5)	3.47	1.58
12. When I need to read texts closely, I do not read on screen	1(0.6)	16(9.5)	13(7.7)	19(11.3)	63(37.5)	56(33.3)	4.76	1.29
16. I only print out texts if I need to bring them with me	20(11.9)	38(22.6)	23(13.7)	26(15.5)	40(23.8)	21(12.5)	3.54	1.63

Table 4.16: Descriptive and Frequency Results for Perceptions of Disadvantages of On-Screen Reading for RWP (N=168)

The table presents the number and the tendency of the respondents by their choice on each item. Note: SD = Strongly Disagree, D = Disagree, SLD = Slightly Disagree, SLA = Slightly Agree, A = Agree, SA = Strongly Agree.

While the mean scores of these three items (Item 8, 9 and 12) were on the affirmative side of the scale, it needs to be pointed out that a considerable proportion of

the participants demonstrated their disagreement with item 10, "I do not read texts on a screen because it is easy for me to get lost from scrolling up and down." In fact, half of the respondents (50% for RCP; 50.6% for RWP) were negative about this statement, indicating that they did not consider getting lost while scrolling on screen as a major disadvantage that influenced their on-screen reading tendencies. Finally, one of the disadvantages of screen-based texts mentioned in the literature is their inconvenience, since they are located in the computer. In this study it was found that the participants slightly disagreed (M = 3.43) with the statement, "I only print out texts if I need to bring them with me" for RCP while slightly agreeing for RWP (M = 3.54). This may indicate that whether or not the students could bring the texts with them was not a major reason as to why they chose to print texts out or to read on a computer screen when reading for course preparation. However, the situation apparently changed when the students read to write papers.

4.2.2.3. Frequency

Section 2 in Part 2 of the questionnaire asked the participants to indicate the number of hours per day and number of days per week that they typically read academic texts on a computer screen when they prepared for course reading assignments and when they read in order to write papers. Moreover, the participants were asked to record the maximum number of pages they were willing to read academic texts on a computer screen. When analyzing the data, the researcher arranged the hours and days so that the data were presented as hours spent per week. The purpose for doing this was to reduce two variables into one variable since both variables touched upon the same issue. In

addition, a few respondents (3 in RCP condition and 5 in RWP condition) reported a surprisingly large quantity of pages read: 500, 1,000 and unlimited. In order to consider these outliers, these three cases were treated as missing data and replaced by the mean score of the variable.

As shown in Table 4.17, the participants responded that they spent an average of 10.12 hours per week reading academic texts on a computer screen when reading for course preparation and 15.39 hours per week when reading for writing. When comparing these average hours to the total number of hours which students spent per week using a computer (48.02 hours per week, Table 4.8), these amounts of time for RCP and RWP on a computer screen are relatively small: only about 20% of their computer-use time was spent on reading on a computer screen for course preparation, and about 32% of that was spent on reading for writing.

	RCP		RWP				
	M	SD	M	SD	t	sig	d
Hours per week	10.12	12.43	15.39	17.58	-3.05	.03*	.23
Maximum page	17.99	21.80	24.62	28.78	-3.36	.001*	.30

Table 4.17: Mean Scores and Standard Deviations of Reading Hours and Pages
**. $p < 0.001$ level (2-tailed)
*. $p < 0.05$ level (2-tailed)

In terms of the maximum number of pages the participants were willing to read, the participants in general were willing to read 17.99 pages on a computer screen when reading for course preparation. A majority (about 77%) of the respondents were not

willing to read more than 20 pages on a computer screen (Table 4.18). Moreover, half of them were not even willing to read more than 10 pages on a computer screen. On the other hand, when reading for writing, the participants in general were willing to read 24.62 pages on a computer screen. Even though the average number of pages seems to be higher in RWP than in RCP, about 74% of the participants still were not willing to read more than 20 pages on a computer screen, no matter what the condition was. If we compare these page numbers to the ones the participants were willing to read for a leisurely purpose, we see that they were willing to do more reading for academic purposes than for leisurely purposes. That is, they were willing to read about 18 pages for course preparation and 24 pages for writing, while they were willing to read just 9.92 pages for leisure in English (Table 4.8).

	RCP				RWP			
	Hours/week		Max page		Hours/week		Max page	
Categories	*f*	Percent	*f*	Percent	*f*	Percent	*f*	Percent
Less than 10	113	67.3	92	54.8	86	50.0	96	57.1
11-20	38	22.6	38	22.6	28	16.7	29	17.3
21-30	10	5.9	16	9.5	21	12.5	23	13.7
31-40	2	1.2	8	4.8	6	3.6	2	1.2
41-50	2	1.2	6	3.6	8	4.8	11	5.3
Above 51	3	1.8	8	4.8	21	12.5	9	5.4
Total	168	100	168	100	168	100	168	100

Table 4.18: Frequency Distribution of Preferences for Reading Hours and Pages
Note: *f* = frequency (number of cases in the category).

When calculating a paired t-test analysis regarding the respondents' on-screen reading frequency, i.e., the number of hours spent reading per week and the maximum

number of pages respondents were willing to read on the computer screen across the two purposes, the difference was found to be statistically significant in hours spent at $p < 0.05$ ($t[167] = -3.05$, $p = 0.03$) as well as in the maximum page numbers read ($t[167] = -3.36$, $p = 0.001$). The results for the calculation of effect size, however, showed that the magnitude of the difference was rather small. For example, the effect size between the two purposes in hours spent had a *d* value of only 0.23. In other words, the hours spent on on-screen reading in the RWP condition were not appreciably greater than in the RCP condition. The difference in the maximum pages that an individual was willing to read on a computer screen was also small, with a Cohen's *d* of 0.30. To sum up, the participants may have spent more time reading on a computer screen for writing purposes than for course preparation purposes and were willing to do more reading on screen when reading for writing papers than reading for course preparation, but the differences between the two conditions were small.

Summary of Results for Part Two of the Questionnaire

The participants in general demonstrated a low tendency toward on-screen reading regardless of reading purposes. However, under several given circumstances, such as gaining an overview of a text, reading parts of an article, and searching for references, they were positive about their tendencies toward on-screen reading. In other words, reading on a computer screen under these circumstances may be considered as facilitation for reading academic texts. At the same time, the participants were negative about their tendencies toward on-screen reading when the texts were difficult and they needed to read closely or re-read the texts. Under these circumstances, on-screen reading

apparently became a hindrance. In addition, although the participants did not demonstrate a clear difference in their tendencies toward on-screen reading, some differences were found with respect to the number of hours of spent on on-screen reading and the numbers of pages participants were willing to read on a computer screen. The participants seemed to spend more hours on on-screen reading for RWP than for RCP. They also were willing to read more pages on a computer screen for RWP than for RCP.

4.2.3. Part Three of the Questionnaire

Twenty-one five-point-scale items were included in this part to investigate the frequency of the participants' strategy usage. As mentioned in Chapter Three, this part of the questionnaire was adapted and modified from an existing and successfully employed 30-item questionnaire, the SORS (Mokhatari & Sheorey, 2002). The participants were asked to indicate the frequency of their strategy usage on a five-point Likert scale (1 = never, 2 = occasionally, 3 = sometimes, 4 = usually and 5 = always).

When looking at the mean score and standard deviation for each strategy, as shown in Table 4.19, the three most frequently used strategies reported by the participants for the two reading purposes, that is, those which had mean scores higher than 4, were: Item 2, "I take an overview of the text to see what it is about before reading it" (M = 4.13 in RCP; M = 4.34 in RWP); Item 14, "when a text becomes difficult, I pay closer attention to what I am reading" (M = 4.18 in RCP; M = 4.33 in RWP); and Item 15, "When a text becomes difficult, I re-read it to increase my understanding" (M = 4.30 in RCP; M= 4.43 in RWP). The three least frequently reported strategies, that is, those which had mean scores lower than 3, for both purposes were: Item 4, "I take notes on paper while reading

screen-based texts to help me understand what I read" (M = 2.78 in RCP; M = 2.98 in RWP); Item 5, "I type notes in my computer while reading to help me understand what I read" (M = 2.34 in RCP; M = 2.55); and Item 10, "I underline or highlight information on screen-based texts using computer software to help me remember it" (M = 2.76 in RCP; M = 2.82 in RWP). As can be seen, the most frequently used strategies were general reading strategies which do not necessarily involve on-screen reading per se. In other words, these strategies can be applied to different modes of text presentation, including print-based reading. On the other hand, the three least frequently used strategies tended to be screen-related approaches.

	RCP		RWP	
Items	M	SD	M	SD
1. I know what I want to get from the text before I start to read.	3.41	0.92	3.70	0.89
2. I take an overview of the text to see what it is about before reading it	***4.13***	***0.92***	***4.34***	***0.82***
3. I skim the text by noting its characteristics like length and organization before reading it	3.74	1.14	3.86	1.11
4. I take notes on paper while reading screen-based texts to help me understand what I read	**2.78**	**1.20**	**2.98**	**1.23**
5. I type notes in my computer while reading to help me understand what I read	**2.37**	**1.33**	**2.55**	**1.44**
6. If I want to take notes while reading, I copy and paste the parts I want into my computer software	3.08	1.4	3.23	1.43
7. I use a Find function to find information I want in the text	3.27	1.45	3.39	1.43
8. I use the cursor to get back on track when I lose concentration	3.19	1.24	3.18	1.24
9. I enlarge font size or change color to read screen-based texts with ease	3.18	1.31	3.26	1.33
10. I underline or highlight information on screen-based texts using computer software to help me remember it	**2.76**	**1.38**	**2.82**	**1.44**
11. I DO NOT read everything on screen; I purposely skip parts	3.44	1.14	3.40	1.16
12. When reading, I decide what to read closely and what to ignore	3.80	0.98	3.85	0.99

Table 4.19: Mean Score and Standard Deviation for Each Strategy Item (continued)

Table 4.19 continued

13. I read screen-based texts slowly to make sure I understand what I am reading	3.24	0.96	3.36	1.02
14. When a text becomes difficult, I pay closer attention to what I am reading	***4.18***	***0.91***	***4.33***	***0.82***
15. When a text becomes difficult, I re-read it to increase my understanding	***4.30***	***0.85***	***4.43***	***0.79***
16. I paraphrase (restate ideas in my own words) to better understand what I read	3.11	1.08	3.30	1.11
17. I go back and forth in the text to find relationships between main ideas	3.70	0.92	3.88	0.88
18. I use tables, figures, and pictures in the text to increase my understanding	3.73	1.13	3.80	1.08
19. I use typographical features (e.g., bold face and italics) to identify key information	3.50	1.20	3.60	1.18
20. I use reference materials (e.g., a dictionary, related online sources) to help me understand what I read	3.84	1.06	3.99	1.00
21. I think about information in both English and my native language	3.41	1.27	3.48	1.22
Indicator score	3.44	0.51	3.55	0.47

Note: 1 = Never, 2 = Occasionally, 3 = Sometimes, 4 = Usually, 5 = Always. ***Italic***: three most frequently used strategies. **Boldface**: three least frequently used strategies

As for reading strategies, as shown in the results of a paired t-test analysis (Table 4.20), statistically significant differences were found for many items and overall indicator scores. Differences for Items 1, 2, 5, 6, 14, 16, 17 and 20 were statistically significant at $p < 0.001$. In addition, differences for Item 3, 4, 7, 9, 13, 15, 19, and 21 were statistically significant at $p < 0.05$. The overall indicator scores were statistically significant between the two reading purposes. To gain a better sense of the magnitude of the differences, these were subjected to effect size calculations. The effect size was found to be small in each item comparison. The largest effect size was for Item 1, with a Cohen's d value of 0.33. The effect size for indicator score difference was also small: $d = 0.23$. Here the indicator scores for the strategy variable for the two purposes were calculated the same way as they were for the preference and tendency variables due to the high reliability at hand ($\alpha = .79$ in RCP and .76 in RWP). The results indicate that even though the

participants overall reported using reading strategies slightly more frequently when reading for writing papers, the difference was not strong.

Items	t	Sig.	d
1. I know what I want to get from the text before I start to read.	-4.27	.000**	0.33
2. I take an overview of the text to see what it is about before reading it	-4.41	.000**	0.26
3. I skim the text by noting its characteristics like length and organization before reading it	-2.16	.033*	0.11
4. I take notes on paper while reading screen-based texts to help me understand what I read	-3.35	.001*	0.16
5. I type notes in my computer while reading to help me understand what I read	-4.08	.000**	0.13
6. If I want to take notes while reading, I copy and paste the parts I want into my computer software	-3.67	.000**	0.10
7. I use a Find function to find information I want in the text	-2.77	.006*	0.08
8. I use the cursor to get back on track when I lose concentration	0.23	.819	-0.01
9. I enlarge font size or change color to read screen-based texts with ease	-2.10	.037*	0.06
10. I underline or highlight information on screen-based texts using computer software to help me remember it	-1.32	.190	0.04
11. I DO NOT read everything on screen; I purposely skip parts	0.74	.460	-0.03
12. When reading, I decide what to read closely and what to ignore	-0.99	.326	0.05
13. I read screen-based texts slowly to make sure I understand what I am reading	-2.39	.018*	0.12
14. When a text becomes difficult, I pay closer attention to what I am reading	-3.88	.000**	0.18
15. When a text becomes difficult, I re-read it to increase my understanding	-3.47	.001*	0.16
16. I paraphrase (restate ideas in my own words) to better understand what I read	-4.03	.000**	0.17
17. I go back and forth in the text to find relationships between main ideas	-4.20	.000**	0.20
18. I use tables, figures, and pictures in the text to increase my understanding	-1.71	.090	0.06
19. I use typographical features (e.g., bold face and italics) to identify key information	-3.08	.002*	0.09
20. I use reference materials (e.g., a dictionary, related online sources) to help me understand what I read	-3.63	.000**	0.15
21. I think about information in both English and my native language	-2.08	.039*	0.06
Indicator score	-6.50	.000**	0.23

Table 4.20: Results of Paired T-Test and Effect Size of Reading Strategy

**. $p < 0.001$ level (2-tailed)

*. $p < 0.05$ level (2-tailed)

Summary of Results for Part Three of the Questionnaire

The participants reported using general reading strategies the most frequently, including taking an overview of a text before reading it and paying closer attention to and re-reading when a text becomes difficult. Screen-related approaches, on the other hand, were reported as the least frequently used strategies. In addition, the participants seemed to report using reading strategies slightly more frequently for RWP than for RCP. Even though the differences were statistically significant, the strength of the differences was rather small.

4.2.4. Part Four of the Questionnaire

Eleven items in Part Four of the questionnaire were analyzed to examine the students' attitude toward reading for the two academic purposes: reading for course preparation and reading for writing. The participants were asked to rate the level of importance of each item on a 5-point scale (1 = not important, 2 = little important, 3 = somewhat important, 4 = important and 5 = very important). The initial questionnaire had 12 items in this section. However, Item 5 was excluded for data analysis because many respondents had difficulty answering this item. Results from a reliability test supported this decision. After reducing the number of examined items to 11, the reliability increased from .81 to .84 in RCP and from .76 to .81 in RWP. Each of the 11 items was then analyzed using descriptive statistics (frequency, mean, and standard deviation).

In terms of reading for course preparation, based on the mean scores for each item (Table 4.21), the participants overall demonstrated a tendency to consider all of the item statements to be at least somewhat important. More specifically, those items featuring the

highest scores were Item 2, “fully understand readings” (M = 4.02); Item 7, “understand the terminologies” (M = 4.17); and Item 10, “organize what I have read” (M = 4.05). The three least important (still somewhat important) items rated by the students were Item 4, “read the article entirely” (M = 3.53); Item 5, “share what I have read with others” (M = 3.26); and Item 11, “critique articles I have read” (M = 3.51).

The same 11 items were used to measure responses regarding reading for writing purposes. As seen in Table 4.21, similar to the attitudes toward reading for course preparation reported earlier, the students considered all item statements to be at least somewhat important. However, more item statements were rated higher for this reading purpose than for reading for course preparation. A total of 6 items were viewed as important or very important when reading for writing purposes: Items 2, 3, 7, 8, 9 and 10. Note that three more items were considered as important in this reading purpose than in the RCP: Item 3,”reading in-depth carefully” (M = 4.18); Item 8, “using reading strategies” (M = 4.00); and Item 9, “take notes” (M = 4.13). The three statements considered least important were Items 1, 4 and 5, though they still had relatively high mean scores. When looked at collectively, the statements that the participants considered the most important and least important were parallel for the two reading purposes.

Item	RCP M	RCP SD	RWP M	RWP SD
1. Finish all readings	3.71	0.95	3.80	0.99
2. Fully understand readings	*4.02*	*0.78*	*4.26*	*0.80*
3. Reading in-depth carefully	**3.83**	**0.85**	**4.18**	**0.83**
4. Read the article entirely	3.53	1.03	3.60	0.97
5. Share what I have read with others	3.26	1.05	3.15	1.09
6. Re-read	3.60	1.07	3.99	0.90
7. Understand the terminologies	*4.17*	*0.88*	*4.39*	*0.74*
8. Using reading strategies	**3.85**	**0.98**	**4.00**	**0.92**
9. Take notes	**3.96**	**0.89**	**4.13**	**0.94**
10. Organize what I have read	*4.05*	*0.90*	*4.29*	*0.83*
11. Critique articles I have read	3.51	1.04	3.93	1.02
Indicator score	3.70	0.54	3.89	0.49

Table 4.21: Mean Scores and Standard Deviations Regarding Attitude Toward Reading for the Two Purposes

Note: *Italic*: most important items which have mean scores higher than 4. **Boldface**: items have mean score higher than 4 in RWP but not in RCP. Here, the indicator scores for the two purposes were calculated by summing up the scores of the items belonging to the variables and then dividing the summed score by the number of items

When comparing the attitudes toward reading for the two academic purposes, the participants demonstrated a clear tendency to consider reading for writing as more important in most regards. All items but one (Item 5) had higher mean scores for RWP than for RCP. In addition, more item statements (Items 3, 8, and 9) were considered as at least important for RWP than for RCP. It suggests that the participants may have thought that reading in-depth carefully, using reading strategies, and taking notes are only somewhat important when reading for course preparation but are important for reading for writing purpose. Different attitudes in the least important statements when reading for RCP and for RWP can also be found. Items 5, 11 and 4 were considered as least important for RCP while Items 5, 4 and 1 were considered as least important for RWP. The comparison of the least important items between the two purposes showed that Item

11 “critique articles I have read” was considered less important for RCP than for RWP. At the same time, Item 4, “read the article entirely,” and Item 1 “finish all reading” were considered less important for RWP than for RCP.

The only item that had a higher mean score for RCP than RWP was Item 5, “share what I have read with others” (M=3.25 for RCP and 3.15 for RCP), though the difference was not large. However, this result may not be surprising. When reading for course preparation, the participants were likely to be asked to share in class discussions their reactions to what they had read, whereas reading for writing would be a more isolated act in which only their reader (i.e., the instructor) would know about what they had read. Thus, for this item the mean score for RCP was likely to be higher.

To gain more insight into participants’ reading for both conditions, paired t-test and effect size were used to examine the strength of differences between the participants’ attitudes toward reading for the two purposes (Table 4.22). Statistically significant differences between their attitudes toward reading for different purposes were found for Items 2, 3, 6, 7, 10 and 11 at $p < .001$ and Items 8 and 9 at $p < .05$. The magnitude of the differences from the results for effect size (d) corresponded with the t-test results, in that the effect size was found to be relatively strong for Items 2, 3, 6, 7, 10 and 11. These results correspond to the descriptive statistics showing that the participants believed reading for writing required a more thorough and careful reading process than reading for course preparation. Moreover, re-reading and being able to critique the texts were considered more important for RWP than RCP. Being able to apply reading strategies was, therefore, considered more important when reading for writing than for course preparation.

Items	t-test	Sig. (2-tailed)	d
1	- 1.12	.232	0.09
2	- 3.70	.000**	0.30
3	- 5.23	.000**	0.42
4	- 0.99	.322	0.08
5	1.76	.080	- 0.10
6	- 5.68	.000**	0.44
7	- 3.75	.000**	0.30
8	- 3.12	.002*	0.16
9	- 2.47	.014*	0.18
10	- 4.35	.000**	0.30
11	- 6.37	.000**	0.41
Indicator	- 5.45	.000**	0.39

Table 4.22: Paired T-Test and Effect Size for Each Item in the Two Reading Purposes
**. $p < 0.001$ level (2-tailed)
*. $p < 0.05$ level (2-tailed)

The results above seem to indicate that participants had different attitudes toward reading for the two different purposes: course preparation and writing papers. According to previous work (e.g., Goldman, 1997; Lorch et al., 1993; Pressly & Afflerbach, 1995), it is commonly agreed that one's attitude toward different reading purposes may influence one's reading behaviors. Therefore, we can assume that the different attitudes found in this study may be related to students' on-screen reading behaviors. In order to investigate the relationship between the students' attitudes toward reading for different academic purposes and their on-screen reading behavior, Person Produce-moment (r) was used to examine the correlation coefficients between attitude and the five indicators of on-screen reading behaviors, namely preference, tendency, hours per week spent on on-screen reading, maximum number of pages willing to read, and strategy. The indicator score for attitude was calculated first and then correlated with the indicator scores for the

other variables concerning reading behaviors. The correlations among the items are presented in Table 4.23. In general, the participants' attitude toward reading for different purposes showed a slightly stronger association with the participants' on-screen reading behaviors in the RWP condition. While the correlation coefficients, overall, were larger for RWP than for RCP, the correlations between the attitude variable and the five indicator variables of on-screen reading behaviors were considerably weak for both purposes. It is worth noting here that the correlation coefficients between on-screen reading preference and attitude and on-screen reading tendency and attitude were negative. This suggests that the more importance the participants placed on reading for academic purposes, the less they preferred or tended to read texts on a computer screen.

Attitude in different purposes	Preference	Tendency	Hours	Page	Strategy
Reading for course preparation	-.049	-.028	.143	.000	.233**
Reading for writing papers	-.146	-.131	.153*	.019	.321**

Table 4.23: Correlation Between Attitude and Indicators of On-Screen Reading Behaviors for the Two Purposes
**. Correlation is significant at the 0.001 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

In addition, attitude toward academic reading appears to have a positive relationship with the hours the participants would spend on reading academic texts on screen. At first glance, this result may not be surprising. If the participants considered reading for academic purposes to be important, it can be safely assumed that they would spend considerable time on reading their assigned texts. Furthermore, the amount of assigned online reading can be safely assumed to be larger than in the past, when print-based texts

dominated. Hence, the hours spent on on-screen reading would be likely to increase. However, the results show the relationship to be weak.

Overall, the difference in students' attitude toward different reading purposes does not associate with their preference, tendency, number of hours spent on on-screen reading, or maximum number of pages they were willing to read on screen. The results also suggest that even though the participants seemed to have slightly different attitudes toward reading for different academic purposes, their on-screen reading behaviors did not seem to differ notably between the two purposes.

While the coefficient correlation between attitude and the four indicators (preference, tendency, hours spent and page number) were weak, it needs to be pointed out that a relatively large coefficient correlation was found between attitude and strategy for both purposes. More specifically, it was stronger in the RWP ($r = 0.32$) than in RCP ($r = 0.23$). This result corresponds with the descriptive data reported earlier which showed that reading strategy was considered more important when reading for writing papers than when reading for course preparation.

Summary of Results for Part Four of the questionnaire

All listed items overall were considered at least important. The three most important across the reading purposes were: understanding texts, understanding terminology, and organizing what has been read. However, reading for writing papers was considered as more important than reading for course preparation in most regards. In addition, three more items were considered at least important in RWP condition than in RCP; they were: reading in-depth carefully, using reading strategies, and taking notes. Moreover, several

differences in attitudes between the two purposes were strong, indicating that the participants viewed reading for writing to require a more thorough and careful reading process than reading for course preparation. However, the differences did not seem to correlate to students' on-screen reading behaviors.

4.3. Results of Structural Equation Modeling (SEM)

This part of the chapter presents results from structural equation modeling as an additional means of analyzing the study's data. Descriptive statistics presented in the previous section have provided an overall look at each part of the questionnaire. However, the descriptive results cannot fully advance our understanding of the complex relationships amongst the variables under investigation. In order to test a theoretical model accompanying the study and examine what factor or factors may have contributed to the participants' on-screen reading behaviors, Structural Equation Modeling (SEM) was used to test the relationship among all variables spontaneously rather than separately. In addition, SEM, unlike a regression model in which solely a dependent observed variable is predicted or explained, enables us to consider multiple observed variables that are hypothesized to measure one or more latent variables. In so doing, we are better able to capture the complexity of participants' reading behaviors in academic contexts.

4.3.1. Variables

Two identical structural models were tested in this study. One was for on-screen reading behaviors related to the purpose of reading for course preparation (RCP), and the other one was for on-screen reading behaviors related to the purpose of reading for

writing papers (RWP). Each structural model consists of one latent dependent variable, on-screen reading behaviors, and three latent independent variables: participants' perceptions of on-screen reading, computer familiarity, and second language proficiency. The latent dependent variable consisted of five indicators/observed variables: preference, tendency, hours spent reading, number of pages willing to read, and strategy. The indicator scores were explained with the descriptive results in an earlier section.

Items related to the perception factor need to be subjected to Exploratory Factor Analysis (EFA) in order to reduce the observed items into fewer factors. Because items in this variable tended to represent different indicators, combining and considering all items as one indicator was not appropriate. If each item was treated as a single item-level indicator, there would be too many indicators, thus requiring a larger sample size. Therefore, EFA was used. Three components were extracted as a result of EFA in RCP, while four components were extracted in RWP. The model explained 52% of the total variance in RCP and 59% in RWP. In order to determine the number of the components to be retained, eigenvalue and scree plot were examined (see Appendix D). Three components in both purposes were identified, as shown in Table 4.24. The first component was related to the participants' perceptions of advantages of reading on a computer screen. The second component was related to the participants' perceptions of disadvantages of reading on a computer screen. The third one was related to their perspectives on the physical convenience of on-screen reading. As shown in Table 4.24, Items 2, 5, 6, 7, 13, 15 and 17 loaded on Component 1, Items 8, 9, 10, 12 on Component 2, and Item 16 on Component 3. The three components, in fact, corresponded to the assigned conceptual considerations. Component 1 was labeled "advantage" (Adv),

component 2 “disadvantage” (Dis), and component 3 “portability” (Prot). Notice that item 11 did not load high in any of the components. Therefore, it was deleted. As a result, the three components will be used as three indicators in the later correlation analysis and model testing. Indicator scores were calculated by summing up all item scores under one component. Each item score was calculated by summing up the score for each item by multiplying its factor loading. One thing needed to be mentioned here, it will be conceptually inappropriate for one factor contains only one variable. However, considering one of the requirements for model testing in that one latent variable needs at least three indicator variables, the researcher decided to keep the three components as EFA results suggested.

Variable	RCP Factor loadings	RWP Factor loadings	Item
Advantages	.572	.545	I take an overview on screen first before I decide whether to print them out
	.646	.551	I read texts on screen to save printing costs.
	.503	.500	I skim texts faster on a computer screen than on paper.
	.621	.580	If I only want to get an overview rather than details, I read texts on screen.
	.630	.619	I read texts on screen because they are freely available on the Internet
	.598	.602	When I need to search for other references while I am reading, I read texts on screen.
	.478	.441	When I only need to read parts of the texts, I read on screen
Disadvantages	.641	.673	If I begin to read on screen and find the texts are difficult, I will print out the texts.
	.599	.501	When I have to re-read texts, I do not read them on screen.
	.527	.474	I do not read texts on screen because it is easy for me to get lost from scrolling up and down.
	.768	.706	When I need to read texts closely, I do not read on screen.
Portability	.716	.578	I only print out texts if I need to bring them with me wherever I go.

Table 4.24: Factor Loadings for the Students’ Perceptions Factor

In order to conduct a correlation matrix analysis, 8 items regarding second language proficiency were transformed into 5 indicators. Four questions related to the length of years were calculated by their mean scores. The four multiple-choice items regarding self-reported second and first language literacy proficiency were analyzed by summing up the scores of the items belonging to the variable and then dividing the summed score by the number of items due to a high reliability score ($\alpha = .87$). The indicator was named "L2 literacy proficiency." As such, the five indicators associated with this L2 proficiency variable were: 1) years in graduate school (Yr1), 2) years in an English-speaking country (Yr2), 3) years of studying in an English-speaking country (Yr3), 4) years of learning English (Yr4), and 5) L2 literacy proficiency (L2lit).

Finally, 9 items regarding the computer familiarity latent independent variable were transformed into 4 indicators: hours of using a computer (Comhr), computer experience (Comex), frequency of leisure reading in L2 (L2fre), and frequency of leisure reading in L1 (L1fre). 'Hours of using a computer' was calculated using the mean score. 'Computer experience' was calculated by summing up the scores of the items belonging to the variable and then dividing the summed score by the number of items. 'Frequency of leisure reading in L2' was calculated by summing up the scores for each of the two items and multiplying by its factor loading (Table 4.25). The same procedure was applied to 'transformed frequency of leisure reading in L1.' The four indicators were, further, correlated with the five indicators of on-screen reading behaviors.

Component	Factor loadings	Items
Frequency of on-screen reading for leisure in native language (L1fre)	.725 .725	Hours of spend Maximum page
Frequency of on-screen reading for leisure in English (L2fre)	.785 .785	Hours of spend Maximum page

Table 4.25: Factor Loadings for Reading Frequency in L1 and L2

4.3.2. Assumptions of Each Indicator Variable

The normality assumption was tested here. The value of skewness was used to judge whether an indicator had a normality problem. Indicators collected from Likert-type scale items were examined first. As displayed in Table 4.26 , the values of skewness in the three dependent indicators (preference, tendency, and strategy) and three perception indicators (advantage, disadvantage, and portability) were within the acceptable range between +/-2.0 (George & Mallery, 2005), meaning that all indicators were normally distributed.

	RCP			RWP		
Indicators	M	SD	Skewness	M	SD	Skewness
Preference	9.55	4.32	.88	9.74	4.31	.69
Tendency	11.04	4.44	.43	11.02	4.50	.48
Strategy	72.14	10.61	-.61	74.69	9.88	- .07
Advantage	17.69	3.32	- .66	16.73	3.09	- .66
Disadvantage	6.81	2.43	.47	6.13	1.78	.25
Portability	2.46	1.10	.11	- 2.05	.94	.46

Table 4.26: Descriptive Statistics and Skewness values

Indicators that were not measured separately for the two different reading purposes were further checked for their normality, including computer familiarity, hours of using computer per week, and frequency of leisure reading on-screen in L1. Their skewness values are listed as follows: 1) computer familiarity had a skewness value of - 0.64 (M = 13.73, SD = 1.98), 2) hours of using a computer per week had a skewness value of .60 (M=48.16, SD=25.22), and 3) frequency of on-screen casual reading in L1 had a skewness value of 1.54 (M = 25.28, SD = 24.21). Finally, the indicator for second language literacy proficiency was normal, with a skewness value of - 0.71 (M = 32.08, SD = 4.64). Again, all the reported values of skewness should not be problematic because they were within the acceptable range.

However, skewness problems were observed in indicator variables regarding self-reported on-screen reading hours and page numbers in academic reading, on-screen reading frequency of casual reading in second language, and years of studying in an English-speaking country. In RCP, both variables related to hours and page numbers were positively skewed. In RWP, one variable, number of page numbers read for reading academic texts on a computer screen, was normally distributed (M = 24.62, SD = 28.78, Skewness = 1.71), but the hours of reading academic texts on a computer screen was positively skewed. Square root transformation was then applied to correct skewness. Table 4.27 presents the descriptive statistics of the original data and that of the transformed data. Even though transforming data makes interpretation difficult, this will affect the interpretation of the estimates in the measurement model, but not so much in the structural model.

	Original data			Transformed data		
	M	SD	Skewness	M	SD	Skewness
Hours of academic reading on a computer screen in RCP	10.12	12.43	3.80	2.73	1.64	.91
Pages willing to read academic texts on a computer screen in RCP	17.99	21.80	2.42	3.66	2.15	1.11
Hours of academic reading on a computer screen in RWP	15.38	17.58	2.40	3.35	2.04	.66
Frequency of on-screen casual reading in L2	14.55	16.68	2.99	3.38	1.77	1.24
Years of studying in an English-speaking country	3.97	3.75	3.29	1.83	.78	1.15

Table 4.27: Original Values and the Transformed Skewness Values from Five Variables

4.3.3. Model Testing

Before establishing the factor structure for on-screen reading behaviors, this model needed to be subjected to a confirmatory factor analysis (CFA) to determine how well it fit the data. Each measurement model was submitted to a CFA. CFA is one application of structural equation modeling. It is used to confirm whether a set of variables defines the theoretical construct or factor. Many criteria can be used to evaluate the fitness of a model. Chapter Three presented each criterion used in this study to judge the goodness-of-fit. A brief summary was given as follows. Five criteria were used here. First, chi-square is one of the most frequent used criteria. However, chi-square is sensitive to the sample size. Hence, practical measures of model fit are considered in a comprehensive assessment of this factor structure. The goodness-of-fit index (GFI), the adjusted goodness-of-fit (AGFI), Root-mean-square error of approximation (RESEA), and Normed fit index (NFI) were used as global model fit indices. Byrne (1998) suggests that RMSEA values less than .05 signify a good fitting model. Schumacker and Lomax

(2004) suggest the maximum value of RMSEA should be less or equal to .08. A GFI value above .95 or at least .90 is suggested. Like GFI, the range of possible AGFI values is from zero to one, with values greater than .90 indicative of good model fits. The last model fitting index utilized in this study was NFI, a measure that rescales chi-square into a zero (no fit) to one (perfect fit) range. A NFI value above .90 is considered an acceptable fit.

The second criterion in judging the statistical significance and substantive meaning of a theoretical model is to compare a t value of each parameter to a tabled t value of 1.96 at the .05 level of significance. The critical t value is computed by dividing the parameter estimates by a standard error of the parameter (Schumacker & Lomax, 2004, p. 81). In most cases, researchers might eliminate parameters that are not significantly different from zero. The third criterion considers the magnitude and the direction of the parameter estimates. Particular attention was paid to whether a positive or a negative coefficient made sense for the parameter estimate.

4.3.3.1. Measurement Models

Dependent measurement models of reading behaviors were tested. All indicators, including preference, tendency, hours spent using a computer, maximum number of pages willing to be read, and reading strategy were put into the measurement model. Standardized factor loadings for both purposes are presented in Table 4.28 along with the chi-square values and global fit indices. Note that RCP models did not satisfy a majority of the fit indices, and the RWP model fit relatively better, satisfying three out of five criteria. However, the parameters of strategy to reading behaviors (RB) in both models

were not statistically significant after being analyzed by t-test (t > 1.96). Therefore, the reading strategy indicator was eliminated in the following modified models.

Estimates/Path loading	RCP	RWP
Preference→ RB	.80*	.83*
Tendency→ RB	.90*	.85*
Hour→ RB	.40*	.25*
Page→ RB	.29*	.38*
Strategy→ RB	.10	.12
Covariance hour and page	.22*	.32*
Chi-square (df; p)	18.19 (4; .001)	9.46 (4; .05)
RMSEA	.15	.09
NFI; GFI; AGFI	.90; .96; .84	.94; .98; .92

Table 4.28: Path Coefficients in the Two Initial Reading Behavior Measurement Models and Global Model Fit Indices
* $p<.05$

Two modified reading behavior measurement models are displayed in Figure 4.1 and 4.2. below. Latent constructs are presented in ellipses, and observed variables are presented in rectangles. Straight arrows indicate causal relationships, and curved arrows denote correlations. Note that the goodness of fit in the two models improved as the reading strategy variable was excluded in the models. The chi-square minimum fit function showed a statistically non-significant value in both models, $x^2 = 0.44$ ($df = 1$, $p = 0.50$) in RCP and $x^2 = 0.07$ ($df = 1$, $p = 0.79$), meaning the chi-square test failed to reject the null hypothesis. Moreover, global fit indices satisfied their thresholds for model fit (Table 4.29).

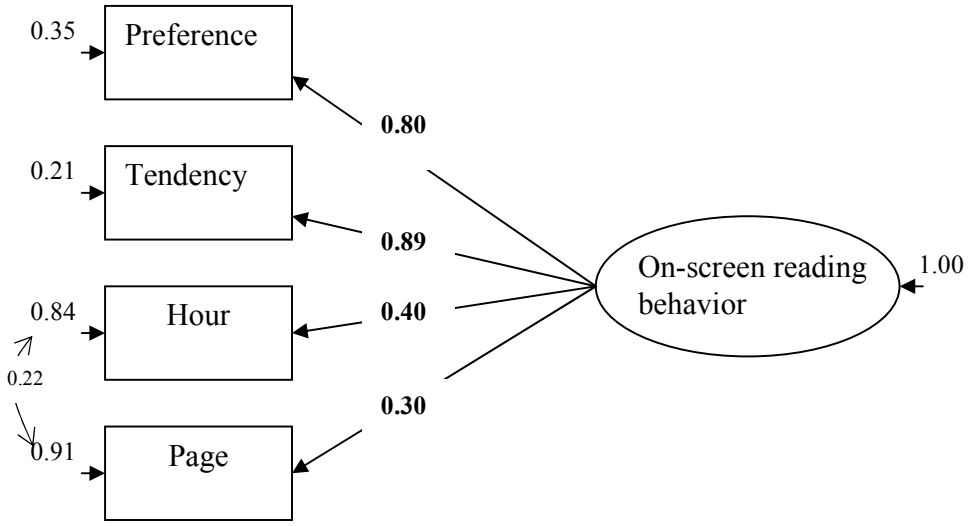

Figure 4.1: Measurement Model of Reading Behaviors for Course Preparation

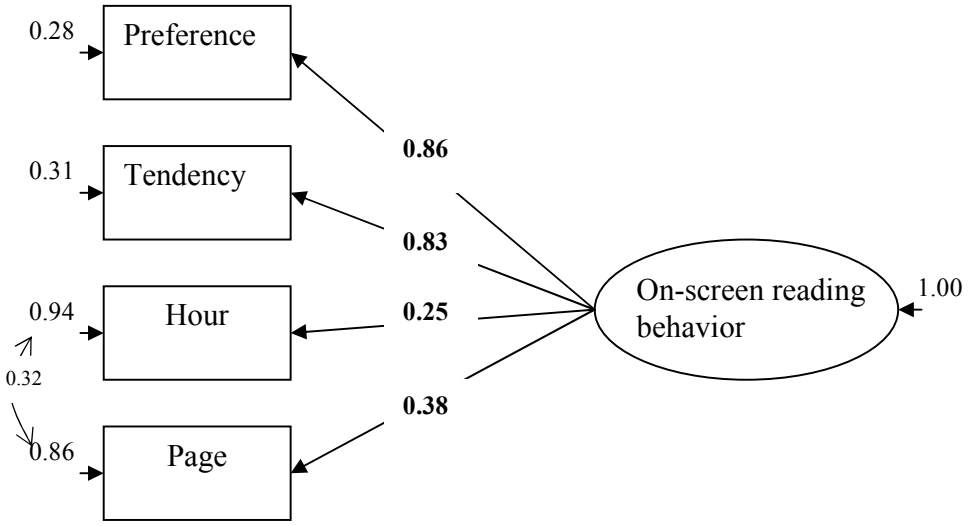

Figure 4.2: Measurement Model of Reading behaviors for Writing Papers

	RCP	RWP
RMSEA	.00	.00
NFI; GFI; AGFI	1.00; 1.00; .99	1.00; 1.00; 1.00

Table 4.29: Global Fit Indices of On-Screen Reading Behaviors in the Two Modified Models

When the estimates were examined by *t*-test to determine if the correlation coefficients were significant, all of the path estimates were found to be statistically significant ($p < .05$). With ample evidence supporting lack of fit for the five-indicator measurement model, four indicators were considered in the final measurement model of on-screen reading behaviors.

Three independent measurement models were further tested. Figure 4.3 displays the standardized path estimates, or factor loadings, linking the indicators with the perception factor. The perception factor has only three indicators, which makes the model a just-identified one. Therefore, it was tested along with the model of reading behavior. Again, the strategy indicator was not included in this model because the path estimate was not significant. In addition, one error covariance was added between the advantage variable and disadvantage variable. The chi-square minimum fit function in RCP yielded a statistically non-significant value, $x^2 = 13.89$ ($df = 11$, $p = 0.27$) but not in RWP, $x^2 = 20.60$ ($df = 11$, $p = 0.04$). Looking at the global fit indices, the models in both purposes satisfied their thresholds for model fit (Table 4.30).

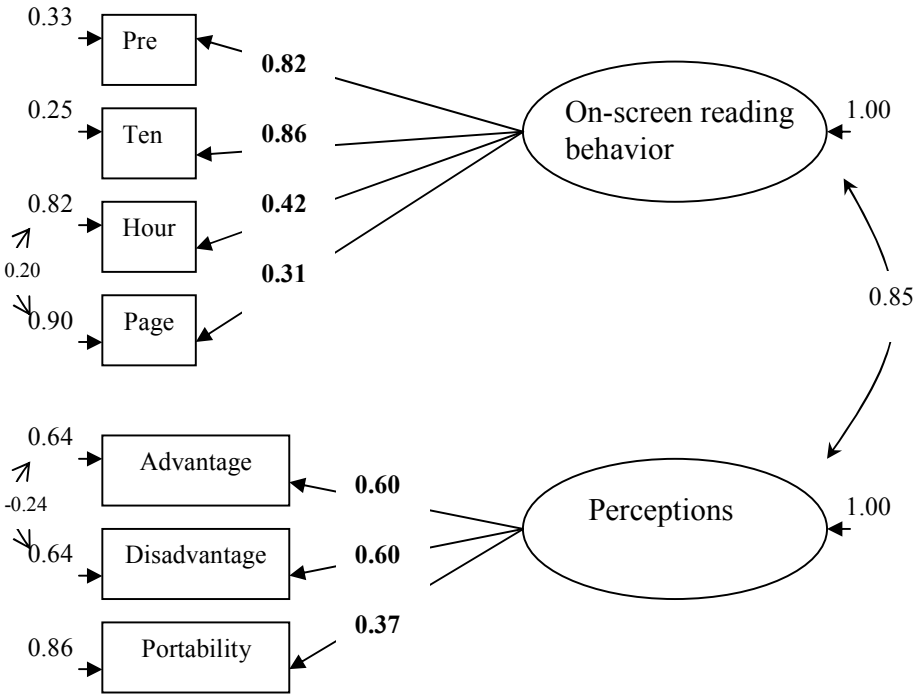

Figure 4.3: Perception and On-Screen Reading Behavior Measurement Models in RCP

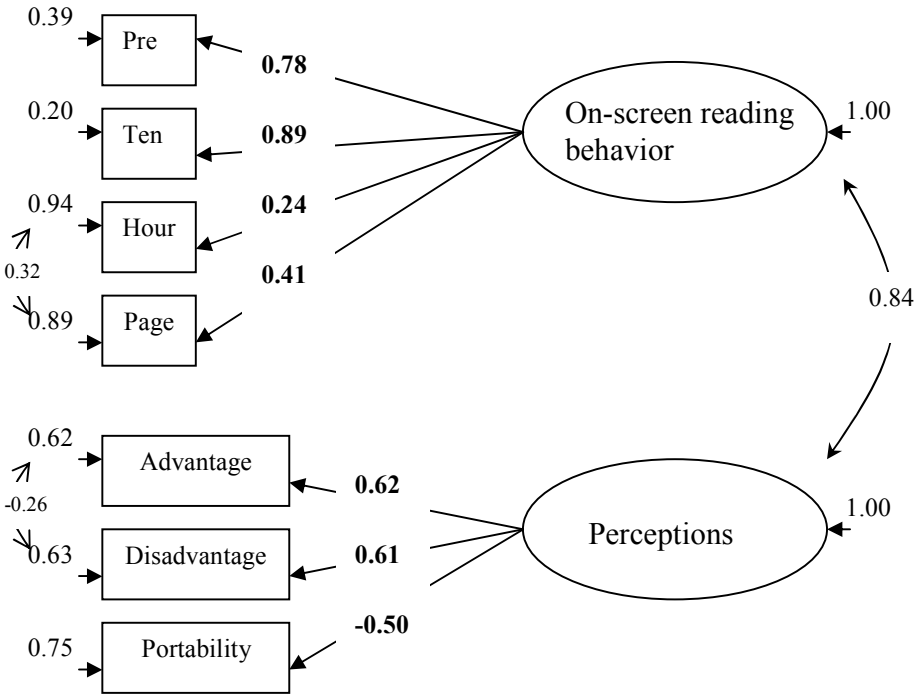

Figure 4.4: Perception and On-Screen Reading Behavior Measurement Models in RWP

	Course preparation	Writing papers
RMSEA	.04	.07
NFI; GFI; AGFI	.97; .98; .94	.95 .97; .91

Table 4.30: Global Fit Indices for Measurement Models of the Perception Factor for the Two Purposes

Each path estimate was once again tested for its statistical significance using a *t*-test analysis, as seen in Figure 4.4 above. All paths were statistically significant. Therefore, no parameter was eliminated in these two models. Note that a difference between the two models appears in the parameter of portability. In RCP, the coefficient correlation was positive, while the coefficient correlation was negative in RWP.

Measurement models of computer familiarity (COMFAMI) and second language proficiency (L2PRO) are presented in Figure 4.5 and Figure 4.6. As can be seen, the standardized path coefficients indicate strong, positive relationships between indicators and underlying factors. Both models have non-significant chi-square values, $x^2 = 1.07$ ($df = 1$, $p = 0.30$) in COMFAMI and $x^2 = 4.58$ ($df = 4$, $p = 0.33$) in L2PRO. All but one of the global model fit statistics in COMFAMI and all in L2PRO yielded satisfactory correspondence between the models and the data, thus implying the proposed theories are reasonable (Table 4.31). One error covariance correlation was added between years of studying in an English-speaking university and years spent in graduate school. This error covariance is conceptually understandable. Most of the international students go aboard to study. Therefore, the time they spend in studying in a foreign country may overlap the time they live in an English-speaking country. As such, these two indicator variables could be correlated in error terms.

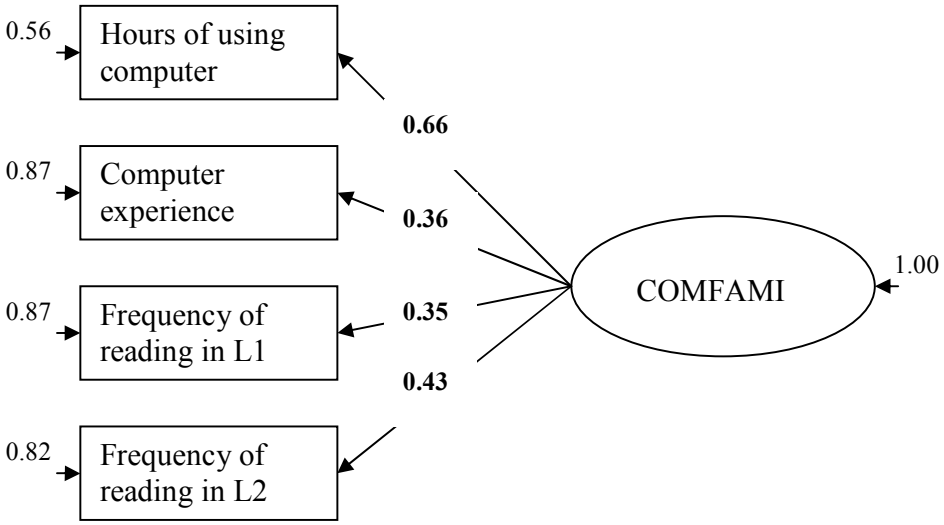

Figure 4.5: Measurement Model for Computer Familiarity

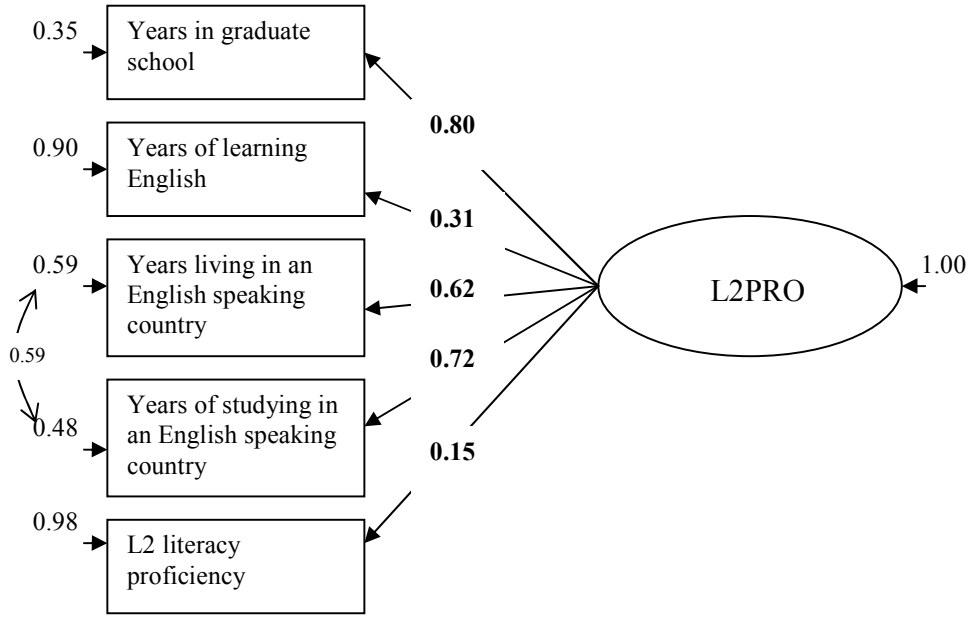

Figure 4.6: Measurement Model for Second Language proficiency

	COMFAMI model	L2PRO model
RMSEA	.00	.03
NFI; GFI; AGFI	.99; 1.00; .97	.98; .99; .96

Table 4.31: Global Fit Indices for Measurement Models of Computer Experience and of Second Language Proficiency

When each path parameter in the two models above was tested, one parameter, L2 literacy proficiency, was found to be statistically non-significant. Therefore, self-rated L2 literacy proficiency was eliminated when this model was tested in the structural model.

Overall, the magnitudes of all measurement terms were associated with the strength of the path coefficients linking the indicators to the respective factors. As mentioned previously, two factor loadings were found to be statistically non-significant ($t < 1.96$) for both purposes: strategy and self-reported second language literacy proficiency. According to Schumacker and Lomax (2004), variables with non-significant parameters on a factor are intended not to measure that factor. Therefore, the non-significant parameters would not be included when the structural models were tested.

4.3.3.2. Structural Model with Three Latent Independent Variables

After examining each measurement model, the structural models of the two purposes were examined. Several variables were adjusted when the structural models were tested: 1) the non-significant paths in the measurement models were deleted in the structural models; and 2) the largest loadings in the measurement models were fixed to 1. The purpose of fixing one factor loading for each latent variable to 1.0 was to avoid an

indeterminacy or ID problem. Table 4.32 lists the standardized factor loadings for both reading purposes along with the model fit indices.

Note that these two models did not satisfy most of the model fit indices. The chi-square was too large to reject the null hypothesis. NFI and AGFI were below the threshold value of .90. A poor fit model indicates that this sample data did not support the hypothesized model. When looking at the three estimated parameters, the direction of each parameter was expected. Students' perception of on-screen reading had the strongest correlation to students' on-screen reading behaviors for both reading purposes. Computer familiarity, on the other hand, was not influential in either model. Second language proficiency was statistically significant in RWP but not in RCP.

	RCP N=168		RWP N=168	
variable	Loading	R^2	Loading	R^2
Preference (pre)	.81*	.66	.77*	.60
Tendency (ten)	.87*	.76	.90*	.80
Hours (hr)	.42*	.18	.41*	.17
Pages (pg)	.32*	.10	.25*	.06
Advantage (adv)	.61*	.37	.61*	.38
Disadvantage (dis)	.60*	.36	.60*	.36
Portability (port)	.37*	.14	- .51*	.26
Hour of using computer (comhr)	.40*	.16	.40*	.16
Familiarity of using computer (comuse)	.55*	.30	.56*	.31
Frequency of on-screen reading in L1 (frel1)	.18*	.03	.14*	.02
Frequency of on-screen reading in L2 (frel2)	.45	.21	.42	.18
Years in grad school (yr1)	.65*	.42	.66*	.44
Year of learning English (yr2)	.27*	.07	.27*	.08
Years in an English-speaking country (yr3)	.81*	.65	.79*	.63

Table 4.32: Factor Loadings Between Indicators, Latent Variables, and Error Covariance in the Initial Models (continued)

Table 4.32 Continued

Years of studying in an English-speaking country (yr4)	.90*	.80	.88*	.77
Per → RB	.77*		.77*	
Comfami → RB	.09		.14	
L2pro→ RB	.17		.18*	
Covariance adv and dis	-.24		-.25	
Covariance frel1 and frel2	.40		.42	
Covariance yr3 and yr4	.20		.26	
Covariance hr and pg	.20		.32	
Chi-square (*df*; *p*)	124.44 (80; .001)		115.53 (80; .005)	
NFI; GFI; AGFI; PNFI	.88; .91; .86; .67		.88; .92; .87; .67	
RMSEA	.058		.052	

*. $t < 1.96$, $p = 0.05$

However, because the models did not fit well with the current data, some modified models were considered: 1) adding more error covariance in each model based on the modification indices and conceptual and theoretical judgments; and 2) creating a new parsimonious model in which the least value of estimate coefficient would be deleted. Both approaches were used to see how well the new models fit.

4.3.3.3. Model Modification

As the modification indices suggested, several error terms among the observed variables were correlated. Judgments were made according to previous literature and practically and conceptually understanding. In both structural models, two error covariance terms were added. One was between hours spent using a computer and hours spent reading academic texts on a computer screen. The other one was between positive perception and hours of reading academic texts on a computer screen. After adding the

two error covariances, both models showed a better fit. Table 4.33 displays the factor loadings between indicator variables, four latent variables, and error covariance.

	RCP N=168		RWP N=168	
Variable	Loading	R^2	Loading	R^2
Preference (pre)	.82*	.66	.77*	.60
Tendency (ten)	.87*	.76	.91*	.80
Hours (hr)	.41*	.18	.41*	.17
Pages (pg)	.32*	.11	.25*	.06
Advantage (adv)	.59*	.37	.58*	.38
Disadvantage (dis)	.61*	.36	.61*	.35
Portability (port)	.37*	.14	- .51*	.26
Hour of using computer (comhr)	.37*	.14	.44*	.19
Familiarity of using computer (comuse)	.52*	.27	.53*	.28
Frequency of on-screen reading in L1 (frel1)	.15*	.02	.17*	.03
Frequency of on-screen reading in L2 (frel2)	.46	.22	.46	.21
Years in grad school (yr1)	.64*	.41	.66*	.43
Year of learning English (yr2)	.26*	.07	.27*	.07
Years in an English-speaking country (yr3)	.82*	.68	.80*	.64
Years of studying in an English-speaking country (yr4)	.90*	.83	.89*	.79
Per → RB	.77*		.79*	
Comfami → RB	.09		.11	
L2pro→ RB	.15		.19*	
Covariance adv and dis	- .22		- .25	
Covariance frel1 and frel2	.41		.40	
Covariance yr3 and yr4	.21		.24	
Covariance hr and pg	.21		.31	
Chi-square (*df*; *p*)	98.96 (78; .05)		93.32 (78; .11)	
NFI; GFI; AGFI; PNFI	.90; .93; .89; .67		.91; .93; .89; .67	
RMSEA	.040		.034	

Table 4.33: Factor Loadings Between Indicators, Latent Variables, and Error Covariance in the First Modified Models

*. $t < 1.96$, $p = .05$

Notice that the significance of the parameters remained the same. Second language proficiency and computer familiarity still were not statistically significant in the RCP model. The parameter of second language proficiency, however, was statistically significant in the RWP model. This result indicates that although the models would fit better after adding more error covariance terms, the overall path coefficient between latent variables in this model did not change much. Structural models of the two purposes are displayed in Figures 4.7 and 4.8.

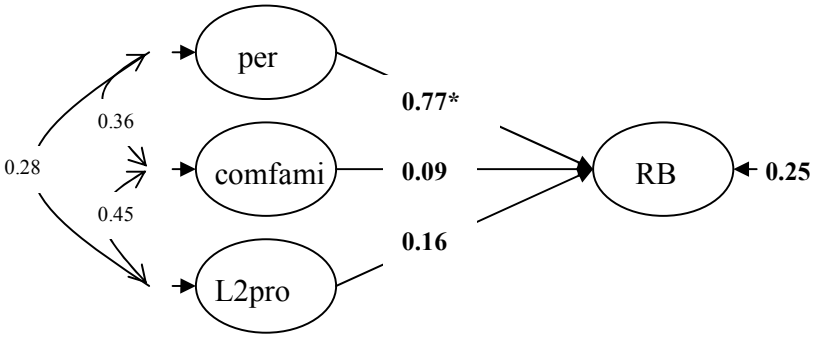

Figure 4.7: Structural Model of Reading Behaviors in Reading for Course Preparation Purpose
Note: RB = on-screen reading behaviors, per = perceptions, comfami = computer familiarity, and L2 pro = L2 proficiency

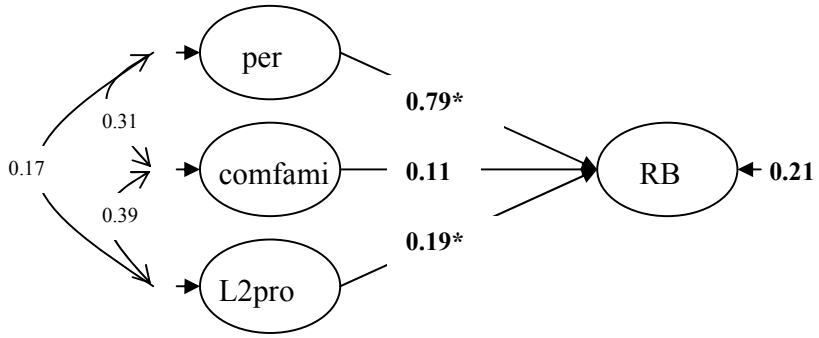

Figure 4.8: Structural Model of Reading Behaviors in Reading for Writing Papers Purpose
Note: RB = on-screen reading behaviors, per = perceptions, comfami = computer familiarity, and L2 pro = L2 proficiency

Path coefficients were also found to differ by purposes: 1) the path from perceptions to the on-screen reading behaviors was slightly stronger in RWP than in RCP; 2) the path from computer familiarity to on-screen reading behaviors was weak for both purposes ($p > .05$), even though the coefficient was slightly stronger in RWP than in RCP; 3) the path from second language proficiency to on-screen reading behaviors was stronger in RWP ($p < .05$) than in RCP ($p > .05$). Overall, the model for RWP had a better fit based on the current data.

From the results of the two structural models, the following three factors contributed differently to reading behaviors for the two purposes. In RCP, only perceptions had the strongest association with the reading behaviors, with a coefficient value of 0.77. The other two factors, computer familiarity and second language proficiency, did not have a strong influence on participants' on-screen reading behaviors, with statistically non-significant values of 0.07 and 0.16. On the other hand, two factors seemed to contribute

significantly to participants' on-screen reading behaviors in RWP: students' perceptions and second language proficiency. Moreover, the path coefficient of parameters in RWP associated more strongly with the dependent latent variable, on-screen reading behaviors, than those in RCP. This result suggests that the predicted factors may better explain on-screen reading in RWP than in RCP based on the sample data.

The second modified model tested was that with two latent independent variables. In this parsimonious model, the parameter that had the smallest path loadings, computer familiarity, was eliminated. Computer familiarity was deleted from the initial model rather than the second model, which had more error covariance terms. Standardized factor loadings for each parameter in both purposes along with the goodness of fit indices are presented in Table 4.34.

	RCP N=168		RWP N=168	
variable	Loading	R^2	Loading	R^2
Preference (pre)	.81*	.66	.78*	.60
Tendency (ten)	.87*	.76	.90*	.80
Hours (hr)	.41*	.17	.41*	.16
Pages (pg)	.31*	.10	.24*	.06
Advantage (adv)	.60*	.36	.61*	.38
Disadvantage (dis)	.60*	.36	.60*	.36
Portability (port)	.37*	.14	- .51*	.26
Years in grad school (yr1)	.66*	.44	.69*	.47
Year of learning English (yr2)	.27*	.08	.29*	.08
Years in an English-speaking country (yr3)	.79*	.62	.75*	.58
Years of studying in an English-speaking country (yr4)	.88*	.77	.85*	.72
Per → RB	.80*		.81*	
L2pro→ RB	.19*		.23*	

Table 4.34: Factor Loadings Between Indicators, Latent Variables, and Error Covariance in the Second Set of Modified Models (continued)

Table 4.34 (continued)

Covariance adv and dis	- .23	- .25
Covariance yr3 and yr4	.26	.30
Covariance hr and pg	.21	.32
Chi-square (*df*; *p*)	51.72 (38; .08)	54.49 (38; .04)
NFI; GFI; AGFI	.94; .95; .91	.93; .94; .90
RMSEA	.047	.051

*. $t < 1.96$, $p = .05$

Note here that after eliminating computer familiarity, the fitting indices indicated an acceptable fit for the overall sample in RCP, while four of the indices indicated an acceptable fit in RWP. LISREAL modification indices suggested adding one more error covariance between advantage (ADV) and on-screen reading hours (HR) in the RWP model could improve the goodness of fit. If added, the fit indices showed that the latter model fit better with the current data than the previous one in RWP. The latter model had a chi-square value of 40.44 ($df = 37$, $p = 0.32$), RMSEA of 0.024, NFI of 0.95, GFI of 0.96, and AGFI of 0.92. However, four out of five fit indices satisfied the threshold and can be considered as the model fit. Moreover, all parameters tested in these models were statistically significant. Therefore, the recommended error covariance was not added in the models presented below. Figures 4.9 and 4.10 exhibit the structural models for the two reading purposes.

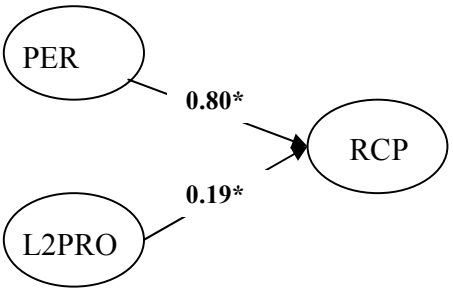

Figure 4.9: Structural Model of Reading Behavior for Reading for Course Preparation Purpose

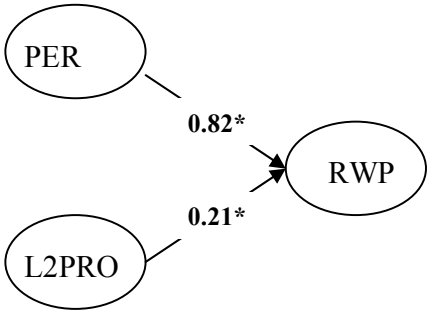

Figure 4.10: Structural Model of Reading Behavior for Reading for Writing Papers Purpose

Eliminating one latent independent variable seems to have had a great impact on the overall model fit and the significance of the path estimate. Second language proficiency was not significant in the first two structural models in RCP. However, after controlling for COMFAMI, the path coefficient of L2PRO changed from non-significant to significant in the RCP model. This may be explained by the relations between indicators

in COMFAMI and the latent variable L2PRO. From the modification indices, most of the expected change paths were directed from L2PRO to observed variables of COMFAMI, indicating that L2PRO can be explained by three out of four observed variables in COMFAMI. In the RWP structure model, however, no paths from L2PRO to observed variables of COMFAMI were found. As a result, eliminating COMFAMI had a greater impact on the RCP model rather than the RWP model.

Overall, the structural models for the two reading purposes fit the sample data. However, the model fits the sample data better in the reading for course preparation purpose under the same degree of freedom. In the reading for writing papers purpose, more error covariance terms needed to be considered in order to have a better fit model. The two models also were assessed by examining the standardized path coefficients for the relations among the latent variables. The examined parameters were all statistically significant ($p < .05$). Moreover, those paths were in the expected direction.

Summary of SEM Results

The results of the SEM analysis showed that the perception factor had the strongest contribution to on-screen reading behaviors in both purposes. In the initial and modified three-latent-independent-variables tested models, perceptions showed a consistently positive and strong influence on participants' on-screen reading behaviors. Computer familiarity, on the other hand, was not associated with their on-screen reading behaviors for either of the reading purposes. The path from computer familiarity to the dependent latent variable was not statistically significant. Moreover, the parsimonious model revealed a better fit after this factor was eliminated from the model. All these

results indicate that the degree of participants' familiarity with computers did not influence their on-screen reading preference, tendency and frequency.

It should also be noted that second language proficiency contributed differently to on-screen reading behaviors in different reading purposes. In reading for course preparation, the path from second language proficiency to the on-screen reading behaviors was not statistically significant. In other words, second language proficiency did not have an association with the participants' on-screen reading behaviors. Only when the computer familiarity variable was eliminated from the model did the path of second language proficient become statistically significance. As explained earlier, this was due to the association between the factor of second language proficiency and indicators of computer familiarity. In the reading for writing purpose condition, the path was statistically significant, which indicates that second language proficiency had a small and positive association with the on-screen reading behaviors.

4.4. Data from Interviews

In this section of Chapter Four the results from the qualitative portion of this explanatory mixed methods study are presented. Follow up interviews of several participants were conducted in order to gain more in-depth understanding of how graduate students read academic texts on a computer screen in order to offer some additional perspectives on the study's quantitative results. Thus, while the quantitative results are considered the most significant part of the study, the qualitative results provide a valuable supplementary dimension to what the quantitative results reveal. A total of nine questions were asked in the semi-structured interviews. The first part of this section will present the participants' responses in accordance with the questions asked. The second part will present a cross-case analysis. Factors which seemed to contribute to the interviewees' on-screen reading behaviors will be discussed.

4.4.1.Background of the Interviewees

Among the original participants responding to the invitation from the researcher to participate in the follow-up interview, six interviewees were selected purposefully based on their on-screen reading behaviors. Pseudonyms are used to refer to them. Two participants, Wendy and CJ, had a low degree of engagement in on-screen reading behaviors. Helen had a relatively high degree of involvement in on-screen reading. Tess had a high degree of involvement in on-screen reading when reading for course preparation, while Patti, on the other hand, had a high degree of involvement in on-screen reading when reading for writing. Tony had neutral engagement in on-screen reading. Table 4.35 presents each participant's on-screen reading behaviors regarding preference,

tendency, frequency, and strategy use as well as their years of living in the U.S. and self-report second language proficiency.

student	Wendy	CJ	Helen	Tess	Tony	Patti
Degree	master	master	doctoral	master	doctoral	doctoral
Years of living in the U.S.	1.5	1.5	6.5	4	3.5	2.5
Preference in RCP	4	4	12	13	11	4
in RWP	4	4	19	4	9	10
Tendency in RCP	4	4	12	19	11	10
in RWP	4	4	17	12	9	18
Hours/week in RCP	0.5	3.5	8	6	0.75	12
in RWP	0.05	3.5	12	6	0.3	12
Pages in RCP	3	5	100	5	10	6
in RWP	3	5	30	2	5	6
Self-report L2 proficiency	29	31	38	35	31	32

Table 4.35: Background Information about the Six Interviewees

4.4.2. Reading for Course Preparation

4.4.2.1. Reading Materials

When reading for course preparation, four students reported that textbooks and journal articles were the two main required materials to read. As Wendy explained, "*Textbooks are the main reading materials and then the teacher will add some more papers*." In the same vein, Patti added, "*You definitely need to go through the assigned textbooks if that's necessary and then will be papers*." For Tony, textbooks were the main material for course preparation. On the average, he read one to two chapters for each class per week. The professors in his discipline, statistics, did not often require students to read additional materials. The materials professors put on Carmen (an online system

many professors use to provide course information, encourage discussion, etc.), if any, were optional information for students to better understand "*the history/story about a theory or some mathematics*."

For Tess, however, journal articles were the main reading assignments for course preparation. "*Textbooks in business class are not so much useful*," Tess explained, "*they [textbooks] are very useful like helping us to understand the concept like finance theories, investment. But if you want to discuss something, textbooks sometimes are not useful at all*." Moreover, professors in business emphasize combining what had happened in the past with what happens right now. Because textbooks were published two or three years ago, they "*are not up-dated at all*." As a result, the majority of the materials Tess read to prepare for courses were articles either put on Carmen by professors or from business magazines, such as the *Wall Street Journal*. Unlike research articles, these articles are relatively short, with an average length of 2 to 3 pages.

4.2.2.2. On-Screen Reading Behaviors: Preference, Tendency, Frequency and Strategies

Because a large proportion of the participants' reading was from textbooks, they tended to engage more in print-based or hard copy reading. Their only real opportunity for engaging in on-screen reading was when the additional journal articles were available online or put on Carmen by the instructors. For those materials, the majority of these participants reported that they had a high tendency to print them out and read them off-screen. Participants with a low level of engagement with on-screen reading behaviors responded that they would print out all materials professors put on Carmen without hesitation. As Wendy stated, "*I definitely will print them out. For the required articles,*

because teachers will discuss them in class seriously, I will print all of them out and read them closely." CJ added, "*For those articles professors put on Carmen, I will print them all out without a second thought. I just can't read on a computer screen.*"

Helen, Tess and Patti, who had a relatively higher level of engagement with on-screen reading behaviors, offered particularly interesting perspectives on the conditions in which they would print out the articles rather than read them on-screen. In Helen's case, "*Usually the choice to read a paper-based version will be made when I need to read the article in detail and I need to take notes on it*." For Tess, "*If the article is important which helps me in class discussion, I print it out*." Patti also mentioned that she would print the digital material out "*if the paper is very important*." All three of them responded that they tended to print out texts if the texts were important and required careful reading. Tony's responses corresponded to this reading pattern in that "*if it's relevant, I will print it out.*" In addition, Tess tended not to read texts on a computer screen if the article was over five pages long.

Still, there were circumstances in which the participants chose to read materials on a computer screen. "*I'm more inclined to read on a computer screen for articles that do not require extensive note taking*," Helen explained. In line with Helen's response, Tess stated that the materials she chose to read on a computer screen would be "*60 70% of the time I can go through [the readings] quickly*." Patti, on the other hand, was more concerned about the quantity of required readings: "*If I have to go through 10 articles, I would feel hesitate [to print them all out] because it'd really cost me a lot of money. I would just scan titles and find out five most important articles and then print out that five*." In Tony's case, the option for him to read on a computer screen was "*if I don't*

understand, I will search the Internet and try to find the answers. Sometimes [I read] some historical things about how one theory changed over time and personal stories of some theorists if I'm interested in." Tony hardly printed out the materials because those references that professors put on Carmen or that were otherwise available online were optional rather than required for the courses. Therefore, he felt that he did not need to read them carefully.

When asked what strategy they used to read on a computer screen, CJ responded that she "*just can't read academic articles on the computer screen*." Therefore, she did not have any on-screen reading strategies. Wendy also claimed that "*I feel that actually I can't use any reading strategies for on-screen reading. I may just use cursor to guide me while I read through*." Interestingly, being unable to use reading strategies while reading on screen was a point expressed not only by the participants who had a low level of engagement in on-screen reading behaviors. Other participants who engaged in relatively more on-screen reading behaviors than Wendy and CJ also indicated that they did not actually apply reading strategies when reading on-screen. Tony, for instance, mentioned that his on-screen reading behaviors were mostly "*a skimming type of reading*." Helen shared a similar reading pattern: "*I will read articles which I can read fast on a computer screen*." In other words, she had little need to employ reading strategies under these circumstances. In same vein, Tess explained that "*I read the materials that do not require careful reading [on a computer screen]*." When the participants mentioned "careful reading," they meant reading in which they needed to use strategies, such as underlining, highlighting, and jotting down notes in the margin of texts. Perhaps because reading on a computer screen is not as easy for students with respect to using strategies as they are

with a hard copy, these participants did not indicate a high level of strategy usage in the interviews. This finding supports the quantitative data reported earlier, in that the path coefficient from on-screen reading strategy to on-screen reading behaviors in the reading-behavior CFA models were not statistically significant.

4.4.3 Reading for Writing Papers

4.4.3.1. Reading Materials

When the participants read for writing papers, journal articles and research papers were the main materials they relied on. Except for CJ, who claimed that she did not have many chances to search for references while writing papers, the majority of these participants reported that their references mainly came from online articles. "*Only when the digital articles are unavailable, I will find books or hard copy articles*," said Tony. Tess added, "*The readings definitely will be from online articles, business articles, mostly from Wall Street Journal.*" Two main reasons the participants chose for searching for articles on the Internet were related to convenience and updating of information. Helen explained that "*usually I rely on online journal more because it's easier to get in terms of availability. Books are not that easy comparing to online journals*." Wendy liked to search for online references because "*I can just look for references at my dorm. I use school literary online system. It's very convenience*." In other words, convenience was an important factor for them. In addition, Wendy felt that online references are "*more up-dated… They may have more new articles. I don't often look for textbook source because textbooks are more dated*."

Textbooks, for this writing purpose, were usually the secondary source of choice. Helen, as mentioned earlier, only used textbooks as references. Wendy and Patti, if necessary, turned to textbooks that professors had used or recommended in class. Tess, however, reported that she used textbooks more often when reading for writing papers than when reading for course preparation, although textbooks were still her second priority reference to look for: "*I would say about 40% of the time, I also use textbooks. So ya, textbooks, I would say 40% of the time is useful*." This is because of the academic environment in business school. Most of the time, students in the business school are asked to analyze cases and find ways to solve those cases. Therefore, according to Tess, "*the professors also ask us to apply the concept, [and] explain [if] the concept can be used in this case or not*." As a result, Tess felt she had to read textbooks for a better understanding about the concepts in order to write a paper.

4.4.3.2. On-Screen Reading Behaviors: Preference, Tendency, Frequency and Strategies

Since the participants preferred to search for references online, they tended to engage more in on-screen reading behaviors. Even CJ, who claimed that she seldom searched for references for writing projects, still had experience in searching for online articles. A common reading pattern observed among all of these participants was that after key-word searching, they read titles, abstracts or summaries on a computer screen. CJ, for example, explained that "*I will search for key words. Then I will read the abstracts and see if those articles are what I want. In that case, I don't print out because the abstracts are usually not very long*." The same reading pattern was reported by Wendy: "*I will read the title first. After reading the title, I will download it. Then I will*

read summary or abstract and then decide if I need this article." Helen and Patti, who tended to engage more in on-screen reading behaviors, described the same on-screen reading behaviors. Patti, for instance, noted that "*I go over the title, abstract and the summaries to determine whether the article really fit my domain. And if yes, I would keep it and save in one file*."

It seems that the participants may have engaged in on-screen reading more frequently when reading for writing papers than when reading for course preparation. Interestingly, however, Wendy and CJ did not consider searching on the Internet as "academic reading." They claimed that as soon as they found the articles worthy of further reading, they printed them out. A statement from CJ provided a further explanation of this: "*the purpose of my reading on a computer screen is to make sure whether I should print out the article or not. Before I print them out, I will read on a computer screen first*." This reading pattern was not an exception among the participants with a low level of engagement with on-screen reading behaviors. The same behavior was reported among participants with more engagement in on-screen reading. That is, when they want to read carefully, they preferred and tended to read hard-copy materials. However, the difference distinguishing these two groups of participants was the time spent in deciding what materials to print. Instead of printing out all related articles like Wendy and CJ did, the participants with a higher level of engagement with on-screen reading chose only what they considered the important ones to print out. As Tony explained, "*I search for key words. I look at the abstract first and then go to the methodology part. Skim through the part unless I'm sure they are important. Most of the time, I will read on screen. But if I want to read in details, I will print it out. Only the*

articles are relevant and important. I save it in the computer first. If those articles are very important, then I will print it out." Helen described in detail similar decision making processes in searching for articles:

> When I look for articles, I do the key word searching first. I will read the abstracts first and see if the article is related to my topic. If it somewhat relates to my topic, I will download and save it in my computer. If it's totally unrelated, then of course I won't save it. I will save any article that is even just slightly related to my topic because I can delete them later after I read them in more depth. Then I read the research questions in the introduction section first and then the literature review. If I still can't decide whether it is related to my topic, I will then read the discussion part. Of course it happens sometimes when I couldn't relate any part of the article to my topic even until I finished reading the whole part. In that case, I will delete it, for I find it to be irrelevant at the end.

As can be seen, Wendy and CJ tended to read only small portions of the articles, such as abstracts, on a computer screen and then simply printed out related articles. In other words, they were highly selective about what they read on-screen. Because they did not prefer to read on a computer screen, they tended not to spend time in screening articles on a computer screen. Other participants, on the other hand, tended to read more sections, such as introduction, methods, or conclusion, on a computer screen before they determined whether or not to print those articles out. Because they only wanted to print the most important articles, they tended to spend more time reading on a computer screen.

In addition, participants engaging more in on-screen reading tended to be more strategic when reading on a computer screen than those who engaged less. CJ and Wendy

did not use reading strategies when reading on a computer screen. CJ said that "*I don't take notes or use strategies when I read on a screen*." Wendy also explained that "*I am very accustomed to writing down things on my own when I am reading*." On the other hand, the other four participant s reported using several strategies when reading on screen. First, they copied and pasted sentences from the articles to their computer. As Tess described it, "*if they've put online or website or on Carmen that I can copy and paste, if I like something about it, then I just copy paste and I put that on the Word document*." Corresponding to Tess, Patti added "*I would copy and paste the title, the abstract the summary and probably the subtitle and over the word and then read it through word*." Furthermore, Helen not only copied and pasted the sentences, but also took notes on the sources of the references as well: "*I copy and paste the sentences or key points to notepad in my computer and then I will write down where they are from, for instance, the title of the article and the page number. It's easy for me to keep track on my reading in case if I need to go back to the article for information*."

In addition to simply copying and pasting relevant material, the majority of these participants took notes on the computer while they read. For instance, Tony "*would put summary [of] the paper and my thoughts in my computer*." In addition, Tess took notes about the content of the article from which she needed to take something and "*incorporate them in my writings*." Helen, moreover, was very particular about what strategy to use under what type of presentation modes; she explained that "*if it's a scanned type, say a JPEG image file, I will type notes on a notepad. Again, I'll still write down the article title, and from where to where is the part I want. For reading articles in PDF format, basically I use the similar strategies [highlight or underline] as which I*

apply to read the paper-based ones. But for web pages, I think it's easier to read if it has hyperlinks. Because in hyperlink, they will list the subtitle and then you just need to click the parts you want to read."

Selecting parts of the articles to read also affected the level of students' on-screen reading engagement. Unlike Wendy and CJ, who tried to read every article word by word, the other four participants selected sections to read in detail instead of reading the whole article. For instance, Patti described her decision making when reading for writing papers as "*after I read through those two parts [summary and abstract] and I would follow the title, the subtitles and then try to get the section I would really fit my papers… I purposefully choose the section I like to read in detail.*" In the same vein, Helen added, "*when I read articles for writing purpose, I read faster than I read for course preparation because I have already have an idea about what I'm going to write…In such case, I may just focus on some sections or the research questions or something like that from the references*."

4.4.4 Factors Contributing to On-Screen Reading Behaviors

4.4.4.1. Reading Purposes

At first glance, the participants seemed to have similar on-screen reading patterns when reading for the two purposes. They all preferred to read hard copy materials if they required careful reading. However, differences in tendency and frequency of on-screen reading between the two purposes still can be found. For example, the participants seemed to have a higher tendency toward and frequency of reading on a computer screen when reading for writing papers than when reading for course preparation. When reading

for writing papers, the majority of these participants searched for and browsed through articles first before they printed out any materials. Therefore, the tendency and frequency of on-screen reading tended to increase for this reading purpose.

In addition, the participants applied more on-screen reading strategies when reading for writing than for course preparation. They reported that they copied and pasted, highlighted, underlined and took notes while they read on-screen materials. Moreover, most of them chose to read articles purposefully when they read for writing papers; that is, they only need parts of the articles carefully. When reading for course preparation, however, all the participants considered the articles to be important. Therefore, they would read the articles thoroughly and carefully when reading for course preparation. As a result, they tended to simply print out texts without a careful initial examination of them when they read for course preparation. However, there were two exceptions. Tess and Tony seemed not to follow the reading pattern mentioned above. Their on-screen reading behaviors can be explained by another factor: the amount of exposure to the on-screen reading materials.

4.4.4.2. Exposure to the On-Screen Materials

Tess and Tony seemed to engage more in on-screen reading behaviors when reading for course preparation than when reading for writing papers. This can be explained by the amount of time they were exposed to the online materials. For Tess, as mentioned earlier, most of her reading requirements involved online journals. Textbooks used for course preparation were not emphasized as much as online articles. When she read to write papers, she used textbooks as an important reference, although she also

searched for articles on the Internet. In other words, she was exposed to the online articles more often when she read for course preparation than for writing papers.

In Tony's case, when he read additional online references for course preparation, he did not feel a need to print any of those references out. Since those materials were optional and thus did not require full comprehension or careful reading (from his point of view), he simply browsed through the materials on a computer screen. On the other hand, when Tony read to write papers, he needed to carefully read some articles that were relevant and important. In this regard, he preferred to print out materials and read them in hard copy form rather than on a computer screen. As a result, Tony revealed a higher preference and tendency toward on-screen reading when reading for course preparation than when reading for writing papers.

4.4.4.3. Strategies

Strategies were reported to be a concern for some of the participants when choosing whether to read on a computer screen. Wendy and CJ employed various kinds of strategies when reading hard copy materials. They frequently highlighted, underlined, and took notes while they read. They also made charts or tables to organize what they had read. Moreover, Wendy "*draws pictures which can simply represent the authors' points*," and CJ "*draws arrows to show the casual relationships among factors*." All these strategies were intended to facilitate their understanding and enhance their memory. Therefore, using pen and paper was much easier for them than typing or drawing on the computer.

Being unable to use reading strategies when reading on a computer screen was not a major problem for those who had a higher tendency toward reading on a computer screen.

This may be because those participants did not use strategies as complex as Wendy and CJ died when reading hard copy materials. They highlighted, underlined, or took notes once in a while but rarely made any charts or drew pictures. Some of them reported that they typed notes in the computers even when they read hard copy materials. As Helen added, "*actually, I have a habit of reading paper-based articles with my computer on. Since I will use my computer anyway, reading on a computer screen is more convenient.*" Therefore, what some may see as the inconvenience of strategy use when reading on a computer screen was not viewed as a major concern by the high level of engagement participants compared to the low level of engagement participants.

4.4.4.4. Optical Effect of the Computer Screen

The majority of these participants reported that optical effect was their great concern regarding their unwillingness to read on a computer screen. For example, Wendy responded that even if the computer software provided tools for reading strategies, she still felt hesitant to read on a computer screen because of a vision problem she had. The high level of engagement participants also stated that they did not prefer to read on a computer screen when they needed to read materials intensely, since they had to stare at the screen for a long time. Five out of six participants expressed concern about negative optical effects on their eyes. The participants felt that on-screen reading made their eyes more tired as compared to hard-copy reading and hence worsened their eyesight. In addition, they felt that they read more slowly on a computer screen than on a hard copy. If a text required careful and long-time reading, the participants thus tended to read it on a hard copy. The only participant who expressed no concern about the optical effect was Helen. She did not think this factor affected her on-screen reading behaviors at all. "*Eyes*

will get tired even if one reads paper base articles," explained Helen. For Helen, reading on a computer requires patience: "*I can read on a computer screen for a long time. I'm good at suppressing my impatience.*"

The optical effects, furthermore, influenced participants' preferences for choosing to read on a big monitor as opposed to a small monitor. Four out of six participants reported that reading on a big screen was more comfortable than on a small screen. As Patti stated, "*I do purpose choose big screen when I have a lot to read… big screen, I would probably read longer. I mean spend longer time.*" In addition, when reading on a big screen, it is possible to enlarge the font size, which makes reading easier. However, for CJ and Wendy, high definition and a big screen still can not overcome the inconvenience of strategy use limitations. Therefore, a big screen was preferable but not necessary. On the other hand, participants with a relatively high level of engagement in on-screen reading, like Helen and Tess, did not believe the size of the monitor affected their on-screen reading behaviors. "*I don't have any problem in terms of reading on other sizes of monitors. I mean, the ones which size the same or bigger than that on the laptop*," Helen said.

4.4.4.5. Language

To participants with low and intermediate levels of engagement with on-screen reading, language issues seemed to affect their on-screen reading behaviors. All of the participants, except Tess and Helen, indicated that if they read in their first language, reading on a computer screen would be more tolerable because they could read texts faster in that language. On top of that, it was easier for them to catch the main ideas when reading in their first language. In other words, they became more efficient readers when

reading in their first language than in English, their second language. It appears that the second language factor interacted with the optical effects, in that if participants did not have to read on a computer screen for a long time, they were more willing to read on a computer screen.

However, for Helen and Tess, language did not affect their on-screen reading behaviors in academic contexts. Tess explained that, "'*cos I really don't have any problems switch to my language or switch to English. So it doesn't make any difference at all*." Helen also indicated that "*it won't make any difference if the materials are academic papers. Instead, what matters more is the author's writing style.*" Helen further explained, "*if the article written in Chinese complies with Chinese sentence structures and grammar, it will definitely be easier for me [as a native speaker of Chinese] to read and comprehend. But, you know, some of the translation, it is written in Chinese but using English grammars and sentence structures, it will be difficult to read*." However, for casual reading, Helen still tended to read in her first language. For example, if she needed to search for travel information, she would look for websites written in her first language first.

4.4.4.6. Availability of Digital References

All of the participants searched for references through digital databases or online journals. The availability and accessibility of the online articles were so powerful that they became the first materials the participants sought when searching for sources to write papers. Searching for references, hence, became the most common reason for the participants to engage in on-screen reading. However, as mentioned earlier, the participants with a low level of engagement in on-screen reading did not consider such

activity as a part of academic reading. When they read articles on a computer screen for such a purpose, their main focus was not on comprehending those articles. Instead, they focused on selecting articles for further reading in hard copy form.

For participants with intermediate and high levels of engagement with on-screen reading behaviors, the availability of digital references increased their on-screen reading tendency and frequency. Tony, for example, read additional references online if needed. Tess "*googles for information when needed*." Helen added, "*if there is something in the article that I don't understand, such as an argument or a theory that I have never heard of, I will then do the searching on Google*." Because this type of reading was considered extensive or additional reading, the participants did not print out those online materials. Most of the time, they skimmed through them quickly on a computer screen. Again, this factor can be related to their reading purposes. If they only needed to grasp the overall idea or theme of the article, they did not need to spend a long time reading it intensely. Therefore, they would be inclined to read what they searched for on a computer screen.

4.4.4.7. Portability

The ability to carry texts around was one of the factors that influenced the participants' on-screen reading behaviors. Participants with low and intermediate levels of on-screen reading engagement reported that the portability of hard copies was one of the reasons why they tended not to read screen-based texts. Wendy elaborated that "*for example, when taking buses, waiting for flight, waiting for people or something, I can read the articles with ease. Can't do that with computer. You can't carry the computer everywhere. It's very heavy*." The same reason was reported by Tony, who said that "i*f I print it out, I can read it all the time when I wait for something. I can't have laptop or*

computers all the time." Helen and Tess, however, did not consider this as an issue. They indicated that they would finish most of the reading requirements at home. Therefore, there was no need for them to carry texts with them, since they had easy computer access in the home environment.

4.4.5. Factors not Contribute to On-Screen Reading Behaviors

4.4.5.1. Saving Printing Cost

The participants did not view this factor as affecting their on-screen reading behaviors. Even though every participant mentioned that they wanted to save printing cost, they still printed out academic materials if they regarded the materials as important. In other words, when the texts required careful reading, cost was not a concern. The majority of the students added that they would print two pages on one piece of paper to save paper and printing cost, but they would not read on a computer screen simply to save printing costs.

4.4.5.2. Familiarity of Computer

Five out of six of these participants did not consider their familiarity with computers to affect their on-screen reading behaviors. The majority of them did not think using a computer was difficult. They were familiar with software they used most frequently, such as Word, Adobe and Internet Explorer. Therefore, computer familiarity was not a problem for them. As Tess indicated, reading on a computer screen was a matter of habit: "*you will find that especially generation younger than me, they really grow up with computers, it's like really in the daily life. I kinda grew up with computers. That's why it becomes habits to read on a screen*."

4.4.6. Summary of Qualitative Results

Six students participated in the interviews. The majority of the participants preferred and tended to read hard copy materials when they felt a need for careful reading. Some factors, however, interacted with this reading pattern. First, the participants' level of engagement in on-screen reading was affected by their reading purpose. When reading for course preparation, most of the required reading consisted of textbooks. Therefore, the participants did not have a chance to read texts on a computer screen under these circumstances. Moreover, for course requirements, most of the participants felt that they needed to read the texts thoroughly. As such, they tended to read required course material in hard copy form. When reading for writing papers, all of the participants searched for articles online. Therefore, they had more chances to read on a computer screen under these conditions. However, as noted earlier, some of the participants responded that they only browsed or skimmed the articles. After they identified the articles they needed, they printed those articles out. However, participants with relatively high level of engagement in on-screen reading behaviors tended to read texts on a computer screen for a longer time and read more sections of texts before they decided whether to print out online materials.

Second, optical effect on students' eyes was a major concern for a majority of the participants. This factor also explains why they tended not to read texts on a computer screen if they needed to read intensely. Reading on a computer screen made their eyes feel tired. Thus, most of the participants only read texts on a computer screen if they did not have to spend a long time on the texts. Factors such as languages, reading strategies, and portability seemed to have a stronger influence on the participants with a low level of

on-screen reading engagement than on those with a high level of on-screen reading engagement. If the texts were in participants' first language, and if they were able to use reading strategies when reading on a computer screen, they were more willing to read texts on a computer screen. The results indicated that if the students could read texts faster and then remember what they had read, the presentation mode was less of a concern for the participants.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1. Introduction

This chapter presents a summary and discussion of the study's findings while addressing its research questions, reviews implications arising from the study, comments on its limitations, and suggests possible directions for future studies. To review briefly, the study explored the on-screen reading behaviors of international graduate students studying in English-speaking universities. The participants' on-screen reading behaviors were explored based on their preferences, tendencies, frequencies, and strategies employed regarding their reading for two academic purposes: course preparation (RCP) and writing papers (RWP). The study also looked at whether their reading patterns differed in accordance with the two reading purposes. Furthermore, participants' on-screen reading behaviors were examined in relation to the factors that were considered likely to influence those reading behaviors. The factors included participants' perception of advantages and disadvantages of on-screen reading, their level of computer familiarity, and their second language proficiency. Their attitudes toward reading for different purposes were also explored and correlated with their reading behaviors. The present study adopted an explanatory mixed methods research design. The quantitative data were considered the main data source to address the study's research questions, while the

qualitative data served as a complementary data source intended to further explain or provide additional perspectives on the survey results. Thus, in summarizing and discussing results of the present study in this chapter, the qualitative results are selectively presented wherever they are considered relevant. These two sets of results were presented separately in Chapter Four; in this chapter they are compared as deemed appropriate. The chapter begins by addressing the study's research questions and then goes on to offer interpretations and conclusions arising from the study. These sections are followed by a discussion of the study's pedagogical implications, of the study's limitations, and of directions for future research.

5.2. Answers to the Study's Research Questions

Question 1: What are the selected international graduate students' on-screen reading behaviors concerning their preferences, tendencies, frequencies and use of strategies employed in academic contexts?

On the whole, with respect to Research Question 1, the answer appears to be that international graduate students overall demonstrated a low preference and tendency toward reading on a computer screen for either reading purposes (course preparation and writing papers). Corresponding to this result, the participants showed a higher preference toward printing out screen-based texts. The same results were found in their tendency toward on-screen reading. With either reading purpose, the participants showed a low tendency toward on-screen reading. In addition, their preference and tendency became comparatively lower when they had an equivalent hard copy text available. Data from the interviews also supported these findings. The six interviewees, regardless of their level of

on-screen reading engagement, indicated that they preferred to read hard copy materials if they needed to read those texts intensively. Participants with a low preference and tendency toward on-screen reading reported that they printed out all screen-based materials. On the other hand, participants with a relatively high preference and tendency toward on-screen reading responded that they would print out texts if the texts seemed important and required careful reading.

These results support the findings of previous studies, which found that readers still use printed media for many reading activities, especially for in-depth reading (Liu, 2005; Lynch, 2001; Mercieca, 2004; Rho & Gedeon, 2000). Abdullah and Gibb (2006) investigated the reasons why students did not use e-books in academic settings and found that one third of the students preferred printed books and one quarter of the students disliked reading on screen. Rho and Gedeon (2000) found that student readers seldom read the entire article from the screen, although they viewed the Web as a resource to locate academic articles. This reading pattern was especially obvious when the participants read for the purpose of writing papers. In this present study, for instance, the participants skimmed over a Web-based academic article on-screen, printed it out, and then read the printed article. Lynch (2001) has also proposed that students use online resources to browse, to do quick checking, and to decide what they do and do not want to read carefully. However, in this study, as in the others discussed above, paper-based texts were students' preferred user interface for reading in depth.

With respect to the number of hours spent their using computers, the participants seemed to spend less time reading academic texts on a computer screen by comparison with the overall amount of time they spent using computers. Although the participants did

not spend a lot of time reading academic texts on a computer screen, the amount of time they spent on reading academic texts was greater than the time they spent on reading non-academic texts for leisure. As seen in Chapter Four, the participants spent an average of 10.12 hours in reading for course preparation and 15.39 hours in reading for writing papers on a computer screen, while spending only 8.12 hours per week reading for leisure in English on a computer screen. The participants did not appear to spend much time reading for leisure in their first language on a computer screen, either. They spent 12.23 hours per week in reading for leisure in their first language. Similar results were found regarding the amount of pages the participants were willing to read on a computer screen. The participants on average were willing to read 18 pages for course preparation and 24 pages for writing papers. These page numbers were relatively high in comparison with what they were willing to read for leisure in English (9.92 pages). The participants were willing to read more pages in their first language (21.24 pages) compared to English, but these page numbers were still less than when they read for writing papers.

A possible explanation may be related to the fact that the participants tended to view reading on a computer screen as skim and scan types of reading. Therefore, they overall did not read long texts on a computer screen nor spent much time reading on a computer even for leisure, despite the easy access they had to online leisure material in both L1 and L2. Even if they did read for leisure on a computer screen, they could stop reading whenever they wanted to. Unlike reading for leisure, in which the participants had the freedom to stop at any point, reading academic texts was a requirement. If they chose to read on a computer screen, they would likely feel an obligation to complete the reading requirements. It is, therefore, highly possible that they would have forced themselves to

read until they finished the assigned texts. As such, they may have spent more time and were willing to read more pages on a computer screen when reading for academic purposes rather than for leisure reading. This finding is in accord with Mercieca's (2003) claim that students show a stronger preference for electronic textbooks if there is a sense of integration of the electronic textbook within the course being taught.

With respect to the on-screen reading strategies, the same strategies were reported as the most and least frequently used for each of the two reading purposes. Specifically, the strategies reported to be most frequently used by the participants seemed to reflect general academic skills they had likely learned as they progressed through their academic careers. These strategies, including taking an overview, re-reading, and paying closer attention, can be considered as natural or logical resources when students try to enhance their comprehension (Bang & Zhao, 2007). On the other hand, the least frequently used strategies were screen-related ones, including using computer software to underline or highlight, typing notes on the computer, and taking notes on a piece of paper when reading on a screen. Moreover, the participants in this study reported that they did not frequently use the "Find" function to search for information in a text. This finding conforms to the finding by Waycott and Kukulska-Hulme (2003), who indicated that students considered software's navigational tools, such as "Find," to be "irksome" (p.36). The interview data likewise revealed that the participants felt that reading on a computer screen limited their application of reading strategies. The majority of these respondents stated that they could not apply reading strategies they usually used on hard-copy text (e.g., writing notes in the margins, underlining or highlighting) to screen-based text.

Inconvenience of reading strategy use may explain the participants' low preference and tendency toward reading academic texts on a computer screen. Previous work has shown that people prefer printed documents for careful reading (e.g., Abdullah, & Gibb, 2006; Altun, 2000; Liu, 2005; Mercieca, 2004). When reading for academic purposes, as Linderholm and van den Broek (2002) have noted, students tend to read at a slow pace and emphasize cognitive processes and strategies. Burns and Sinfield (2003) have pointed out that students use different reading strategies to understand different types of reading materials. Reading academic texts, for example, requires the ability to recognize and process the textual discourse practices of an academic discipline across a range of genres, whereas reading for leisure may well be a more relaxed and less analytic process. This characteristic of high involvement in the use of reading strategies, such as underlining, highlighting, taking notes, and writing comments in the margin, influences readers' preferences toward text presentation modes. The nature of screen-based texts, however, might make using reading strategies difficult and inconvenient. McKnight (1997, cited in Liu, 2005, p.702) has pointed out that manipulating electronic documents is certainly possible, but it does require more resources and additional skills than a simple pencil or highlighter. The interviewees in this study expressed a similar view: they found it difficult to apply to screen-based materials the strategies which they used frequently when reading hard-copy materials. Even those participants with a relatively high level of preference and tendency toward on-screen reading agreed that they would print out important texts that require extensive use of reading strategies. As a result, they were more inclined to read articles that could be skimmed through or read fast on a computer screen, such as articles that are not laden with highly technical or confusing material.

However, the difficulty of using reading strategies on-screen was not the only problem that shaped the participants' preference and tendency toward on-screen reading. Interview participants indicated that even if the computer software provided user-friendly tools for strategy use, they were still reluctant to read on a computer screen. The major concern they noted was the optical effect related to looking at a computer screen. As seen in both the qualitative and quantitative data, the participants indicated some degree of discomfort if they needed to read a long text on a computer screen or if they needed to read a screen-based text for a long time. Some researchers in this area have claimed that as long as the quality of a monitor, resolution or text organization improves, there will be no difference between reading on a computer screen and reading a hard copy in terms of efficiency (Gould et al., 1987; Mills & Weldon, 1987; Muter & Maurutto, 1991; Noyes & Garland, 2003). Bennett and Landoni (2005), for example, suggested that increasing the "added values" qualities of e-resources will motivate students to be more willing to use e-books. In addition, Mercieca (2003) stated that the preference may change as the readability of digital content improves. These suggestions may be accurate for those who have a higher preference and tendency toward on-screen reading. However, for those who have a low level of desire to read any screen-based texts, simply improving the quality of the monitor or presentation mode will likely not influence their on-screen reading behaviors. The participants in the present study stated that although they preferred big monitors when they had to read texts on a computer screen, high-quality screens would not solve the eyestrain problem. This finding corresponds to what was found in Mercieca's (2004) study. Participants in Mercieca's study stated that they would read the document initially from the screen. They would persist in reading three or four pages but

then found that they started to "suffer from eyestrain." However, in contrast to the participants in Mercieca's study who did not attempt to adjust the text size, the participants in the current study claimed that they would enlarge the font size if they read from a screen. Still, the eyestrain problem would persist.

Question 2: Are there any differences in international graduate students' on-screen reading behaviors between the two purposes?

To summarize the answer to Research Question 2, a mixed picture emerged from the different sources of data. More specifically, while the quantitative data did not show any statistically significant differences in participants' on-screen reading preference and tendency between the two purposes, the interview results told a somewhat different story: the students reported that they tended to read more texts on a computer screen when reading for writing papers as opposed to reading for course preparation. When reading for writing papers, the majority of these participants searched and browsed through digital articles first before they printed out any materials as opposed to initially seeking print-based sources. Therefore, according to this data, the participants seemed to have a higher tendency toward on-screen reading for RWP than for RCP.

Significant differences between the two reading purposes were found in the respondents' on-screen reading frequency, namely the number of hours spent reading per week and the maximum number of pages they were willing to read. Results from the quantitative data showed that the participants spent more hours reading academic texts on a computer screen for writing papers than for course preparation. This can probably be explained by the materials the students were exposed to when reading for different

purposes. The students were exposed to more screen-based materials when reading for writing as opposed to reading for course preparation. In most of the cases from the interviews, the participants indicated that they needed to search for references for their written projects. A digital library and database were their main sources. On the other hand, the required materials for course reading assignments were mainly in hard-copy format. As a result, the participants may have had more opportunities and spent more time reading on a computer screen when reading for writing papers than for course preparation. This result is interesting in light of what Liu (2005) found: A positive relationship between the frequency of exposure to digital documents and change of on-screen reading patterns. Liu (2005) investigated the changes in people's reading behaviors in a digital environment over 10 years and found that people were spending more time on reading digital documents as digital documents became easier to locate and allowed more opportunities for accessing more information.

Participants in the current study also reported that they were willing to read slightly more pages for the writing papers purpose than for the course preparation purpose. The difference was also statistically significant. A possible explanation for this can be drawn from the interview results. When reading for course preparation, most of those participants considered the assigned readings important and hence may have printed out the screen-based materials without reading them carefully on a computer screen first. In contrast, when reading to write papers, the participants said they needed to first search for relevant articles. Thus, the majority of these participants may have read more sections from the articles to decide whether the articles matched their needs for their written projects. More specifically, some responded that they purposefully selected sections to

read when reading for writing papers, while they tended to read the whole article when reading for course preparation. As such, they were willing to read more pages on a computer screen when reading to write papers than when reading for course preparation. Thus, although the majority of the students in this study did not consider searching for e-sources a form of reading, this searching habit, in fact, increased the number of hours and the number of pages they spent reading from a screen when they read for the purpose of writing papers.

Similar results were found in the frequency of strategy use. The participants reported using strategies slightly more frequently when reading for writing papers than for course preparation. Interview results corresponded with the quantitative results, in that four out of six of these participants responded that they used more strategies in the RWP condition, including taking notes and copying and pasting relevant sentences, than in the RCP condition. One possible explanation for this is that the participants were exposed to digital documents more frequently when reading to write papers. As such, they may have typed notes into the computer and used some on-screen reading strategies while they were engaged in screen-based reading. On the other hand, the participants encountered hard copy materials more often when reading for course preparation. In that context, they may have simply underlined, highlighted, or written down notes in the margins of the texts.

From the interview data, it is also worth noting that strategy use seemed to distinguish the level of on-screen reading engagement among the participants. Those with a low level of engagement seemed to apply various reading strategies when reading hard copy materials, while they were not able to apply any strategies when reading on a

computer screen. In contrast, those with a high level of engagement seemed to apply more reading strategies even when they read texts on a computer screen. They copied and pasted relevant sentences or paragraphs and also typed notes in their computers. Numerous studies have suggested that what distinguishes experienced and novice readers from each other is their reading strategy use (e.g., Bang & Zhao, 2007; Carrell, 1996, 1998). Experienced readers appear to apply strategies more effectively and appropriately (Anderson, 1991). Snow, Burns and Griffin (1998) also pointed out that skilled readers differ from unskilled readers in "their use of general world knowledge to comprehend text literally as well as to draw valid inferences from texts, in their comprehension of words, and in their use of comprehension monitoring and repair strategies" (p.62). Corresponding to previous results, the frequency of strategies used by the participants in the current study seemed to distinguish the level of on-screen reading engagement among them.

Question 3: How did the factors regarding students' perceptions of on-screen reading, computer familiarity, and second language proficiency contribute to an individual's on-screen reading behaviors?

With respect to Research Question 3, the overall answer appears to be that the participants' perceptions of on-screen reading had the greatest influence on their on-screen reading behaviors among three factors, namely perception, computer familiarity, and second language proficiency. The SEM results showed the participants' perceptions of on-screen reading had a consistently strong and positive association with their on-screen reading behaviors. More specifically, the more positive the perception the

participants had toward on-screen reading, the higher their preference and tendency toward on-screen reading as well as the longer their on-screen reading time and pages were. Previous researchers have identified some of the main reasons why students use and do not use online sources such as e-books (Abdullah & Gibb, 2006; Chu, 2003). Yet, not many have discussed the impact of these positive and negative perceptions on on-screen reading behaviors. The participants in the current study demonstrated that their perceptions of the disadvantages of on-screen reading played a stronger role in shaping their overall attitude toward on-screen reading as well as their actual on-screen reading behaviors. The interview results correspond to this finding. Many interview participants recognized the advantages of on-screen reading, such as ease of accessing online sources and saving on printing costs. However, the disadvantages of on-screen reading, such as limits on strategy use and eyestrain, overtook the advantages.

Looking more deeply at the results, the current study found that the participants did not consider saving printing cost a significant influence on their on-screen reading behaviors, although this was considered as an advantage of on-screen reading. The questionnaire results showed that the participants overall had a neutral attitude toward the statement regarding whether they would read on a computer screen to save printing cost. Elaborations on this were found in the interview data. As discussed in Chapter 4, all of the interview participants stated their willingness to save paper and to save printing cost, if possible. This result supports the findings of Mercieca (2004). Mercieca interviewed fourteen Business school students about their opinions on comparing print-based text with three online presentation formats: PDF, Microsof e-book reader format, and onion HTML formats. When the participants were asked what would make them read on screen,

two key criteria were “saving money” and “content integration.” However, the importance of these criteria seemed to vary according to circumstances, such as whether the texts were considered important and must be read carefully. In such a case, the participants in this study would print the texts out.

With regard to disadvantages of on-screen reading, the strategy use factor seemed to have a stronger impact on the on-screen reading behaviors of those participants who had a higher degree of preference and tendency toward on-screen reading. Optical effect, on the other hand, seemed to have a greater influence on those who had a lower level of preference and tendency toward on-screen reading. In the qualitative data, participants with a higher level of engagement in on-screen reading did not consider optical effect as a major concern. Instead, the inability to use reading strategies was the main reason why they preferred not to read on-screen and instead printed out texts before reading them. For those participants who had a higher level of on-screen reading engagement, how to suppress impatience while reading was a key factor shaping their reading behavior. Being able to employ reading strategies was, therefore, crucial to them as a way to maintain momentum while reading. This finding corresponds with what other researchers have pointed out; that is, sustained attention seems to decrease when reading on-screen, as readers tend to lose their patience (Levy, 1997; Liu, 2005). This may be due, at least in part, to a relatively slow reading rate when reading on a computer screen as opposed to reading a hard copy (Haas & Hayes, 1986; Muter et al., 1982; Muter & Maurutto, 1991; Wilkinson & Robinshaw, 1987; Wright & Lickorish, 1983), or the preference in the digital environment for skimming and browsing (Birkerts, 1994; Bolter, 1991; Healy, 1990). In the case of this study, the former reason seems to be a better explanation of the

observed reading patterns. The participants were required to read academic texts, which they presumably would not read shallowly due to their importance. This reason can also explain why the participants did not prefer to read academic texts on-screen. If they tended to have a slower reading rate when reading on-screen, they likely would need to spend more time looking at the screen, which most participants feared would negatively affect their eyes. Therefore, optical effect was a major issue shaping participants' on-screen reading behaviors.

Finally, portability was also an important contributor to participants' perceptions regarding on-screen reading behaviors. The participants in this study mentioned that they tended to print texts out if they wanted to have the texts available to them at all times. This finding contradicts one of the results of Wilson's (2003) study on students' use of e-books. The participants in Wilson's (2003) study reported that one of the reasons they would use an electronic book was because of portability. That is, they indicated that they would use e-books because they could access large amounts of material "anytime, anywhere." The participants in this study, however, considered reading on-screen to be inconvenient in terms of portability. This difference may be caused by the fact that the participants in Wilson's study were asked to read e-books from different types of display equipment. Thus, the "easy to carry" idea may have referred to small, easy to carry technology such as palm pilots rather than larger computer-related formats, which Wilson did not specifically discuss. For instance, carrying a laptop is not as easy as carrying a palm pilot or hard-copy materials. For the participants in the present study, hard-copy materials were apparently more appealing because they could be read anytime and anywhere as opposed to screen-based materials.

While the participants' perceptions of on-screen reading made the strongest contribution to on-screen reading behaviors in both purposes, the computer familiarity factor was not associated with their on-screen reading behaviors for either of the reading purposes. From the SEM results, the path from computer familiarity to the dependent latent variable, on-screen reading behaviors, was not statistically significant in any of the models tested. Moreover, the parsimonious model revealed a better fit after the computer familiarity factor was eliminated from the model. These results seem to indicate that the degree of one's familiarity with the computer does not influence his or her on-screen reading preference, tendency and frequency. The interview data provided a similar picture. All of the participants considered themselves proficient computer users and had no problems using computers for daily and academic purposes. However, this computer proficiency and familiarity contributed little to their on-screen reading preference and tendency in academic contexts. It may have increased their willingness to read more pages on a computer screen, though how much is unclear.

Previous studies have claimed that computer familiarity among different age-group readers affected their computer usage and attitude (Al-Khaldi & Al-Jabri, 1998; Czaja & Sharit, 1993; Gardner et al., 1993; Meyer & Poon, 1997). The current study moved beyond previous work to investigate whether this computer familiarity has an impact on students' on-screen reading behaviors in academic settings. As the results show, even though the participants in this study demonstrated an overall high level of confidence and a high comfort level with respect to using a computer, their preference and tendency toward on-screen reading were not influenced by their computer familiarity. On the other hand, the positive association between casual and academic on-screen reading frequency

seems to suggest that the greater the exposure to on-screen reading, the more willingness there is to engage in on-screen reading (Shashaani, 1994).

The only factor that contributed differently in the two purposes was second language proficiency. Second language proficiency seemed to play a more influential role on participants' on-screen reading behaviors when reading for writing papers than when reading for course preparation. The SEM results showed that second language proficiency did not seem to have an association with participants' on-screen reading behaviors in the reading for course preparation condition. Regarding the reading for writing papers purpose, however, the path was statistically significant in all of the tested models. These results suggest that second language proficiency played a more influential role on the participants' on-screen reading behaviors when they read for writing than for course preparation. A possible explanation for this is that, when reading for course preparation, the preferred reading pattern was to read through every text closely (i.e., paying attention to details). When reading to write papers, on the other hand, the reading pattern was to skim through articles first and then choose which ones to read later in detail. In other words, being able to recognize the main idea of an article and finding the important or relevant sections were considered crucial when reading for writing. As such, language seemed to have a more important facilitative role when reading for writing papers than when reading for course preparation.

Another possible explanation may be related to the optical effect. As mentioned earlier, the majority of the participants did not feel like reading on a computer screen for a long time due to fears of negative optical effects. When reading for course preparation, they tended to simply print out required reading materials and read them in hard copy

form. When reading for writing, however, they tended to spend more time reading on a computer screen because they often searched for digital journal articles. In this case, the optical effect may have been a concern, which then led to the desire to read on a computer screen quickly and thus reduce eye strain. At the same time, reading in their first language was more efficient than reading in the second language. As such, the language used could be a more important factor when reading for writing papers than when reading for course preparation, since they did more reading on a screen for the former purpose than for the latter. However, the correlation between second language and students' on-screen reading behaviors was weak even in the reading for writing papers condition.

In the interview data, it was seen that the majority of the participants seemed to view language as one of their major concerns in their on-screen reading behaviors. Five out of six participants from the interviews stated that language did make a difference in their on-screen reading preference and tendency when reading for academic purposes. If they read in their first language, they could read faster. Moreover, they could catch the main idea more easily when reading in their first language than in the second language. As such, they would be more willing to read on a computer screen if they read in their first language. The only participant who indicated that language did not change her on-screen reading behaviors explained that this was because she was equally fluent in both her first and second languages.

A possible explanation for the difference between the quantitative and qualitative results may be that the data were collected from two different perspectives. That is, for the quantitative data, students' second language proficiency level was correlated with

their on-screen reading behaviors. However, for the qualitative data, they were pointedly asked if language made any difference in their on-screen reading behaviors. As such, the results in the quantitative data showed that participants' on-screen reading behaviors were not strongly related to their second language proficiency. However, if they could choose to read in their first language, they were more willing to read texts on a computer screen.

Question 4: Is there any association between students' attitude toward different reading purposes and their on-screen reading behaviors?

The participants overall considered the items listed in the current study's questionnaire as at least somewhat important. More specifically, reading comprehension (e.g., understanding readings, understanding terminology, and organizing thoughts) was considered the most important factor when the participants read for both academic purposes. However, differences in attitudes toward academic reading between the two purposes could still be found. For instance, the participants viewed being able to share what one has read with others as more important in reading for course preparation than in reading for writing papers. On the other hand, re-reading and being able to critique the texts were considered more important in reading for writing papers than in reading for course preparation. Being able to apply reading strategies was also weighted more heavily when reading for writing papers than when reading for course preparation.

Moreover, as was seen in Chapter Four, the participants seemed to feel that reading for writing papers required more intensive and careful reading (M = 3.89) than reading for course preparation (M = 3.70). In addition, more item statements were

considered as at least important in the reading for writing papers condition (fully understand readings, understand the terminology, organize what I have read, read in-depth carefully, using reading strategies, and taking notes) than those in the reading for course preparation condition (fully understand readings, understand the terminology, and organize what I have read). It may be that the participants thought they needed to read more carefully for writing papers than for course preparation because they regarded writing papers as a more important purpose. As such, applying reading strategies and taking notes became relatively more important in that condition. These findings suggest that the participants believed reading for writing requires more thorough and careful reading processes than reading for course preparation. This result also corresponds with the interview data, which showed that the participants engaged in more strategy use when reading for writing while stating that they hardly applied any strategies when reading on a computer for course preparation.

In addition, reading the entire article seemed to be one of the least important factors for both purposes. However, the participants felt the necessity to finish all reading when reading for course preparation but may not have felt the same when reading for writing papers. This attitude explains the frequency of students' on-screen reading. As mentioned earlier, the participants read for longer amounts of time and were willing to read more pages on a computer screen when reading to write papers. Because they may not have needed to read the whole article they located when reading for writing papers, they tended to take more time to use a computer screen to read selected texts. In other words, the on-screen reading was more selective in nature, and this may have impacted on the participants' attitudes toward it. Again, because the participants felt that they needed to

read the whole text when reading for course preparation, they tended to simply print out texts for further reading.

The relationship between attitudes toward different reading purposes and the participants' on-screen reading behaviors also supports the interpretations above. First, the correlation coefficients between attitudes toward the two reading purposes and on-screen reading preference and tendency were negative. This suggests that the more important the participants considered reading for academic purposes to be, the lower their preference and tendency toward on-screen reading. Second, the attitudes seemed to have a stronger association with the students' on-screen reading behaviors in RWP than in RCP. This suggests that because reading for writing papers was viewed as more intensive, this attitude may have had a stronger negative influence on the students' on-screen reading preference and tendency than the attitude toward RCP. One more point needs to be mentioned in this regard: this attitude seems to contradict the general on-screen reading patterns discussed earlier. In other words, if the participants thought that reading for writing papers was more intense and required more strategy use, they would presumably have a higher degree of preference and tendency toward printing out screen-based texts when reading for that purpose. However, the quantitative data did not show the expected reading patterns. The interview data may help explain why. The participants reported that they read small portions of a text when reading for writing papers. Even though this kind of selective reading seemingly requires more careful reading than reading for course preparation, the participants indicated that they only needed to read some sections of texts. In this case, they did not mind reading on a computer screen. If they needed to read the whole article, as they said they did when reading for course

preparation, reading on a computer screen definitely was not their preferred mode. It should be pointed out, too, that their preference and tendency toward on-screen reading also depended on the portion of a text they chose to read on a computer screen.

Finally, the relationship between the attitudes and strategies was the strongest among all of the correlation coefficients. Specifically, the correlation was stronger in RWP than in RCP. This suggests that because reading for writing required more careful reading, the participants needed to use reading strategies more frequently. This attitude supports the general agreement among researchers, according to Grabe (2005), that reading to critique and evaluate (activities associated with writing) requires more cognitive processes in comparison to reading to learn, in that readers usually are required to reflect, elaborate and integrate their prior knowledge. Readers may need to read more in depth with a slow reading rate (p.50). Lorch, Lorch and Klusewitz (1993) also reported that college students, when reading for class preparation, read faster and pay less attention to details than when they read to learn or for a research project or exam. Moreover, students appear to distinguish the degree of specificity for reading, ranging from a specific, well-defined purpose (e.g., exam preparation and research) to reading with a less specific goal (e.g., learning and class preparation). Further, researchers have suggested that reading attitudes can be related to reading behaviors (e.g., Kubis, 1996; Partin, 2002). The relationship between reading attitude and reading frequency found in the current study seems to be consistent with the study of Karim and Hasan (2007), where students' attitudes toward reading had a positive correlation with the amount of time spent on reading and the frequency of reading academic books.

However, the different attitudes toward different reading purposes did not seem to influence the participants' on-screen reading preference and tendency in the current study. The correlation between attitude, preference and tendency was weak. As mentioned earlier, the participants in general considered reading for academic purposes was important no matter whether it was for writing papers or for course preparation. As such, their attitudes did not affect their overall preference and tendency toward on-screen reading but only influenced their on-screen reading hours, and the frequency of strategy use.

These findings are in accord with previous research, which indicates that participants consider electronic media to be more useful for searching, while they prefer paper-based for actual consumption of information (Liu, 2005; Mercieca, 2004; Ramirez, 2003). Even though, in the current study, an increased amount of time spent on reading digital documents was observed in the reading for writing purpose, the screen-based reading behavior was characterized by more time spent on browsing and scanning, keyword spotting, one-time reading, and more selective reading, while less time was spent on in-depth reading and concentrated reading, as also seen in Liu (2005). This explains why the attitude toward different reading purposes was only associated with the participants' on-screen reading hours and strategy use but not their on-screen reading preferences and tendencies.

5.3. Implications

In this section, I discuss the pedagogical implications arising from the findings of the study. The results suggest that graduate students overall do not prefer nor tend to read academic texts on a computer screen. This indicates that what has been claimed to be

advantages of online reading in language classrooms does not necessarily apply to the findings in this graduate level academic context. As mentioned in Chapter Two, researchers have found that web-based programs enhance learners' L2 language knowledge such as grammar and vocabulary (e.g., Leffa, 1992; Liu, 1994; Reinking & Rickman, 1990) and background knowledge (e.g., Anderson-Inman & Horney, 1999; Bernhardt, 1993), which leads to facilitate their reading comprehension. However, the participants in the study did spend some time reading on-screen. More specifically, the time they spent on reading academic texts on-screen was greater than they spent on reading via computer for leisure. Liu (2005) has noted that the time readers spend on screen-based reading has increased over the past ten years. Reading on-screen, therefore, seems to be unavoidable among graduate students. This new reading environment, moreover, requires readers to develop new ways of reading (Armstrong & Warlick, 2004; Brown, 2001; Parrot, 2003). As Murphy et al. (2003) have stated, teachers and educators may need to be aware of the strategies for comprehension required for computerized texts because they appear to be different from those for comprehending printed texts.

This study has found that the participants' perceptions of advantages and disadvantages of on-screen reading were the most influential to their on-screen reading behaviors. Moreover, the negative perceptions seem to be a stronger contributor to impact students' overall perceptions as compared to the positive perceptions. As mentioned earlier, their negative perceptions mainly came from inconsistency in reading strategy application and optical effects arising from looking at the computer monitor for long periods of time. We may assume that if students are taught appropriate reading strategies, they may be able to read screen-based texts more efficiently and effectively, thus

minimizing the optical effect. Empirical research has also suggested the explicit teaching of specific strategies for facilitating students' reading performance (Dheib-Henia, 2003; Jenks, 2002) and improving students' reading comprehension (Block, 1992; Carrell et al., 1989 Jimenez et al., 1996). The results of the current study showed that students used general strategies the most frequently. Huang, Chern & Lin (2009), while exploring EFL learners' online reading strategies, also found that global strategies were the most efficient strategy for better comprehension. These findings corresponded to the studies conducted in the printed-based environment (e.g., Sheorey & Mokhtari, 2001). In other words, students seem to be able to transfer some of the general strategies from a printed-based presentation mode to a screen-based one. Teachers and educators, hence, can help students develop screen-based reading strategies based on the strategies that the students already have acquired from reading in a print-based environment.

In addition to general strategy instruction, teachers need to be aware that different reading purposes have certain degrees of influence on students' on-screen reading frequency and strategies. It seems from the results of this study that students are able to use various reading strategies when reading hard copy materials and use several on-screen reading strategies when reading for writing paper while at the same time are not able to apply either of the sets of strategies to read on a computer screen when reading for course preparation. Educational practitioners may need to pay more attention to helping students be more flexible in applying strategies in different reading situations and reading purposes. At the same time, practitioners should attempt to show students what kinds of strategies and tactics are appropriate for what kinds of reading purposes in order to facilitate reading comprehension as well as enhance students' long-term memory. For

example, the participants in this study seemed to have more opportunities to search for and read screen-based texts when reading for writing papers. Thus, the ability to search for references through the digital libraries seems to be basic but is essential for newly arriving international graduate students. Moreover, the abilities to skim, scan and comprehend main ideas effectively through browsing and searching digital references can be considered more important in the reading for writing papers condition than in the reading for course preparation condition.

At the same time, helping students be aware of the advantages that on-screen reading can bring about may increase their preference and tendency toward on-screen reading. Mercieca (2004) pointed out that two key criteria that would influence readers to read on-screen were "saving money" and "content integration." Among these two, textual materials integration seemed to be the main motivation for on-screen reading in Mercieca's study. Digital documents, in contrast to paper-based ones, have the ability to integrate other references or even other media to support the original content. For instance, they may contain links to other texts. This characteristic of digital documents is frequently applied in language learning (Bernhardt, 1993; Leffa, 1992; Lyman-Hager, 2000) where, for example, students reading online texts clicked on the unknown vocabulary and then found the definition and explanation of the word without having to consult a paper-based dictionary. Some academic texts are designed in a similar manner. What educational practitioners need to do is make those advantages known to students and to teach students how to read, integrate and organize the original content along with the electronically provided references.

In addition, second language (L2) proficiency can be an important component to increase students' reading comprehension. Numerous studies have shown a positive relationship between L2 proficiency and comprehension (e.g., Bernhardt & Kamil, 1995; Carrell, 1991; Lee & Schallert, 1997). Even though the participants in this study generally reported their level of L2 proficiency as better than good, the majority of the interviewees still noted that reading in a second language made reading on a computer screen more difficult than reading in their first language. In this sense, if students' L2 proficiency level increases, it is highly possible that they may be more willing to read texts on a computer screen along with acquisition of necessary strategies. Many studies have suggested pedagogical approaches for teachers to increase ESL students' second language proficiency by enriching students' linguistic knowledge. Extensive reading, for example, is one of the most common approaches to increase L2 learners' vocabulary acquisition (Pigada & Schmitt, 2006; Tudor, & Hafiz, 1989) and overall language proficiency (Renandya, Rajan & Jacobs, 1999).

The present study and previous studies (Birkerts, 1994; Bolter, 1991; Healy, 1990) have shown that students tend to regard reading on-screen as a skim and scan type of reading. Birkerts (1994), for example, stated that people growing up in the digital environment lack the ability to read deeply and to sustain a prolonged engagement in reading because of this emphasis on skimming and scanning. One student from the current study also pointed out that "suppressing impatience" may be the key for her to keep reading on screen. How to help students maintain their reading momentum seems to be necessary if the students nowadays have to engage in more on-screen reading than before. Mackey (1997) investigated the importance of readers' "good-enough" decisions

that will enable them to keep reading. Readers in Mackey's study demonstrated ways, such as developing provisional understandings and providing affective substitutes, to help them keep reading rather than call a halt. Even though Mackey claimed that "the definition of what makes a private reading decision good enough is ultimately for the individual reader to decide" (p.455), instructors and educational practitioners can still have some experienced on-screen readers share what strategies they apply and decisions they make to "suppress their impatience" in order to keep reading on-screen rather than avoid it or end it prematurely. Perhaps students also need to have more opportunities to complete online reading comprehension tasks in academic contexts. Exposure to and practice with the medium can be beneficial to students who will most likely conduct many on-screen reading tasks and research.

Software designers or e-reference publishers can also benefit from the findings of this study. Since being unable to use reading strategies is one of the major limitations the students considered when they read texts on a computer screen, it is important for software designers and e-reference publishers to design user-friendly tools so that readers can use both general and basic reading strategies, such as highlighting, underlining, and note-taking, with ease while reading electronically. In addition, the participants in this study acknowledged overall the advantages of on-screen reading, that is its availability and searchability. If digital documents can be easily reached from hyperlinks (for instance, the references mentioned in one text can be linked to the original ones), students may be more willing to read digital documents on a computer screen. E-book publishers may focus on how to provide added value, as Mercieca (2004) has suggested, to their e-textbooks to increase students' motivation to read material from the screen. They are: 1)

make feasible links between academic theory, practical exercises, additional references and reading, 2) lay out a clear navigational path through content which guides the readers to the whole chapter or the section they want to focus on. The same approach can be applied to e-journals and other digital documents.

5.4. Limitations of the Study

The present study explored the on-screen reading behaviors of international graduate students who studied in an English-as-a-second-language (ESL) environment. The study differs from previous studies in that 1) on-screen reading behaviors in this study were investigated based on two academic reading purposes, 2) on-screen reading behaviors were considered as a collective variable as well as a series of investigated factors, which made the variables more representable, and 3) possible factors that have been discussed in the literature were investigated all together and simultaneously rather than separately in this study. Despite its contributions, the study has some limitations, as is true with any study. First, the researcher acknowledges that the generalizability of this study is restricted due to the sampling approach. Participants in this study were recruited through convenience sample by a snowballing approach. Therefore, the findings of this study should not be generalized beyond the participants in the present study. In addition, since the participants were ESL graduate students, the findings of this study may not be generalized to other contexts, such as English learners in EFL contexts or undergraduate students. Second, the data collection of this study mainly relied on survey questionnaires. The investigated variables were determined by the participants' self report rather than

objective measurements. Different tasks for measuring the investigated variables might produce different results from those of the current study.

Third, the researcher chose to put the two investigated purposes in one questionnaire out of concern about the length of the questionnaire. However, this type of design may have caused certain response tendencies that could, in turn, influence the results obtained. In other words, it is highly possible that the participants may have recorded the same responses to different purposes because the two purposes were presented together in the same questionnaire. If the questionnaire had been designed in a different format or the participants were asked to represent their on-screen reading behaviors in two different questionnaires in accordance with different purposes, the study might have produced different results.

Fourth, the participants in the follow-up interviews were all from an East Asian cultural background. Recruitment of participants from other nationalities may have influenced the interview findings of the study. This relates to a fifth limitation, which has to do with the procedures used for conducting the follow-up interviews. The interview protocol in this study was a one-time event and thus, the findings were limited. Repeated interviews with the same participants might have yielded additional findings and revealed other emergent patterns about international graduate students' on-screen reading behaviors in academic contexts.

5.5. Suggestions for Future Studies

Research concerning on-screen reading is still under-developed in comparison to the print-based reading research. Based on what took place with the current study, several possible directions for future search are provided as follows:

1. It is recommended to replicate this study with different students and different academic settings. As mentioned earlier, this study has a number of limitations that prevent its results from being generalized beyond its research participants, particularly its sampling procedures. Thus, studies with different samples and contexts can extend and enrich our understanding of on-screen reading behaviors. In addition, studies with different research designs are recommended. The current study employed a mixed method explanatory research design with an emphasis on quantitative rather than qualitative measures. Regarding the quantitative approach, this was an exploratory study and thus had design limitations. This type of study cannot properly investigate a cause-effect relationship between its independent and dependent variables. Thus, studies using different research designs will provide different perspectives and results that will establish a broader forum in which reading researchers can discuss on-screen reading behaviors extensively. Qualitative research may be especially useful in investigating the multi-faceted aspects of students' on-screen reading behaviors and be able to explore on-screen reading behaviors more comprehensively. Meanwhile, experimental studies will be able to detect or explore possible cause-and-effect relationships between various factors and students' on-screen reading behaviors.
2. As mentioned previously, many EAP practitioners focus on reading for writing.

Attention to reading for course preparation seems to be undervalued. In order to better prepare international students to be able to read in academic contexts, careful and intensive reading for course preparation purposes cannot be ignored. This would imply the need for a heightened awareness and sensitivity in the teaching of reading in EAP classrooms. Students need to learn different reading strategies either in screen-based or paper-based reading environments for different reading purposes in order to read in an effective and efficient way. More studies are needed to investigate students' reading behaviors when they read for other academic purposes rather than writing papers as well as students' perspectives and attitudes toward reading for different academic purposes.

3. Numerous printed-based studies concerning reading strategies have suggested that successful ESL readers use different strategies than less successful readers (e.g., Bang & Zhao, 2007; Jimenez et al., 1996). Hypertext reading research has also found that experienced hypertext readers use different strategies to navigate in a complex hyper-environment than inexperienced ones (e.g., Hofman & van Oostendorp, 1999; Huang et al., 2009). It is generally believed that there are certain strategies that characterize successful reading comprehension and certain ones that characterize less successful comprehension. In this sense, more research is needed to investigate how experienced and skillful students read academic texts on a computer screen. What strategies these students use to comprehend digital documents and create chances for long-term memory development can be the focus of such research, which could in turn lead to the creation of a more effective pedagogical framework for educational practitioners.
4. Other factors which may account for on-screen reading behaviors need to be

identified in the future studies. The current study focused on three main factors, namely students' perception of on-screen reading, second language proficiency, and computer familiarity. Academic discipline may be another variable worth investigating. Smith (2003) has found that faculty in different academic disciplines read different types and formats of journals. Science faculty members, for example, reported reading more articles from online sources than print-based ones. The types of online materials employed in various academic disciplines may influence students' on-screen reading behaviors. In addition, Smith (2003) also reported that junior faculty members, such as assistant professors, use electronic resources more than senior faculty members. Thus, on-screen reading behaviors seem to differ according to different age groups. Age, therefore, can be another potential variable that may impact students' on-screen reading behaviors, and so it would be worthwhile to investigate this variable.

5. The present study has suggested that the motivation one has to keep reading seems to be essential in the digital environment. With respect to this suggestion, it is recommended to conduct a study investigating students' "good-enough-reading" decisions (see Mackey, 1997) that motivates them to read academic texts on-screen. Mackey's (1997) study provides a valuable framework but yet may not be enough for us to understand what ESL students need in order to sustain their momentum when reading on-screen.
6. Because the structural model established in the current study was an initial one, future studies exploring what other factors can be added or excluded from the model are recommended. In addition, this model needs to be tested with different groups and in

different contexts for the purpose of comparison. In so doing, a theoretical framework that can better explain the nature of students' on-screen reading behaviors can be established.

5.6. Conclusion

This study explored international (ESL) graduate students' on-screen reading behaviors in academic settings. Students' on-screen reading preference, tendency, frequency and strategy use were investigated and compared between two academic purposes: reading for course preparation and reading for writing papers. This study also examined possible factors explaining students' on-screen reading behaviors, namely students' perception of on-screen reading, computer familiarity, and second language proficiency.

Despite its limitations noted earlier, this study has contributed to our understanding of international graduate students' on-screen reading behavior in various ways. First, as opposed to focusing solely on reading for writing papers purpose, this study also investigated international students' on-screen reading behaviors in reading for course preparation, which is rarely seen in previous work. Teachers may, therefore, have a more complete picture about students' on-screen reading behaviors in academic contexts and will be able to better prepare new-coming international graduate students. Second, this study extends previous on-screen reading studies by implementing quantitative and qualitative research approaches. As can be seen in Chapter Four, the survey data presented a general picture of students' on-screen reading behaviors, while interview data deepened our understanding of the complexity behind the students' reading behaviors.

Third, in addition to solely exploring international students' on-screen reading behaviors, this study investigated possible factors that may influence students' on-screen reading behaviors. As this study showed, students' perception of on-screen reading is the most influential factor, followed by second language proficiency and computer familiarity. These factors, moreover, interact with one another in their contribution to students' on-screen reading behaviors. The finding also enriches our understanding of international students' on-screen reading behaviors.

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APPENDIX A
QUESTIONNAIRE

Study of On-Screen Reading Behaviors in an Academic Context

Thank you for your willingness to participate in this study. This questionnaire will take you 20-30 minutes to finish and is concerned with your reading behaviors on a computer screen when you read in order to 1) prepare for a course or 2) prepare to write a paper.

Part 1. Your on-screen reading preference (4 items)

In this section, please **write the number** representing your level of agreement with the statement about reading on a computer screen with the given conditions.

Level of agreement
1=strongly disagree
2=disagree
3=slightly disagree
4=slightly agree
5=agree
6=strongly agree

EXAMPLE: I like chocolate. **5**

Writing the number **5** indicates that you **agree** that you like chocolate.

YOUR PREFERENCE	READING PURPOSES	
	For course preparation	For writing papers
I prefer to read texts on a computer screen no matter how long they are.	☐	☐
I don't mind reading texts on screen for a long time.	☐	☐
I don't mind reading long text on screen.	☐	☐
I prefer to print out computer-screen texts on paper.	☐	☐

1=strongly disagree
2=disagree
3=slightly disagree
4=slightly agree
5=agree
6=strongly agree

Please continue to the next page

Part 2. Your on-screen reading habits when reading academic texts (23 items)

<Section 1> Please **write the number** representing your level of agreement with the statement concerning your academic on-screen reading habits.

Level of agreement: *1=strongly disagree, 2=disagree, 3=slightly disagree, 4=slightly agree, 5=agree, 6=strongly agree*

> ***EXAMPLE:*** I like chocolate. **5**
>
> Writing the number **5** indicates that you **agree** that you like chocolate.

ON-SCREEN READING HABITS OF READING ACADEMIC TEXTS	READING PURPOSES: For course preparation	READING PURPOSES: For writing papers
1. I read texts on screen even if there is a printed hard copy available.		
2. I take an overview of texts on screen first before I decide whether to print them out.		
3. I feel comfortable reading texts on a computer screen.		
4. I feel confident reading carefully on a computer screen.		
5. I read texts on screen to save printing costs.		
6. I skim texts faster on a computer screen than on paper.		
7. If I only want to get an overview rather than details, I read texts on screen.		
8. If I begin to read on screen and find the texts are difficult, I will print out the texts.		
9. When I have to re-read texts, I DO NOT read them on screen.		
10. I DO NOT read texts on screen because it is easy for me to get lost from scrolling up and down.		

1=strongly disagree
2=disagree
3=slightly disagree
4=slightly agree
5=agree
6=strongly agree

	1=strongly disagree	2=disagree	3=slightly disagree	4=slightly agree	5=agree	6=strongly agree
11. I read texts on screen because the layout of the text changes when printed out.		☐			☐	
12. When I need to read texts closely, I DO NOT read on screen.		☐			☐	
13. I read texts on screen because they are freely available on the Internet (e.g., library database).		☐			☐	
14. If the assigned texts are available on the Internet and on hard copy, I read the texts on a computer screen.		☐			☐	
15. When I need to search for other references while I am reading, I read texts on screen.		☐			☐	
16. I only print out texts if I need to bring them with me wherever I go.		☐			☐	
17. When I only need to read parts of the texts, I read on screen.		☐			☐	

<Section 2> Please answer the following questions regarding your general habits of reading ACADEMIC TEXTS on a computer screen.

1. When you take courses and have reading assignments to read in one week, how often do you typically read *academic texts* on a computer screen **to prepare for courses**? _____ hours per day; _____ days per week
2. When you take courses and have term papers due in one week, how often do you typically read *academic texts* on a computer screen **to prepare for writing papers**? hours per day; _____ days per week
3. What is the maximum number of pages you are typically willing to read *academic texts* on a computer screen **to prepare for courses**? _____ pages
4. What is the maximum number of pages you are typically willing to read *academic texts* on a computer screen **to prepare for writing papers**? _____ pages

Please continue to the next page

Part 3. The strategies you use when you read academic texts on a computer screen

The purpose of this part is to collect information about how you read. Please **write the number** indicating the **frequency** of the strategy you use when you read on screen.

Level of frequency
1= never
2= occasionally
3= sometimes
4= usually
5=always

EXAMPLE:
I watch football games. **3**

Writing the number 3 indicates that you **sometimes** watch football games.

When I read on a computer screen,	READING PURPOSES: For course preparation	For writing papers
1. I know what I want to get from the text before I start to read.		
2. I take an overview of the text to see what it is about before reading it.		
3. I skim the text first by noting its characteristics like length and organization before reading it.		
4. I take notes on paper while reading screen-based texts to help me understand what I read.		
5. I type notes in my computer while reading to help me understand what I read.		
6. If I want to take notes while reading, I copy and paste the parts I want into my computer software.		
7. I use a Find function to find information I want in the texts.		
8. I use the cursor to get back on track when I lose concentration.		
9. I enlarge font size or change color to read screen-based texts with ease.		
10. I underline or highlight information on screen-based texts using computer software to help me remember it.		
11. I DO NOT read everything on screen; I purposely skip parts.		
12. When reading, I decide what to read closely and what to ignore.		
13. I read screen-based texts slowly to make sure I understand what I am reading.		

	1=never	2=occasionally	3=sometimes	4=usually	5=always
Please **write the number** indicating the **frequency** of the strategy you use when you read on screen.					
When I read on a computer screen,	**READING PURPOSES** For course preparation			For writing papers	
14. When a text becomes difficult, I pay closer attention to what I am reading.	☐			☐	
15. When a text becomes difficult, I re-read it to increase my understanding.	☐			☐	
16. I paraphrase (restate ideas in my own words) to better understand what I read.	☐			☐	
17. I go back and forth in the text to find relationships between main ideas.	☐			☐	
18. I use tables, figures, and pictures in the text to increase my understanding.	☐			☐	
19. I use typographical features (e.g., **bold face** and *italics*) to identify key information.	☐			☐	
20. I use reference materials (e.g., a dictionary, related online sources) to help me understand what I read.	☐			☐	
21. I think about information in both English and my native language.	☐			☐	

22. Other strategies you use to read on a computer screen but did not mention here:

please continue to the next page

Part 4. Your attitude about the importance of reading for two purposes: reading to prepare for courses and reading to prepare to write a paper. Please **write** the number indicating the importance of each statement according to your own opinion.

Level of importance
1= not important
2= little important
3= somewhat important
4= Important
5= Very important

EXAMPLE:
I think that. . .
watching OSU football games [3]
Writing the number 3 indicates that you think watching football games is **somewhat important.**

When I read academic text, I think that . . .	READING PURPOSES	
	For course preparation	For writing papers
finish all readings		
fully understand readings		
read in-depth carefully		
read the article entirely		
skip parts that I do not understand		
share what I have read with others		
re-read		
understand the terminologies		
using reading strategies		
take notes		
organize what I have read		
critique articles I have read		

please continue to the next page

Part 5. Your utilization of computers

Please **fill in** the blanks or **check** the description that fits you

1. How often do you typically use computers? _____hours per day; _____days per week
2. How do you categorize your experience in using computers? (check one)
   _high experience _moderate experience _low experience
   _no experience
3. How comfortable are you with using a computer? (check one)
   _very comfortable _comfortable _somewhat comfortable
   _not at all comfortable
4. How comfortable are you with using a computer to write a paper? (check one)
   _very comfortable _comfortable _somewhat comfortable
   _not at all comfortable
5. How comfortable are you with using a computer to read non-academic materials (e.g., news paper, magazines, novels) for pleasure? (check one)
   _very comfortable _comfortable _somewhat comfortable
   _not at all comfortable
6. On average, how often do you typically read for *leisure* in **English** on a computer screen?
   _____ hours per day; _____ days per week
7. On average, how often do you typically read for *leisure* in **your native language** on a computer screen?
   _____ hours per day; _____ days per week
8. What is the maximum number of pages you are typically willing to read for *leisure* in **English** on a computer screen?
   _____ pages
9. What is the maximum number of pages you are typically willing to read for *leisure* in **your native language** on a computer screen?
   _____ pages

Please continue to the next page

Part 6. Demographic information

1. Age: ____years old 2. Sex: ___ Male ___ Female
3. Country you are from:
4. College you are enrolled in:
5. Degree you are pursuing: __ Master __ Doctorial __ Other
6. How many years have you been as a graduate student at the OSU? ____ years
7. How many years have you lived in an English-speaking country? _____ years
8. How many years have you been studying in an English-speaking country? ___ years
9. How many years have you learned English? _____ years
10. Self-evaluate your general English literacy proficiency (check one)
    - reading
    __ excellent __ good __ fair __ not good __ poor
    - writing
    __ excellent __ good __ fair __ not good __ poor
11. Self-evaluate your English *academic reading and writing proficiency* (check one)
    - reading
    __ excellent __ good __ fair __ not good __ poor
    - writing
    __ excellent __ good __ fair __ not good __ poor
12. Self-evaluate your *general* literacy proficiency in your native language (check one)
    - reading
    __ excellent __ good __ fair __ not good __ poor
    - writing
    __ excellent __ good __ fair __ not good __ poor
13. Self-evaluate your *academic* literacy proficiency in your native language (check one)
    - reading
    __ excellent __ good __ fair __ not good __ poor
    - writing
    __ excellent __ good __ fair __ not good __ poor
14. Are you willing to participate in a follow-up interview or a follow-up questionnaire if necessarily?
    ☐ Yes. My email:_____ ☐ No.

~Thank you so very much for your participation~

APPENDIX B
INTERVIEW QUESTIONS

Can you describe the academic environment in your program?

1. When you reading for course preparation:
    1) What materials do you usually read?
    2) When you have hard copy materials, how do you approach those materials? What strategies do you use?
    3) When you have on-line materials, how do you approach those materials? What strategies do you use?
    4) Main thins you focus on when you read to prepare for courses

2. When you read for writing papers:
    1) What materials do you usually read?
    2) When you have hard copy materials, how do you approach those materials? What strategies do you use?
    3) When you have on-line materials, how do you approach those materials? What strategies do you use?
    4) Main things you focus on when you read to write
3. Reasons why you choose to read on a computer screen
4. Reasons why you choose Not to read on a computer screen
5. Does technology support (software) make different?
6. Does monitor make different? Laptop or desktop? Big screen or small screen?
7. Does familiarity of using computers make different?
8. Does language make different regarding your on-screen reading behaviors? How?
9. Does on-screen reading experience make any different in your preference and frequency of reading on a computer screen?

APPENDIX C
LETTER OF INVITATION

Dear International graduate students,

My name is I-Chia Chou and I am a Ph.D. candidate in Language, Literacy and Culture with a specialization in the Foreign and Second Language Education program at The Ohio State University. I am writing today to invite you to participate in my doctoral dissertation research on *On-Screen Reading Behaviors of Graduate Students in Academic Contexts*. The main purpose of the study is to explore students' on-screen reading behaviors in academic contexts. Many ESL studies have shown that technology facilities language learning. However, reading for academic purposes is different from that for language learning. In this case, only through investigating under what circumstances graduate students read academic text on the screen can reading researchers make sense of on-screen reading behaviors specifically in the academic context. In doing so, pedagogy that provides international graduate students' need can be provided.

You may participate by completing the survey questionnaire. This instrument will take approximately twenty-five minutes to complete. If interested, you can contact me and I can send you the questionnaire through email. You can then complete it and email me back. Your confidentiality is given the highest priority. If you have any questions, please feel free to contact me by email (chouih@gmail.com or chou.126@osu.edu).

This project was reviewed by the Human Subjects, Internal Review Board of the Ohio State University (IRB) (protocol number: 2008E0397).

Your opinions and experiences are very important. Thank you for your time and willingness to participate.

Sincerely,

I-Chia Chou, Ph.D. Candidate

Foreign and Second Language Education
School of Educational Teaching & Learning
The Ohio State University
Phone: (858) 401-2110
Email: chou.126@osu.edu; chouih@gmail.com

APPENDIX D
EXPLORATORY FACTOR ANALYSIS

Exploratory factor analysis—Reading for Course Preparation

Communalities

	Initial	Extraction
VAR00002	1.000	.448
VAR00005	1.000	.421
VAR00006	1.000	.470
VAR00007	1.000	.597
VAR00008	1.000	.441
VAR00009	1.000	.589
VAR00010	1.000	.507
VAR00012	1.000	.663
VAR00013	1.000	.462
VAR00015	1.000	.469
VAR00016	1.000	.711
VAR00017	1.000	.506

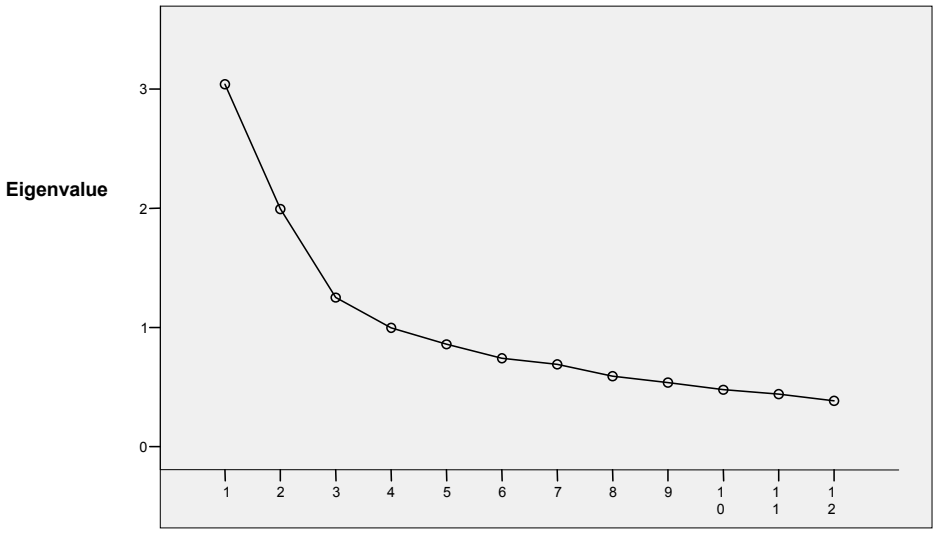
Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.039	25.328	25.328	3.039	25.328	25.328
2	1.994	16.620	41.948	1.994	16.620	41.948
3	1.251	10.425	52.373	1.251	10.425	52.373
4	.997	8.312	60.685			
5	.858	7.154	67.838			
6	.741	6.174	74.012			
7	.689	5.746	79.758			
8	.590	4.918	84.676			
9	.538	4.482	89.158			
10	.477	3.978	93.136			
11	.440	3.666	96.802			
12	.384	3.198	100.000			

Extraction Method: Principal Component Analysis.

Scree Plot



Component Matrix(a)

	Component		
	1	2	3
VAR00002	.572	-.319	-.139
VAR00005	.646	.042	-.042
VAR00006	.503	.122	-.449
VAR00007	.621	-.275	-.368
VAR00008	-.172	.641	.028
VAR00009	.412	.599	-.243
VAR00010	.464	.527	.118
VAR00012	.262	.768	.071
VAR00013	.630	-.196	-.163
VAR00015	.598	-.147	.300
VAR00016	.435	.092	.716
VAR00017	.478	-.307	.429

Extraction Method: Principal Component Analysis.
a 3 components extracted.

Exploratory factor analysis—Reading for Writing Papers

Communalities

	Initial	Extraction
VAR00002	1.000	.513
VAR00005	1.000	.312
VAR00006	1.000	.501
VAR00007	1.000	.564
VAR00008	1.000	.458
VAR00009	1.000	.505
VAR00010	1.000	.479
VAR00012	1.000	.655
VAR00013	1.000	.480
VAR00015	1.000	.615
VAR00016	1.000	.662
VAR00017	1.000	.369

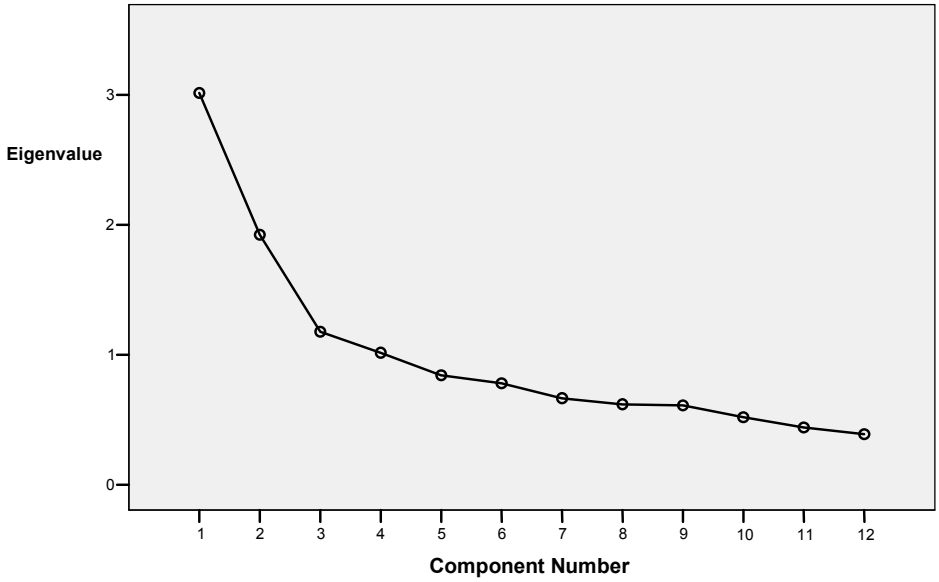
Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.014	25.114	25.114	3.014	25.114	25.114
2	1.923	16.025	41.139	1.923	16.025	41.139
3	1.178	9.814	50.953	1.178	9.814	50.953
4	1.015	8.461	59.414			
5	.843	7.026	66.441			
6	.781	6.508	72.949			
7	.666	5.553	78.502			
8	.619	5.161	83.663			
9	.611	5.092	88.755			
10	.519	4.329	93.084			
11	.441	3.673	96.757			
12	.389	3.243	100.000			

Extraction Method: Principal Component Analysis.

Scree Plot



Component Matrix(a)

	Component		
	1	2	3
VAR00002	.545	-.395	.245
VAR00005	.551	-.019	.089
VAR00006	.500	.047	.499
VAR00007	.580	-.383	.284
VAR00008	-.071	.673	-.015
VAR00009	.425	.501	.271
VAR00010	.496	.474	.096
VAR00012	.395	.706	-.010
VAR00013	.619	-.311	.015
VAR00015	.602	-.085	-.495
VAR00016	.547	.173	.578
VAR00017	.441	-.237	-.344

Extraction Method: Principal Component Analysis.
a 3 components extracted.

APPENDIX E
CORRELATION MATRIX

Correlation matrix in RCP condition:

Observed variables: copre coten cohr copg coad codi copy comhr comsum l1 l2 yr1 yr2 yr3 yr4
1
.716 1
.310 .359 1
.256 .253 .336 1
.381 .435 .359 .124 1
.452 .438 .208 .248 .127 1
.251 .274 .195 .082 .280 .169 1
.067 .108 .285 .104 .037 .106 .097 1
.182 .223 .206 .190 .170 .201 -.027 .241 1
-.003 -.023 .188 .235 .011 -.010 -.108 .250 .086 1
.129 .142 .171 .367 -.003 .082 -.044 .273 .181 .481 1
.158 .216 .093 .070 .130 .155 -.009 -.022 .178 -.024 .124 1
.003 .122 .027 .006 .083 .004 -.032 -.031 .064 -.035 .062 .252 1
.289 .335 -.027 .226 .046 .200 .008 .011 .223 -.058 .217 .508 .208 1
.306 .348 -.009 .220 .042 .242 .019 .002 .239 -.068 .229 .576 .227 .952 1
Standard deviations: 4.31514 4.44244 1.64104 2.14846 3.32177 2.43751 1.09877 25.21580 1.97734
24.20723 1.76932 1.92913 6.33770 .84866 .78472
Means: 9.5476 11.0357 2.7282 3.6613 17.6900 6.8111 2.4591 48.1638 13.7321 25.2765 3.3822 2.5922
14.1939 1.8851 1.8322
Sample size: 168

Correlation matrix in RWP condition:

Observed variables: pre ten hr pg adv dis phy comhr comuse l1 l2 yr1 yr2 yr3 yr4
1
.706 1
.319 .317 1
.218 .202 .419 1
.362 .441 .377 .091 1
.386 .485 .226 .119 .114 1
-.328 -.364 -.297 -.081 -.358 -.254 1
.142 .152 .255 .113 .071 .035 -.086 1
.173 .264 .127 .162 .171 .188 .005 .241 1
-.037 -.086 .073 .210 -.052 .027 .110 .250 .086 1
.105 .107 .052 .259 .003 .048 .037 .273 .181 .481 1
.166 .213 .185 .096 .127 .137 -.001 -.022 .178 -.024 .124 1
-.026 .101 .046 .011 .095 -.017 .025 -.031 .064 -.035 .062 .252 1
.247 .283 .061 .220 .024 .092 .019 .011 .223 -.058 .217 .508 .208 1
.251 .301 .079 .213 .025 .134 -.003 .002 .239 -.068 .229 .576 .227 .952 1
Standard deviations: 4.51212 4.50080 2.04362 28.77979 3.08984 1.78329 .94215 25.21580 1.97734
24.20723 1.76932 1.92913 6.33770 .84866 .78472
Means: 9.7440 11.0179 3.3522 24.6157 16.7300 6.1259 -2.0471 48.1638 13.7321 25.2765 3.3822 2.5922
14.1939 1.8851 1.8322
Sample size: 168