การตรวจสอบผลกระทบของการนำเสนอข้อความต่อความเข้าใจในการอ่านของนักศึกษาจีน
Examining the Effects of Text Presentation on Chinese Students' Reading Comprehension

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อตรวจสอบผลกระทบของการนำเสนอข้อความและความรู้ด้านคอมพิวเตอร์ต่อความเข้าใจในการอ่านภาษาอังกฤษ การนำเสนอข้อความ หมายถึง วิธีการแสดงข้อความผ่านหน้าจอคอมพิวเตอร์และการแสดงข้อความบนกระดาษ ความรู้ด้านคอมพิวเตอร์ หมายถึงความรู้และทักษะพื้นฐานในการใช้เทคโนโลยีคอมพิวเตอร์ซึ่งแบ่งเป็นสามระดับ คือ ต่ำ กลาง และสูง การศึกษานี้ได้ใช้กลุ่มตัวอย่างเป็นนักศึกษาจีนชั้นปีที่หนึ่งที่มิใช่สาขาวิชาเอกภาษาอังกฤษจำนวนหนึ่งร้อยยี่สิบคน ข้อมูลได้จากการสอบวัดระดับด้านคอมพิวเตอร์ระดับชาติจีน (เกรดหนึ่ง) และแบบทดสอบความเข้าใจในการอ่าน

ผลการวิเคราะห์ทางสถิติโดยใช้ ANOVA สองทาง พบว่า ความรู้ด้านคอมพิวเตอร์มีผลกระทบอย่างมีนัยสำคัญต่อความเข้าใจในการอ่าน ในขณะที่การนำเสนอข้อความไม่มีนัยสำคัญต่อความเข้าใจในการอ่าน การนำเสนอข้อความและความรู้ด้านคอมพิวเตอร์นั้นไม่มีปฏิสัมพันธ์กัน ผลการทดลองแสดงให้เห็นว่า

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ควรมีการวัดระดับความรู้ด้านคอมพิวเตอร์ของนักศึกษาสำหรับรายวิชาการอ่านภาษาอังกฤษที่ใช้คอมพิวเตอร์ และควรมีการฝึกอบรมคอมพิวเตอร์เพื่อเพิ่มทักษะก่อนการเรียนวิชาภาษาอังกฤษที่ใช้คอมพิวเตอร์ การศึกษาในอนาคตควรพัฒนาคำถามการวิจัยเชิงคุณภาพเพื่อให้เห็นอีกมิติหนึ่งของการศึกษาเกี่ยวกับการอ่านด้วยหน้าจอคอมพิวเตอร์และกระดาษ

Abstract

This study aimed to examine the effects of text presentation and computer literacy on English reading comprehension. *Text presentation* is operationally defined as the means to display text. In this case, it refers to computer screen or paper. *Computer literacy* refers to the basic knowledge and skills to deal with computer technology, involving three levels: low, moderate and high. One hundred and twenty Chinese first-year college non-English majors participated in the study. National Computer Rank Examination Grade One and Reading Comprehension Test were used as part of the data. A two-way ANOVA found a significant main effect for computer literacy on reading comprehension but no significant main effects for text presentation. No interaction between text presentation and computer literacy was found. The results suggest that in computer-based English reading instruction courses, the students' computer literacy level should be taken into consideration and a program of computer training to teach computer skills should be introduced in order to prepare students for learning English via computer. For future studies, research questions of a qualitative nature should be developed to provide another dimension to the area of study about reading from computer screens and from paper.

Key words: Text presentation; Computer literacy; Non-English majors; Reading comprehension

1. Introduction

In general, there is an agreement that the function of reading is to obtain meaning from printed texts. Nowadays, with the increased use of computers, reading materials are not only displayed on the traditional medium of paper but on computer screens as well. Moseley, Mearns and Tse (2001) and Kerr and Symons (2006) stated that the use of computers in educational settings has exploded in recent years, despite a lack of evidence supporting associated gains in academic achievement. However, as a matter of course, universities intend that students obtain language input by reading a variety of materials both on paper and on computer screens.

Alderson (2000) stated that **"**research is needed into how people process information presented via OHP slides, TV screens, films or other media**"** (p.78). He further claimed that it has become essential to know whether processing text on screens is different from processing on paper. It needs to be verified to what extent the new means of reading via electronic media helps learners to enhance their reading performance or impedes their processing of reading text.

1.1 Text presentation and reading comprehension

According to Alderson (2000), text presentation is one of the text variables of reading, defined as **"**the medium by which the text is presented**"** (p.78). For the current study, text presentation was operationally defined as the means to display text, referring to computer screens and paper.

Since the 1980s, a great deal of research has been conducted on reading performance to report differences in reading between computer screens and paper. Some studies show differences between the two media, while others demonstrate inconsistent results or contradict earlier results.

Some researchers reported that there was no significant effect on reading comprehension for different presentation media (e.g. Grimshaw, Dungworth,

McKnight, & Morris, 2007; Muter, Latremouille, & Treurniet, 1982; Muter & Maurutto, 1991; Mayes, Sims, & Koonce, 2001; Noyes & Garland, 2003). Muter et al (1982) required all subjects to answer 25 multiple-choice questions by hand after reading for two hours. The results showed that no effect was found on comprehension either for condition or question set. Noyes and Garland (2003) reported that in terms of comprehension scores, no difference in the number of correct scores was found between a Visual Display Terminal (VDT) and paper-based materials.

Grimshaw et al. (2007) investigated differences in comprehension and enjoyment according to the medium of presentation. The results indicated that the subjects generally took longer to read the extract from the computer than from the printed books. Further, there were no significant differences in either their comprehension or in the enjoyment of the extracts when reading the electronic versions of the extracts compared to reading printed versions of the same.

Other studies reported contradictory results (i.e. Joly, Capovilla, Bighetti, Neri, & Nicolau, 2009; Kerr & Symons, 2006; Wastlund, Reinikka, Norlander, & Archer, 2005; Wayne, 2003). Joly et al (2009) evaluated the differences of comprehension among 80 freshman students when they read a journalistic text on paper or on the Internet. The results showed that there were significant differences in the comprehension performance for printed and electronic texts. Students performed significantly better for electronic texts.

On the other hand, Kerr and Symons (2006) compared the effects of computer and paper presentation of text on reading time, free recall, cued recall, and inferential comprehension measures. The results indicated that comprehension was impeded when reading from computer monitors. The participants were more efficient at comprehending text when reading from paper. The same results were found in Wastlund et al.(2005), suggesting that

consumption of information, measured by a test of reading comprehension, is more difficult when the assignment is presented on a VDT than on paper

Reporting similarly, Wayne (2003) had 267 subjects read the same text, one version in print form, one in linear electronic form and the third in hypertext form. The subjects were then tested for the immediate retention of content. The results indicated that the comprehension of texts presented through both computer formats (linear and hypertext) was found to be significantly lower than that of the printed text.

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

1.2 Computer Literacy and Reading Comprehension

Since the 1990s, the concept of literacy has been expanded to not only include reading, writing and calculus, but also abilities associated with other media and technologies, such as computer literacy. Tsai (2002) defined computer literacy as **"**the basic knowledge, skills, and attitudes needed by all citizens to be able to deal with computer technology in their daily life**"** (p. 69). Similarly, Hoffman and Vance (2005) referred to computer literacy as familiarity with the basics of operating systems, hardware configurations, and desktop applications.

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

Computer literacy has been receiving more and more attention in research literature. It is frequently assumed that computer users need a special

literacy competence to control monitors when reading on screens. However, such beliefs are largely lacking in empirical verification. Even though some studies (i.e. Eveland & Dunwoody, 2001; Clariana & Wallace, 2002) have been conducted to examine whether the past experience of using a computer may affect reading comprehension, the results are inconsistent. Although Bussiére and Gluszynski (2004) claimed that there exists a clear link between reading scores and perceived computer abilities. A good number of studies have examined this link and found mixed effects.

Some studies, conducted by Renaud (1998), Attewell and Battle (1999) and Mann, Charol, Jonathan, and Robert (1999), found positive links. Renaud (1998) analyzed the impact of in-school computer use on science performance of seventh grade low-achievers. The study found a positive relationship between computer use and achievement as a function of exposure to computer assisted science instructions. Attewell and Battle (1999) using the 1998 National Longitudinal Study data, found that having a computer at home is associated with higher test scores in mathematics and reading. Similar results were found in the study by Mann et al. (1999) evaluating the impact of technology on school performance in West Virginia. The study showed that students who were exposed to the computer training program BS/CE scored significantly higher on the Stanford-9 state exam.

On the contrary, other studies that suggested exposure to and the use of computers might have no impact or even have negative effects on educational performance have been emerging more frequently. For example, Angrist and Victor (2001) investigated the effect of computers on test performance of students in Israel. No evidence of a relationship was found between Computer Assisted Instruction (CAI) and test scores. Johnson (2000) revealed that students who use computers in the classroom at least once a week do not perform better on the National Assessment of Educational Progress reading test than do those

who use computers less than once a week. Johnson's results were confirmed in 2002 through a study by Tremblay, Ross, and Berthelot, claiming no relationship between the presence of a computer in the classroom and the achievement of students.

Because of the importance of international standardized testing, many studies addressed the effects of computer literacy on computer-based (CBTs) and paper-based (P&P) tests. Since computer familiarity is relevant to Test of English as a Foreign Language (TOEFL) administration, many studies have compared computer-based and paper based TOEFL testing (e.g. Al-Othman, 2003; Clariana & Wallace, 2002; Kirsch, Jamieson, Taylor, & Eignor, 1998; Taylor, Jamieson, Eignor, & Kirsch, 1998).

In an important large-scale study, Kirsch et al. (1998) investigated the effects of computer literacy on TOEFL performance. The study found no difference in TOEFL performance between those who were familiar with computers and those who were not. A small but significant effect due to experience was observed by Taylor et al. (1998) on the computer-based TOEFL, with those who were less familiar with computers obtaining lower scores.

In a subsequent study, Clariana and Wallace (2002) investigated several key factors including content familiarity, computer familiarity, competitiveness, and gender in computer-based versus paper-based assessment. The results indicated that the computer-based test group outperformed the paper-based test group significantly. Also, gender, competitiveness, and computer familiarity did not affect the performance while content familiarity did.

Moreover, Al-Othman (2003) examined the relationship between online reading speed rates and performance on proficiency tests. The subjects were Arabic speaking students performing on the reading subtest of a simulated CBT TOEFL. Results indicated that those candidates with a strong computer background read significantly faster and performed significantly better.

The reviewed literature paints a mixed picture both in terms of the effects of text presentation on reading comprehension and in the impact that computer skills and knowledge might have on students' academic performance. The studies ranged in methodology from descriptive to multivariate. A paucity of studies conducted in Chinese context was apparent in the literature. Therefore, the study attempted to examine the effects of the two variables of text presentation and computer literacy on reading comprehension when Chinese non-English majors read from computer screens and from paper. The following research questions guided the study:

1. Are there differences in the English reading comprehension of Chinese non-English major students when reading from computer screens and from paper?

2. Are there different effects of computer literacy on the English reading comprehension of Chinese non-English major students when reading from computer screens and from paper?

2. Method

2.1 Design and Participants

The experiment was set up following a 2 (text presentation) x 3 (computer literacy) independent design, with no subject being tested on more than one condition. The independent variables of the study were modes of presentation (Computer screens and Paper) and computer literacy (Low, Moderate and High). The dependent variable of the study was the scores for multiple choice questions on the English Reading Comprehension Test.

A total of one hundred and twenty first-year non-English major undergraduate students at Guizhou University (GU), Guizhou Province, China participated in the main study. They were from four intact groups of the researcher's web-based multimedia course classes with around 50 students in each class. The researcher met them every Thursday and Friday morning.

The subjects were categorized into three groups: Low Level (Hereafter, LL), Moderate Level (Hereafter, ML) and High Level (Hereafter, HL), based on their computer literacy levels as determined by the scores on the National Computer Rank Examination Grade One test (see 2.2.1).

The subjects were matched across modes of text presentation (computer screens and paper) in terms of language proficiency, and as far as possible in terms of gender. A one-way ANOVA and independent t-test were performed to analyze the background information data from the pre-questionnaire survey and the NCRE scores. The age of the participants ranged from 18 to 21, with a mean age of 20.

All groups were controlled for gender. No differences in gender were found between text presentation of computer reading and paper reading, or among the three computer literacy groups of low, moderate and high level.

Control for language proficiency was confirmed by conducting t-tests on the students in two reading presentations and by one-way analyses of variance on the three groups. No significant differences were found, $F(2, 119) = 1.286$, $p = .280$ among the three computer literacy groups of low, moderate and high level, and between the text presentation modes of computer reading and paper reading condition ($t = .283$, $p = .777$).

2.2 Instruments

The subjects of this study completed three data collection instruments in the following order: 1) National Computer Rank Examination Grade One (NCRE One), 2) Pre-Experiment Questionnaire, and 3) Reading Comprehension Test.

2.2.1 *National Computer Rank Examination Grade One* is a standardized nationwide computer proficiency test in China, sponsored by the National Education Examinations Authority of the People's Republic of China, and approved by the Ministry of Education. It tests people's computer knowledge and abilities. The scores were used to categorize the subjects into three groups:

students whose scores were 0.5 standard deviations above the mean score were placed into a HL group, students whose score was within 0.5 standard deviations of the mean score were placed into a ML group, and students whose scores were 0.5 standard deviations below the mean score were placed into a LL group.

2.2.2 *Pre-Experiment Questionnaire.* Prior to conducting the main experimental task, a pre-experiment questionnaire was administered to collect demographic information about the participants' gender, age, and their English scores on the National Standard Matriculation Examination (NSMT).

2.2.3 *Reading Comprehension Test.* The subjects' reading performances were measured by a reading comprehension test in which there are two reading passages and a total of 20 multiple choice question items in hard copy. Two passages were selected for this experiment from the Volume One of the *College English Intensive Reading Coursebook*, which was published by Shanghai Foreign Language Education Press and was for a long time used as a course book for students enrolled in four-year undergraduate programs. The coursebook consisted of four volumes, of which Volume One represented the lowest of the four levels. The two passages were judged by five experienced EFL teachers at Guizhou University to be comprehensible to first year college students. In addition, text readability was analyzed in terms of (a) the average length of sentences, (b) the number of new words, and (c) the grammatical complexity of the language used. For this, the Flesch Reading Ease Readability Formula was applied to analyze the reading texts (see "Flesch Reading Ease Readability Formula," n.d.). The first passage was 556 words in length and had a Flesch-Kincaid Grade level of 8 and a Flesch Reading Ease of 60. The second passage was 349 words in length and had Flesch-Kincaid Grade level of 10 and a Flesch Reading Ease of 49. The results indicated that both passages were appropriate for first year college level students.

Each reading passage was followed by a set of 10 multiple-choice comprehension questions focusing on general comprehension, recognition of referents, and ability to deduce vocabulary in context. The use of a dictionary was not allowed.

The reading comprehension test was sent to 5 experts before the experimental task. In addition, the data obtained from a pilot study prior to the main study were analyzed with the Item Analysis System (IAS) developed by Khaimook (2004) to check the quality of all 20 items in the Reading Comprehension Test for the study. The reliability of the test was checked by using Cronbach's alpha which produced a value of 0.821, which indicated that the reading comprehension test in this study had a very good internal consistency. According to Kline (2005), an alpha value of 0.90 and up is considered excellent, 0.80 very good, and 0.70 acceptable. Therefore, the test is very good for the present study.

Two Types of Text Presentation of the Reading Passages

The selected texts were presented in two different presentation media: on paper and on computer screens. For both the paper display and the computer screens, the font was 12-point Times New Roman, single-spaced, with a maximum of 85 characters per line. Black text was typed on a white background. Texts on two text modes were full justified.

For paper reading, the two texts were printed on A4 paper using a laser printer. Each passage was 44 lines in total. The first line of each paragraph was indented three spaces. The text covered a space of approximately 29.7 cm (height) x 21 cm (width).

For computer reading, the same texts were typed into a computer. The resolution of the image was controlled so that the paper and screen versions of the texts were as similar as possible. Electronic versions of the text were powered by a Pentium IV processor and presented on a standard 14" colour

monitor made by Lenovo in China. Pixel dimensions of the monitor were 1024x768, and it had a refresh rate of 60 Hz. The computer presentation allowed for 25 lines to be seen in the viewing area, and a scrolling interface was employed.

2.3 Procedures

The procedures for the present study were as follows.

First, NCRE was administered to the subjects in paper version in order to collect data about their computer literacy. Based on the scores of NCRE, the subjects were categorized into 3 groups (Low, Moderate and High). Next, a pre-experiment questionnaire was administered to the participants in order to collect demographic information. Finally, 120 participants were required to do the experimental task. The participants were seated based on the presentation modes either in front of a computer or at a desk. Half of the subjects of each computer literacy group were seated in front of a computer, while the other half at a desk. All of the subjects read the two passages. After reading, all of the participants received 20 multiple-choice questions in paper version, 10 for each passage, and an answer sheet as well. All students were able to access the reading materials when answering the questions. The participants completed the whole task within the two 50-minute periods of course time, 100 minutes in total.

3. Results

3.1 Text presentation and reading comprehension

After finishing the experiment, the students' test papers were examined and graded. A subject's score out of 20 items was summed across the two passages for a maximum reading performance score of 20 points (10 for each passage). Descriptive statistics were first used to get the overall picture of means and standard deviation between the two text presentations. The means and standard deviations of subjects' reading scores in terms of text presentations are presented in Table 1 below.

Table 1: Means and Standard Deviations of Reading Performances for Text Presentations

Text presentation	N	Mean	Std. Deviation(σ)
Computer reading	60	13.53	3.159
Paper reading	60	15.00	3.707

It can be seen that the participants' average reading score obtained from computerized texts was 13.53 with σ = 3.159, while the average reading score from paper-based texts was 15.00 with σ =3.707. Standard deviation from average scores obtained for the computerized text was lower than for the paper-based text, which indicates a larger variability in the performance standard of the participant's comprehension of the paper-based text.

3.2 Computer literacy and reading comprehension

Descriptive statistics were also used to obtain an overall picture of means and standard deviation among the three computer literacy groups when reading English texts on computer screens and on paper. The means and standard deviations of subjects' reading scores in terms of computer literacy are presented in Table 2 below.

Table 2: Means and Standard Deviations of Reading Comprehension in terms of Computer Literacy Level

Computer level	N	Presentation Modes	Mean	σ
LL	40	Computer reading	11.60	2.191
		Paper reading	12.50	1.924
ML	40	Computer reading	14.20	4.604
		Paper reading	15.00	2.000
HL	40	Computer reading	17.60	4.393
		Paper reading	14.80	1.304

Note: LL=Low Level ML=Moderate Level HL=High Level

As Table 2 shows, in the computer reading condition, the mean scores of LL, ML and HL were 11.60 (σ =2.191), 14.20 (σ =4.604) and 17.60 (σ =4.393), respectively. The highest scores were obtained by HL students while the lowest scores were obtained by LL students, suggesting that the students' scores increased with the increase of computer literacy. Table 2 also shows that in paper reading, the means of each level were 12.50 (σ =1.924), 15.00 (σ =2.000) and 14.80 (σ =1.304), respectively. Unlike on computer reading mode, the highest scores were obtained by ML students, not by HL ones. Standard deviation from average scores obtained for the LL was lower than for the other two level groups, which indicates a smaller variability in the comprehension performance of the LL participants.

3.3 Effects of text presentation and computer literacy on reading comprehension

In order to answer the research questions, a two-way (text presentation x computer literacy) factorial ANOVA was employed to test for significant differences between means for reading comprehension scores. The two-way ANOVA results are presented in Table 3 below.

Table 3: Two-way ANOVA for the Reading Comprehension by Text Presentation and Computer literacy

Source	Type III Sum of Squares	df	F	Sig.
Presentation	5.208	1	.642	.425
Computer Literacy	164.867	2	10.159	.000**
Computer Literacy * Presentation	.867	2	.053	.948
Error	925.050	114		
Total	26355.000	120		

Note: Significance level is at .05.

As Table 3 shows, the main effect for computer literacy on reading comprehension, $F(2,114) = 10.159$, $p<.05$, was statistically significant. However, there was no significant main effect for text presentations, $F(1,114) = .425$, $p>.05$. As to the interaction effect between text presentation and computer literacy, no interaction was found, $F(2,114) = .053$, $p>.05$.

Tukey post hoc multiple comparisons were performed to further identify which group means is different from others (see Table 4).

Table 4: Multiple Comparisons for Computer Literacy Level

Computer literacy	Computer literacy	Mean Difference	Std. Error	Sig.
LL	ML	-2.80 *	.637	.000
	HL	-1.95 *	.637	.008
ML	LL	2.80 *	.637	.000
	HL	.85	.637	.379
HL	LL	1.95 *	.637	.008
	ML	-.85	.637	.379

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

As shown in Table 4, there was a significant difference between LL and ML groups ($p<.05$, MD = -2.80), and LL and HL groups ($p<.05$, MD = 1.95), but interestingly, there were no significant differences between the ML and HL groups ($p>.05$, MD = .85).

Therefore, the two research questions can be answered by noting that there are no differences in the English reading comprehension of Chinese non-English major students when reading from computer screens and from paper, while there are different effects of computer literacy on the English reading comprehension of Chinese non-English major students when reading from computer screens and from paper.

4. Discussion

4.1 Text presentation and reading comprehension

The results indicated that there were no significant differences in the subjects' comprehension scores when they read the paper-based version compared to the computerized version. This finding did not support certain previous studies (e.g. Joly et al., 2009; Kerr and Symons, 2006; Wayne, 2003). The results of Wayne's study revealed superior comprehension for the texts presented in printed format, while the studies of Joly et al. (2009) and Kerr and Symons (2006) found that comprehension when reading digital texts was better than that when reading hard copy texts. However, the present study was consistent with several studies which found no difference between the modes (e.g. Grimshaw et al., 2007; Muter et al, 1982; Muter & Maurutto, 1991; Mayes et al., 2001; Noyes & Garland, 2003). This may be because the modes of presentation of the material were adequately matched in content and appearance. The findings suggest that if the computerized and paper-based versions of the reading material are matched as similarly as possible in terms of resolution, contrast, character size, luminance, etc, reading comprehension may not differ significantly between the two presentation modes.

4.2 Computer literacy and reading comprehension

The results also revealed that computer literacy affected reading comprehension when reading from both presentation modes. The findings support the results suggested by previous studies that computer familiarity affects performance (e.g. Attewell & Battle, 1999; van Daal et al., 2000, Taylor et al, 1998), while they contradict the findings of other studies that the amount of previous exposure to and the use of computers might have no impact or even have negative effects on educational performance (e.g. Angrist & Victor, 2001; Johnson, 2000; Tremblay et al., 2001; Trites & McGroarty, 2005).

As the result of the present study suggested, there was a significant difference between both the LL and ML groups, and the LL and HL groups.

There are two possible explanations for this. First, the difference may have been related to the level of familiarity with the text modes. The HL and ML subjects presumably had more experience in reading computerized texts; therefore, when they read on computer screens, the mode did not impair the process of comprehending the materials. However, those from the LL group, not familiar with the computer medium, may have been hindered in their reading performance, since more cognitive load may be required when reading computerized texts from computer screens than from paper (Noyes & Garland, 2003). Hess and Miura (1985) revealed that the less experience and less exposure to the computer the subjects have, the more interference they may encounter in the reading process via computer.

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

Interestingly, a difference did not occur between the ML and HL groups. The possible reason may be that the ML students are equipped with enough basic skills, although not as high as the HL students, to cope with some problems in computer reading. In addition, they may be less anxious, which produces less handicapping factors when they interact with computers.

5. Conclusion

In the present study, text presentation did not impact students' reading performance, while computer literacy did have some effects on reading comprehension. The outcome of the study suggests that if the material used is matched as similarly as possible, no differences will occur in reading

comprehension between the two media. In addition, the findings of the study demonstrated that computer familiarity did affect performance and that the amount of previous exposure to and use of computers might have an impact on their performance.

The findings are beneficial in two respects. Firstly, the results of this study can be used to expand the database of literature in this field; therefore, further studies about text presentation can be conducted. Secondly, the results may help reading instructors as well as college students to promote awareness of attaching importance to both format and text presentation in computer-based reading lessons and computer-based tests, and to computer literacy in their online teaching and learning.

It has been observed that instructors should never assume that all students have basic computer skills and knowledge (Dupin-Bryant, 2002). Though many students use computers these days, they have varying prior experiences with computers. Both Dupin-Bryant (2002) and Kirtley (2005) pointed out that if a course requires a certain level of computer proficiency, students need to be taught to acquire those basic skills.

Therefore, it is suggested that a tutorial program of computer training should be included and developed in computer-based reading instruction in educational contexts where a wide range of computer literacy may be expected in an attempt to overcome any problem of lack of computer skills occurring in first-year college students. Such training could help prepare the students for learning English via computers.

The current study is subject to certain limitations regarding participants' background, sample size and choice of performance indicator. It is believed that inviting more subjects from different backgrounds and adding other performance indicators could have led to deeper insights into reading computerized texts on screens. As Noyes and Garland (2003) stated, research should move away from comparing computer screens and paper using only superficial measures such as

reading times and comprehension scores. For future studies, research questions of a qualitative nature should be developed to provide another dimension to the area of study of reading from paper and from computer screens. One area that merits further research is the affective dimension of reading on computer screens, for example, what attitudes students hold towards reading texts presented in different modes. Another might be strategy use in reading from paper and from computer screens.

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