

The Effect of CALL on EFL Learners' Reading Comprehension and Attitude towards the Use of Technology

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Abstract

The purpose of this study was to assess the effectiveness of CALL in developing reading proficiency of Iranian EFL learners in comparison to paper-based instruction and to investigate any significant difference in the reading comprehension of the high and low proficient learners after receiving computer-assisted instruction (CAI). This study also investigated the participants' attitudes toward Information Technology before and after the instruction in the experimental groups and examined the differences between the high and low proficient learners' attitudes toward Information Technology. The 40 female participants of the study, who were 20 high and 20 low proficient learners were randomly divided into four groups, two experimental groups and two comparison groups. The findings of the study indicated that there was a significant difference in the reading comprehension of the learners who received CAI in comparison to those learners who received paper-based instruction. Furthermore; there was a significant difference in the reading comprehension of the high and low proficient learners who received CAI. The results also showed that while the high proficient learners developed a more positive attitude toward Information Technology after instruction, the low proficient learners' attitude did not change significantly.

Introduction

Computer-Assisted Instruction (CAI) has been very popular during the last two decades, and scholars agree on the feasibility of applying computers in reading instruction under appropriate designs (Labbo & Reinking, 1999, cited in Sung et al., 2007, p.2).

Computer-assisted instruction may reduce the difficulties of implementing reading instruction in classrooms (Sung et al, 2007). According to Carrel (1987), while English is considered as one of the important instruments for academic achievement, reading comprehension and vocabulary can be the two primary elements to determine students' English proficiency in their academic achievement. For a long-term learning goal, reading seems the most important of the four language skills in learning English as Second Language (ESL) or as English as a Foreign Language (EFL) (Carrell, 1987). Carrell also indicated that effective reading is critical for students in EFL contexts and for students with academic purposes. To cope with the competitive edge in the age of technology and information, an effective and efficient reading ability is the key to academic success (Levine, Ferenz & Reves, 2000).

Moreover, technology has impacted foreign language instruction. Numerous ESL/EFL studies (e.g., Chappelle, 2001) suggest that technology incorporated in language learning can improve students' academic performance, enhance motivation, and promote learning. The application of practice with the most relevant technology in a particular context is challenging language teachers to achieve effective teaching with technology.

As Computer-Assisted Instruction (CAI) is increasingly integrated into curricula to promote the development of all skills, it is important to understand how software design impacts educational effectiveness. According to Renshaw and Taylor (2000), "the most basic CAI software is little more than an electronic textbook enhanced with electronic flashcards where the student is presented with a series of facts and answers a series of questions" (p.678).

The purpose of this study was to use a reading improvement software as a computer-assisted instruction (CAI) to investigate the influence of this reading software on high and low proficient Iranian learners' reading comprehension. It is believed that a reading software helps learners read faster, while maintaining and even improving their comprehension. AceReader which was used as a tool in this study to investigate the effectiveness of similar reading softwares, utilizes two technologies. 1) Rapid Serial Visual Presentation (RSVP) and 2) Tachistoscopic Scroll Presentation (TSP). When AceReader is in RSVP mode, the text is displayed in the center of the text area. As a result, learners read faster than normal because the eyes do not need

to move. When AceReader is in TSP mode, the text is displayed in a manner that forces the eyes to move just like they do in normal reading.

A software like AceReader permits learners to adjust 1) speed of text presentation, 2) font color, 3) font size, 4) background color, 5) number of words or lines, 6) delays and much more to meet their needs. It also provides the learners with the correct answer of the questions after they finish answering all the questions and reports their comprehension percentage. Providing all these options, it seems that AceReader as a CALL software can be an effective learning tool in reading comprehension. Consequently, studies seem to be necessary to investigate the effectiveness of using softwares in reading comprehension classes. As a whole, using a software that converts face-to-face instruction to CAI is an important element to be considered in developing effective CAI (Lowe & Holton, 2005).

Statement of the Problem and the Purpose of the Study

In recent years, English has been considered an important language on the road to internationalization among the non-English speaking countries (Burns, 2004). According to Carrel (1987), while English plays an important role for academic achievement, reading comprehension and vocabulary can be the two primary elements to determine students' English proficiency in their academic achievement. Because of the great importance of tests for language learners in pursuing their education abroad or participating in doctoral examinations, this study aimed to see if the use of a reading software, which can even be used as an autonomous learning tool, can help to improve Iranian EFL learners' reading proficiency and also to see if there was any significant difference in reading comprehension of the high and low proficient learners after computer-assisted instruction.

This study also attempted to identify the most useful features of the software from the participants' point of view. Computer technology holds promise for improving student's achievement in educational programs at all levels (Vernadakis, Avgerinos, Tsitskari & Zachopoulou, 2005). However, to what extent second language (L2) reading instruction using a computer-assisted language learning (CALL) software as a tool can facilitate language learning and reading comprehension is of major concern.

While many countries are using new technologies in language teaching, Iranian EFL learners' instructions are more text-book based and the students are less confronted with the new technologies in their classrooms. Moreover, in the third millennium in which mobility, time, and accessibility are of great importance due to the rapid increase in population, paper-based instruction would not suffice and can not be considered as the only way of instruction.

Lowe and Holton (2005) believe that with the rapid advances in technology, the need for lifelong learning and the growth of non-traditional students, the use of computers as a means of instructional delivery seems to be necessary. CAI has been shown to have positive effects on the academic achievement of students in the USA (e.g., Bangert-Drowns et al., 1985). In spite of claims regarding the potential benefits of using CAI in education, there is not much evidence that technology significantly influences the EFL learners' learning process (Kulik et al., 1980).

Significance of the Study

CAI is popular as it provides numerous benefits in practice. According to Worthington et al. (1996), computerized study can impact and improve students' overall level of mastery. Also, they emphasize that testing may be improved if students complete tests on computer screens and receive immediate feedback about their performance.

It is worth noting that although computer-assisted reading has had some impressive results (e.g., Blok, Oostdam, Otter, & Overmaat, 2002), there are some limitations as well. Regarding levels of reading abilities, most studies on computer-assisted reading have dealt with reading issues on a more fundamental level, such as word recognition (e.g., Frederiksen, Warren, & Roseberry, 1985) or phonological awareness (e.g., Farmer, Klein, & Bryson, 1992). There are relatively few studies focusing on assessing higher-level text comprehension through computer technology (Sung et al).

The purpose of this study was to assess CALL software (AceReader) effectiveness in developing reading proficiency of Iranian EFL learners in comparison to that of the paper-based instruction and to investigate any significant difference in reading comprehension of the high and low proficient learners after receiving CAI. This study also investigated the participants' attitudes toward Information Technology before and after the instruction and examined any significance difference between the high and low proficient learners' attitudes toward Information Technology.

Research Questions

The following research questions and hypotheses were formulated in this study.

1. Is there any significant difference in reading comprehension between the participants who receive computer-assisted instruction (CAI) and those who receive paper-based instruction?
2. Is there any significant difference in reading comprehension of the high and low proficient participants after receiving computer-assisted instruction?
3. Do the participants' attitudes toward Information Technology change in the experimental groups after the instruction?
4. Is there any significant difference between the high and low proficient participants' attitudes toward Information Technology after receiving computer-assisted instruction?

Computer-Assisted Language Learning (CALL)

Over the past 30 years language teachers have witnessed dramatic changes in the ways languages are taught. The focus of instruction has broadened from the teaching of discrete grammatical structures to the fostering of communicative ability. Providing comprehensible input has become a common pedagogical imperative (Krashen, 1985). One of the most significant areas of innovation in language education- computer-assisted language learning (CALL) has become the trend (Kern & Warschauer, 2000). Today, audiotape-based language labs are gradually being replaced by language media centers, where language learners can use multimedia CD-ROMs, and access articles and authentic learning materials on the Internet, and communicate with their teachers, classmates, and native speakers by e-mail.

To date, there has been relatively little published research that explores the relationship between the use of computer networks and language learning (Kern & Warschauer, 2000). One simple question to which everyone wants an answer is, "Does the use of network-based language teaching lead to better language learning?" This is the very issue many researchers and language teachers try their best to address. According to Kern and Warschauer (2000), the changes in language teaching are characterized as a shift from structural to communicative perspectives on language teaching. Researchers perceive a complex overlapping of three theoretical movements: structural, cognitive/constructivist and socio-cognitive perspectives in the recent development of language teaching (Kern & Warschauer, 2000). Chomsky (1965) believed that the development of an individual's grammatical system was guided by innate cognitive structures, not behavioral reinforcement. Chomsky's theory contributed to a gradual shift in goals from shaping accurate language habits to fostering a learner's mental construction of a second language system. Language learning had been understood not as conditioned response but as an active process of generating and transforming knowledge (Kern and Warschauer, 2000).

The influence of cognitive/constructivist approach was seen in the teaching of reading. Second-language readers were taught a variety of cognitive strategies, both top-down and bottom-up in order to improve their reading processes. 'During the 1980s, communicative competence became the buzzword of the language teaching profession' (Kern & Warschauer, 2000, p. 5). Communicative processes in language use became as important as linguistic product, and instruction became more learner-centered and less structurally driven. In a socio-cognitive approach, learning is viewed not just in terms of changes in an individual's cognitive structures but also in term of the social structure of the learner's discourse and activity (Crook, 1994).

Within the above shifting context of structural, cognitive, and socio-cognitive orientations we can understand changes in how computers have been used in language teaching. Logically, shifts in theoretical perspectives on language learning and teaching have paralleled developments in technology from the mainframe of the personal computer to networked computer (Kern & Warschauer, 2000). In the structural approach of CALL, language-learning programs, which consist of grammar and vocabulary tutorials, drill and practice programs, and language testing, strictly follow the computer as-tutor model. In line with cognitive/constructivist views of learning, the CALL programs tended to shift agency to the learner. From this cognitive approach of CALL, learning programs opportunities for problem solving are provided and allow learners to utilize their existing knowledge to develop new understandings (Kern & Warschauer, 2000). With socio-cognitive approaches to CALL, learners move from the learner's interaction with computers to interaction with other humans via the computer.

Software and L2 Language Reading

The first major computer-based reading curriculum was the work of Richard Atkinson in 1964 at Stanford University which was supported by a grant from the U.S. Office of Education. The project was a first-grade reading curriculum aimed to lessen the need for classroom teachers. Computer-based reading curricula

continued to develop but were of a commercial nature. Though some research, primarily evaluative, was conducted, most computer-based reading curricula studies have been sponsored by the companies marketing them. These research attempts were exclusively for first language (L1) reading; however, only during the past seventeen years has the use of computers in the field of teaching second language reading been increasing (Atkinson, 1974; cited in Mokhtarnia, 2007).

Culver (1991) implemented a computer reading program to determine the exit and entrance scores of ESL college students and to find out if their reading speed and comprehension would improve. The results showed some improvements for the majority of students in the target group with an overall increase of 3.9 grade level in reading rate. It was concluded that the computer reading program was a good tool for improving students' reading rate.

Preisinger, R. et al. (1988) used the schema theory as a basis to evaluate reading software programs. They developed criteria and questions to evaluate: 1) interactive capabilities of reading software 2) information processing, 3) background knowledge, 4) general software construction and implementation. The goal of this study was to develop an evaluative tool based in light of a theory to help teachers choose the right reading programs for their students.

In today's fast-paced information age, it is more important than ever to be a proficient reader. In Iran, several studies (Hedayati, 2005, & Hamidi, 2004) have been done to investigate the effect of Internet on reading comprehension of Iranian EFL learners, but just few studies are carried out using a reading software as a computer-assisted instruction to improve reading comprehension. To investigate the effect of Internet, Mokhtarnia (2007) compared the metacognitive awareness of hypertext (the text on Internet) reading strategies of Iranian EFL learners with its printed text counterparts. The results revealed that there is statistically significant difference between metacognitive awareness of hypertext and printed text strategies of Iranian EFL learners. Although the Internet offers valuable resources from around the world (e.g., databases, online journals, news, instructional materials, etc.), reading hypertext, however, has the possibility of drawing students in an information overload (McDonell, 2003). Although hypertext documents can help readers find information through different resources, it may cause confusion. With the multiple paths that are possible when reading a hypertext, there is a greater navigation load on the reader than the linear text.

There seem to be several advantages in using a reading software such as AceReader in reading instruction. For example, based on what is written on AceReader's website, the users of AceReader have claimed that AceReader is a modern-day software version of the mechanical tachistoscope machines from years ago. Those machines, which would flash text onto a screen at configurable speeds, were to help many students and teachers learn how to read better by pacing their eye movement. It seems that AceReader goes beyond those machines' capabilities, by providing more additional options and features, and it includes the ability to track students' progress. AceReader can be accessible both online and offline. It permits learners to adjust 1) speed of text presentation, 2) font color, 3) font size, 4) background color, 5) number of words or lines, 6) delays and much more to meet their needs.

It is often necessary, in a language learning classroom, to provide repeated practice to meet important objectives. Because this can be boring, painful, and frustrating, many students lose interest and motivation to learn foreign languages. According to Ravichandran and Phil (2000), CALL programs present the learner with a novelty. The materials are presented in more interesting and attractive ways. "Many students need additional time and individualized practice to meet learning objectives. CALL programs offer students self-instructional tasks that let them master prerequisite skills and course objectives at a speed and level dictated by their own needs" (Ravichandran & Phil, 2000, p. 85).

Furthermore, Ravichandran and Phil (2000) believe that students also differ in their preferred styles of learning. Many students seem to learn much more effectively when they are able to use a compatible learning style than when they are forced to employ an incompatible one. Serious conflicts may arise when a teacher employs a style that is incompatible with a student's. In this regard, CALL programs can be used for adapting instruction to the unique styles of individual students. According to Ravichandran T. & Phil, M. (2000), "learners receive maximum benefit from feedback only when it is supplied immediately" (p.84). They claim that students' interest and receptivity declines when the information on their performance is delayed. Yet for various reasons, classroom feedback is often delayed and at times denied.

CALL programs can give instantaneous feedback and help the learner ward off his misconception at the initial stage itself. As soon as the learners answer the questions, AceReader will show whether they have answered correctly or not and it will also give the percentage of the correct responses. Providing all these

options, it seems that AceReader as a CALL software can be an effective learning tool in reading comprehension. Consequently, studies seem to be necessary to investigate this issue.

Participants

The participants of this study were 40 female learners, selected from among the high and low proficient learners of two private language centers in Takestan. The high and the low proficient learners were each assigned randomly into two groups, the experimental group and the comparison group. So there were four groups, two comparison groups (high and low) and two experimental groups (high and low), each with 10 learners. High and low proficient learners were chosen in this study as it was thought that high proficient learners might have greater confidence confronting the computer while low proficient learners would have a lower confidence. On the other hand, low proficient ones might have more motivation to improve their proficiency for different reasons. These two groups were compared to find the effect of CAI on two different language proficiency levels.

The participants of each group were considered homogenized based on the institutes' criteria, but to ensure their homogeneity a sample reading comprehension test (Phillips, 1996) was also given to both the high and low proficient learners.

Instrumentation

Four instruments were used in this study: AceReader as a reading software, a Computer Attitude Questionnaire, sample reading comprehension passages (Phillips, 1995, 1998 & 2001), two sample tests of the reading section (Phillips, 1996), one for the pre- and post-test and the other for ensuring the homogeneity of the participants. It is worth pointing out that the questions of the pre and posttest were different from those that were used to ensure the homogeneity of the participants although the year is the same. The reading comprehension passages were taken from the book *Longman Preparation Course for the Test* which includes 5 practice tests. Each of the instruments used in this study is briefly described below.

AceReader

It is considered a sample reading software which was used as a tool in this study to investigate the effectiveness of this reading software specially and other similar softwares with similar techniques in general on the reading comprehension of Iranian EFL learners. As the creators of AceReader claim on their website, AceReader has several features such as reading improvement and assessment, reading fluency, speed reading and vision training. It can also assess the current reading ability and improve reading speed and comprehension. The researcher chose this software because of its potential features that let the learners choose the best one based on their particular needs.

AceReader which was just used as a tool in this study to investigate the effectiveness of similar reading softwares utilizes two technologies: 1) Rapid Serial Visual Presentation (RSVP) and 2) Tachistoscopic Scroll Presentation (TSP). When AceReader is in RSVP mode, text is displayed in the center of the text area. As a result, learners read faster than normal because the eyes do no need to move. When AceReader is in TSP mode, text is displayed in a manner that forces the eyes to move just like they do in normal reading. AceReader provides the learners with various options from among which the learners can choose the best that meet their own styles and preferences.

Computer Attitude Questionnaire

This questionnaire which was based on a 5-point Likert scale was given to the participants in the experimental groups at the beginning and the end of instruction to investigate their attitudes toward Information Technology. The seven-factor structure of the Teacher Attitudes Questionnaire developed by Knezek and Christensen (1998) was used. Included in it are five different domains designed to examine several relevant areas of interest. The information obtained from these instruments included the following:

Table 1. The Five Domains of the Computer Attitude Questionnaire

Enthusiasm/Enjoyment	15 items
Anxiety	15 items
Avoidance	13 items
E-mail for Classroom Learning	11 items
Productivity Improvement	15 items

Each of the instruments from which the items were taken has demonstrated high reliabilities and adequate levels of validity, as demonstrated in studies done by Knezek and Christensen (1998). The internal

reliabilities for the five instruments used range from .90-.96. The Cronbach alpha coefficient of the modified questionnaire used in this study was .81.

The original questionnaire consisted of 69 items. However, the modified version of this questionnaire which contained 54 items was adopted for this study. Some of the items were deleted as they were related to the use of the Internet and E-mail and these were not the focus of this study. The answers to the items ranged from Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A) to Strongly Agree (SA). Normal completion time was less than 15 minutes. It is worth mentioning that despite the name of the questionnaire, it is not only used for investigating the attitudes of faculty members. For example, in 1999, Knezek et al. used this questionnaire to investigate the attitudes of teachers and students toward Information Technology in four nations.

Sample Reading Comprehension Passages (Phillips, 1995, 1998 & 2001)

Sample reading comprehension passages (Phillips, 1995, 1998 & 2001) were used as the material of the study during the 16 sessions of the instruction. Each session, one passage was chosen and the participants of the four groups were provided with the passages and their following questions. The questions were multiple-choice and the number of the questions varied from one passage to another. The passages and the questions were given on paper to the comparison groups while the experimental groups could access them via the AceReader software.

Two Sample Reading Tests (Phillips, 1996)

One sample test was used as the pre-and posttest given to the four groups, the high and low proficient learners in the experimental and the comparison groups (see D), and the other one was used as the test to ensure the homogeneity of the participants (see E). Each of these sample tests consisted of 5 passages and a total number of 50 questions that were all multiple-choice. The time given to the participants to answer the questions was 55 minutes. The Cronbach alpha of the sample test for homogenizing the participants and the sample reading test used as the pre-and posttest was .80 and .86 respectively.

Procedure

At the beginning of the research, a sample test of reading comprehension (1996) was given to 50 high and low proficient learners to ensure the homogeneity of the participants, though they were considered homogenous based on the language centers' criteria. Then the mean of the scores was calculated and outliers i.e., those who were one standard deviation or more below and above the mean were excluded from the study. Thus, ten of the learners from the proficient were excluded. A sample of the reading section of the test (1996) was administered to the four groups as the pretest and the scores were recorded.

A modified version of the Computer Attitude Questionnaire (Knezek and Christensen, 1998) was given to the experimental groups to investigate their attitudes toward CAI. The questionnaire was based on a 5-point Likert scale and consisted of 54 items. The items of the questionnaire concentrated on the four areas of Enthusiasm/Enjoyment, Anxiety, Avoidance and Productivity Improvement.

Before the instruction began, the participants in the experimental groups were trained for about two hours in order to be able to use the software effectively. They were taught how to adjust the speed of text presentation, font color, font size, background color, number of words or lines, delays and all other options to meet their needs. The researcher clarified everything for the participants and she made sure that they had learned to use the software properly. The instruction lasted for 16 sessions in total. Each session, the participants of the four groups were provided with two sample reading comprehension passages (Phillips, 1995, 1998 & 2001) and they worked on the passages under the researcher's supervision.

Every session, the researcher gave a warm up at the beginning of teaching any passages which was asking general questions related to the topic of the passages in the four groups. Then the participants were given time (the time varied based on the words number of each passage) to read the first passage and to answer the following multiple-choice questions. The passages and the questions were given on paper to the comparison groups while the experimental groups could access them on the AceReader software. After the given time ended, the correct answers were provided. In this case, the difference between the comparison groups and the experimental groups was that the experimental groups had access to the correct answers after answering all the questions while the participants of the comparison groups had to wait for the teacher to provide the correct answers. The participants of the experimental groups could also see the test results graph which was the indicator of their speed and their comprehension of the test.

After providing all the correct answers, the researcher started reading the passage, paraphrasing, teaching the new vocabulary or any grammatical structure that the students were not familiar with. Then the

questions were discussed and reasons were given for selecting or rejecting any of the answers. As there were sixteen sessions of instruction, 16 samples of passages were chosen randomly from years 1995, 1998 & 2001 and were worked on in the four groups. After the 16 sessions of instruction, the participants of the experimental groups were again given the computer attitude questionnaire to see whether their attitudes toward Information Technology had changed.

Results and Findings

As mentioned earlier, the participants were considered homogenous based on the institute’s criteria, but to ensure their homogeneity, a sample test of reading comprehension (Phillips, 1996), was given to 20 high and 20 low proficient learners. The low proficient learners were the learners of the basic level of the institutes and the high proficient learners were the advanced learners of the institutes. This chapter provides a detailed data analysis based on the research questions of the current study.

Homogenizing the Participants

Although the level of participants was defined by the criteria of the institutes, the researcher tried to homogenize the participants in each level (high & low) based on a test to make sure that the difference is due to the treatment only. Therefore, a sample test of reading comprehension (Phillips, 1996) was given to 20 high and 20 low proficient learners. The test consisted of 50 multiple choice questions and each question had 2 points.

Table 2 displays the mean and standard deviation of the scores and also reflects the minimum and maximum scores of both high and low proficient participants. The data displayed in Table 4.1 indicates a mean of 50.09 for the high proficient learners and a mean of 16.14 for the low proficient learners.

Table 2. Descriptive Statistics of the Scores of 70 High and 70 Low Proficient Learners

	N	Minimum	Maximum	Mean	Std. Deviation
High Group	20	22	76	50.09	8.817
Low Group	20	4	36	16.14	5.578

In order to homogenize the participants of the high and low group based on their own level at each group; the extremes and the outliers were identified and excluded from the study (10 participants). Table 3 shows the descriptive statistics of the scores after the extremes and the outliers were excluded from the study in the high and low groups.

Table 3. Descriptive Statistics of the 60 High and 60 Low Proficient Learners after excluding the Extremes and Outliers

	N	Minimum	Maximum	Mean	Std. Deviation
High Group	20	46	58	51.73	3.654
Low Group	23	10	24	16.95	3.548

In order to determine whether the remaining participants were homogenous, a One-Sample Kolmogorov-Smirnov Test was used.

Table 4. One-Sample Kolmogorov-Smirnov Test for the High and Low Proficient Learners

		Low	High
N		20	20
Normal Parameters ^a	Mean	18.79	51.73
	Std. Deviation	3.548	3.654
Most Extreme Differences	Absolute	.150	.132
	Positive	.150	.130
	Negative	-.141	-.132
Kolmogorov-Smirnov Z		1.187	1.026
Asymp. Sig. (2-tailed)		.119	.243

a. Test distribution is Normal.

The results shown in Table 4 indicate a significance of 0.24 for the high proficient learners and a significance of .119 for the low proficient learners which are greater than $p = 0.05$. Therefore, it can be concluded that there was no significant difference with regard to the reading comprehension level of the participants before the instruction in the high and low groups. According to this, all the high and low proficient participants were homogenous in each group before the instruction and the test distribution was normal.

4.4. The First Research Question

The first research question in the present study was directed toward investigating the probable difference in reading comprehension of the students who received CAI and those who received paper-based instruction. In order to address the research question, the descriptive statistics of the four groups were examined. The pretest and posttest contained 50 multiple choice questions of the sample reading comprehension (1996). Each question had 2 points; therefore, the total possible score for the reading comprehension was 100. It is worth noting that both the pre and posttest were the same. Table 5 displays the mean and standard deviation of the pre and posttest scores and also reflects the minimum and maximum scores in the four groups.

Table 5. Pretest and Posttest Descriptive Statistics for the Experimental and Comparison Groups

Groups	N Pretest	N Posttest	Pretest mean	Posttest mean	Pretest SD	Posttest SD
Experimental(High)	10	10	52.87	66.38	4.91	5.42
Comparison(High)	10	10	53.13	60.20	4.94	5.43
Experimental(Low)	10	10	16.67	24.59	3.97	4.78
Comparison(Low)	10	10	16.27	23.69	3.81	4.92

All the four groups show an increase in scores after the instruction was completed. The high experimental group's mean increased by 13.51, while the high comparison group's mean by 7.16. As it is shown in Table 5 the low comparison group's mean is lower than the low experimental group's mean. The low experimental group increased by 7.92 while the low comparison group's mean increased by 7.42. Before doing the independent samples t-test, the gain scores were calculated and the normality of distribution was checked, since one of the assumptions of a t-test is the normal distribution of the scores. The results shown in Table 6 indicate a significance of 0.003 which is lower than $p=0.05$. Therefore, the data does not meet the assumption of normality.

Table 6. One-Sample Kolmogorov-Smirnov Test for Checking the Normality of distribution of the Gain Scores

N	104	
Normal Parameters ^a	Mean	8.85
	Std. Deviation	4.074
Most Extreme Differences	Absolute	.177
	Positive	.177
	Negative	-.108
Kolmogorov-Smirnov Z	1.805	
Asymp. Sig. (2-tailed)	.003	

As a result, the gain scores were ranked and the Mann-Whitney U test was used as a nonparametric analog to the t-test to determine whether there was any significant difference of the performance between the experimental groups and the comparison groups.

Table 7. The Mann-Whitney U test Comparing the Experimental Groups and the Comparison Groups on the Gain Scores

	Rank of Scores
Mann-Whitney U	983.500
Wilcoxon W	2414.500
Z	-2.435
Asymp. Sig. (2-tailed)	.015

The Mann-Whitney U test analysis in Table 4.6 indicates that computer-assisted instruction resulted a significant difference in students' reading comprehension when compared to paper-based instruction, $Z=2.435$; $p<.05$. Thus, in addressing research question 1, it appears that computer-assisted instruction did make a difference in students' reading comprehension.

The Second Research Question

The second research question in the present study was directed toward investigating the probable difference in reading comprehension of the high and low proficient learners after receiving CAI. To do so, at first the gain scores were calculated and the normality of distribution was checked. The results shown in Table 8 indicate a significance of 0.019 which is lower than $p=0.05$. Therefore, it violates one of the assumptions of the t-test; that is, normality of distribution.

Table 8. One-Sample Kolmogorov-Smirnov Test of the Experimental Groups Scores for Checking the Normality of Distribution

N	53	
Normal Parameters ^a	Mean	9.25
	Std. Deviation	4.645
Most Extreme Differences	Absolute	.209
	Positive	.209
	Negative	-.110
Kolmogorov-Smirnov Z	1.522	
Asymp. Sig. (2-tailed)	.019	

To see if there was any significant difference in reading comprehension of the high and low proficient learners, at first the gain scores were ranked and then Mann-Whitney U Test was used as a nonparametric equivalent test for independent sample t-test.

Table 9. Mann-Whitney U Test Comparing the Experimental Groups (High and Low) Gain Scores

	Rank of Scores
Mann-Whitney U	116.000
Wilcoxon W	467.000
Z	-4.254
Asymp. Sig. (2-tailed)	.000

The results shown in Table 4.8 indicate that there is a significant difference in the reading comprehension gain scores of the high and low proficient participants after receiving computer-assisted instruction, $Z=4.254$; $p<.05$. It means that CAI does not have the same effect on different language proficiency levels. In fact high proficient learners benefit more from computer-assisted instruction.

Reliability of the Questionnaire

As mentioned earlier, a computer attitude questionnaire was used in this study to investigate the participants’ attitudes toward Information Technology in the experimental groups before and after the instruction. The modified version of the questionnaire used in this study consisted of 54 items and the Cronbach’s alpha for the questionnaire used in this study as demonstrated in Table 10 was .81. This shows that this questionnaire was fairly reliable for assessing the participants’ attitudes toward Information Technology.

Table 10. The Reliability of the Computer Attitude Questionnaire

Instrument	Cronbach’s Alpha	N of Items
Computer Attitude Questionnaire	.81	54

The third Research Question

The third research question presented in this study was directed toward investigating the participants’ attitudes toward Information Technology before and after the instruction in the experimental groups to see if there was any significant difference between them. The modified version of the questionnaire used in this study was based on a 5-point Likert scale and consisted of 54 items. The items of the questionnaire concentrated on the four areas of Enthusiasm/Enjoyment, Anxiety, Avoidance and Productivity Improvement. Each item included in computer attitude questionnaire had 5 response options. These options were given values from one to five, where value five indicated the highest degree of agreement with the use of computer and technology, and one indicated the least. Therefore, the possible score range was from 54 to 270.

The descriptive statistics of the participants’ scores on the computer attitude questionnaire before the instruction in both high and low groups is presented in Table 11.

Table 11. Descriptive Statistics of the Participants Scores on the Computer Attitude Questionnaire before the Instruction

	Mean	SD	Maximum	Minimum
High Group	115.46	12.67	169	71
Low Group	115.63	17.36	164	79

The results shown in Table 11 indicate that the mean score of the low group is higher than the mean score of the high group before instruction.

Table 12 presents the descriptive statistics of the participants’ scores on the computer attitude questionnaire after instruction.

Table 12. Descriptive Statistics of the Participants’ Scores on the Computer Attitude Questionnaire after the Instruction

	Mean	SD	Maximum	Minimum
High Group	190.81	9.87	212	164

Low Group	116.43	14.85	145	88
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As it is shown in Table 12 the mean score of the high group is higher than the mean score of the low group after the instruction. Before conducting a matched t-test, one-sample Kolmogorov-Smirnov tests were run to check the normality of the distribution of the scores both on the pretest and posttest.

Table 13. One-Sample Kolmogorov-Smirnov Test for Checking the Normality of the Distribution of the Scores on the Pre and Posttest

		post	pre
N		53	53
Normal Parameters ^a	Mean	152.02	115.55
	Std. Deviation	18.423	22.565
Most Extreme Differences	Absolute	.0127	.082
	Positive	.161	.082
	Negative	-.227	-.057
Kolmogorov-Smirnov Z		1.655	.598
Asymp. Sig. (2-tailed)		.080	.867

a. Test distribution is Normal.

As observed in Table 13, the sig. values for the pretest and posttest are .080 and .867 respectively which are greater than the alpha level (.05). Therefore, this result indicates that both the pretest and posttest have normal distributions. To determine whether a significant difference existed in the participants' attitudes toward Information Technology in the experimental groups after the instruction, a matched t-test (Table 4.13) was conducted.

Table 14. Matched T-Test Results for the Difference between Pre and Post Test Scores on the Questionnaire

The matched t-test analysis in Table 14 indicates that there was a significant difference in students'

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
The Experimental Groups	61.698	12.034	3.301	55.073	68.323	18.689	52	.000

attitudes toward Information Technology before and after the instruction, [t (52) =18.689; p<.05]. In other words, participants had a more positive attitude toward Information Technology after the instruction. Thus, in addressing research question 3, it appears that computer-assisted instruction did make a difference in raising students' positive attitudes toward Information Technology.

The Fourth Research Question

The fourth research question of this study aimed at investigating the probable difference between the high and low proficient participants' attitudes toward Information Technology after receiving computer-assisted instruction. Therefore, at first the normality of distribution was checked to see if meets the assumption of the t-test or not.

Table 15. One-Sample Kolmogorov-Smirnov Test for Checking the Normality of Distribution

		Scores
N		52
Normal Parameters ^a	Mean	61.69
	Std. Deviation	24.269
Most Extreme Differences	Absolute	.122
	Positive	.063
	Negative	-.122
Kolmogorov-Smirnov Z		.877
Asymp. Sig. (2-tailed)		.425

a. Test distribution is Normal.

The results shown in Table 15 indicate a significance of 0.425 which is greater than $p=0.05$. Therefore, it meets one of the assumptions of the t-test that is the normality of distribution. To answer the fourth research question an independent samples t-test (Table 16) was conducted on gain scores.

Table 17. An Independent Sample t-test for the Difference between High and Low group Scores on the Questionnaire after the Instruction

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.008	.928	5.499	50	.000	29.529	5.370	18.742	40.315
Equal variances not assumed			5.515	50.000	.000	29.529	5.354	18.775	40.283

The Levene's test in Table 16 indicates that the assumption for the equality of variances is verified ($F = .008$; $p > .05$); and the t-test indicates there was a significant difference between the high and low proficient participants' attitudes toward Information Technology after receiving computer-assisted instruction, $t(50) = 5.499$; $p < .05$. In other words, high proficient learners had a more positive attitude toward Information Technology after the instruction.

Discussion

The findings of this study suggest that CAI can enhance Iranian learners' reading comprehension in both high and low groups. Moreover, it shows that there is a significant difference in the reading comprehension of the high and low proficient learners after receiving CAI. The results show that the high experimental group outperformed the high comparison group in the posttest while the mean of the post test scores of low experimental and low comparison group were quite similar. Thus, it seems that high proficient learners benefit more from CAI than the low proficient learners due to their high language proficiency and their great confidence confronting computers. In fact, the results show that, the mode of instruction does not make a big difference for the low proficient learners in their reading comprehension, whereas it plays an important role in the high proficient learners' reading comprehension. Paper-based instruction and computer-assisted instruction had the same effects on the low proficient learners' reading comprehension while there is a significant difference in reading comprehension of the high proficient learners who received paper-based instruction and those who received computer-assisted instruction.

The results of this study are in accordance with a number of studies which claimed that there are several advantages in incorporating computers and that CAI can enhance reading comprehension (Lynch, Fawcett, & Nicolson, 2000; Mathes, Torgesen, & Allor, 2001). Yet, these studies do not take into account the importance of language proficiency. This study indicates that perhaps high proficient learners get a better result from CAI due to their high language proficiency.

According to Cotton (1992), computer-assisted instruction can improve students' attitude in some aspects. These aspects include improved attitudes towards themselves as learners (e.g., self-efficacy), the use of computers in learning, course subject matter, quality of instruction, and school, in general.

The findings of this study also showed that the participants' attitude toward Information Technology change after the instruction. Although the participants of the high experimental group developed a more positive attitude toward Information Technology after the instruction, the attitude of the low experimental group did not change significantly after the instruction. The results showed that the low group had a more positive attitude toward Information Technology in comparison to the high group before the instruction which indicated that they were more interested in computer-assisted instruction; however, the low group attitude did not change significantly after the instruction. The results can confirm the fact that the low group found computer assisted instruction difficult after the instruction. But the high group's attitude changed significantly after the instruction, which shows that the high group found computer-assisted instruction very interesting and helpful.

According to Scholnik and Kol (2006), reading to learn involves heavy cognitive processing on the part of the reader and the second-language reader has a greater cognitive load than the native speaker. They believe that a feature like changing the font and color which let the learner read according to his/her own learning styles and preferences will decrease this cognitive load.

Conclusions

Computers have been used since the first half of the 20th century, but they were not used for educational purposes until the 1960s (Gunduz, 2005). The 1970s witnessed the evolution of CALL as a result of development in research related to the use of computers for linguistic purposes and for creating suitable language learning conditions. According to Gunduz (2005), Computer-Assisted Instruction (CAI) is among the range of strategies being used to improve student achievement in all subjects, including reading. According to Kulik, Bangert, and Williams (1983) students are expected to benefit from CAI. Among the benefits that have been expected are better and more comfortable learning for students, since they learn at their own pace and convenience. Kulik, Bangert, and Williams (1983) also believe that teachers as well are expected to gain from CAI, as they experience less work and repetition, greater ease in updating instructional materials, more accurate appraisal and documentation of student progress, and more time to work directly with students.

Although a great deal of research was conducted during the 1970s, 1980s, and early 1990s on the effects of computer use on student achievement and attitudes, the use of a reading software to improve learners' reading comprehension is still a relatively new domain for researchers to investigate and little research exists on the effect of using a software on learners' reading comprehension. Therefore, this study was an attempt to examine the effect of using a software on Iranian EFL learners' reading comprehension and attitudes.

As mentioned in chapter four, the results showed that Ho.1, Ho.2, Ho.3, and Ho.4 were all rejected. Thus, the results suggest that there is a significant difference between CAI and paper-based instruction group in reading comprehension. In other words, computer-assisted instruction can help EFL learners to develop a higher reading comprehension. As a result, as mentioned earlier, due to the importance of reading comprehension for EFL learners and the fact that computer-based will take the place of paper-based sooner or later, EFL learners should be trained through CAI to cope with the new technologies in ESL/EFL instruction. The results showed that there is a significant difference in reading comprehension of the high and low proficient learners. In fact CAI was more beneficial for the high proficient learners than the low proficient ones. Thus, taking into consideration the importance of language proficiency is crucial before the implementation of CAI into classroom.

Questionnaire results of this study also indicated that an effective CALL classroom has the possibility of changing the students' attitudes toward Information Technology; however, language proficiency plays an important role. Based on the results of this study, the high proficient learners developed a more positive attitude toward Information Technology after the instruction, whereas the low proficient attitudes did not change significantly after the instruction.

These findings are in line with the opinion of those scholars who believe that computer applications can play a significant role in teaching and learning and that CAI as an instructional tool has been effective in raising reading achievement, especially when used to supplement traditional instruction (Bangert-Drowns, et al. 1985;

Lungberg, 1995). According to Soe, Koki and Chang (2000), computer applications to teach reading hold great promise as instructional tools to increase students' engagement in reading, promote reading comprehension, and improve reading skills. They claim that teachers can be empowered to vary the pace of instruction, teach and reinforce specific skills and strategies, improve motivation, and provide students with relevant and immediate feedback (Soe, Koki and Chang, 2000).

Nevertheless, these findings are still inconsistent with the opinion of some other scholars who argue against the effectiveness of applying computers in education. Their main argument against computers in the classroom is that teachers need to take into account the importance of student emotions. They do not want the quick evolution of computer technology to interfere with the student's need for human support that they receive from the teacher-based instruction. Many people who grew up in a pre-computer age worry that the use of computers will take the emotion and heart out of the classroom. Wehrle (1998) states "the pre-computer age generation envisions designing computer technologies that still take into account the emotional needs of the students (p.5)."

In closing, there is still much to be learned about using a software in L2 reading. It should not be forgotten that the computer's role in teaching is solely a teaching aid. What is of great importance is not the use of technology per se but the quality of what is done with this medium. Therefore, the use of CAI alone may be insufficient in the teaching of reading. While CAI as an instructional tool has been effective in raising reading achievement, especially when used to supplement paper-based instruction, other variables need to be considered in the teaching of reading (Soe, Koki & Chang, 2000).

According to Gulley (2003), education serves as a window through which our imagination and curiosity can take flight into the unknown and enhance our creativity, and the use of computer technology in education plays an enormous role in helping students to achieve their full development potential. Given the role that education plays in preparing students to go into the world, it seems clear that there should be a connection between the world and the classroom. Unless education reflects the world in which it exists, it has no relevance for the students. In conclusion, "Computer technology is a positive supplement to bridge the gap between education and the technological world in which we live" (Gulley, 2003).

Implications

This study is of critical importance for curriculum developers as they create, examine and select curricula for students. Curriculum developers should understand how CAI support the way students read and comprehend text. This study has the potential to encourage material developers to integrate appropriate software so that the learners can practice based on their own pace of learning and preferences to promote their reading skills. Besides, curriculum developers can use appropriate softwares for other skills such as listening and writing to help the learners reach their full potential.

Another implication of this study is for language teachers. They must be aware of the fact that CAI can not only improve learners' reading comprehension, but also motivate the learners and make reading fun. Provided the learners' proficiency level is taken into consideration, reading instruction aligned with computer-assisted instruction can serve as a powerful teaching tool to assist teachers in helping students reach their potential in reading. Teachers should not be afraid to be replaced by the computers as it is the teacher who decides what degree of control the computer will have in her/his classes. Hence, as Brierley & Kemble (1991) state, there is no need for teachers to feel threatened to lose their professions to the computer.

The third implication of this study is for EFL learners. Reading, especially reading comprehension, is of great importance for all L2 learners who want to pursue their studies. The EFL learners need to adopt the new technologies to cope with the age of technology. They should accept the fact that computer-based instruction (CBI) will take the place of paper-based instruction sooner or later.

Further Research

Further research can address several issues left unresolved by this study. In future studies, one might consider the following issues:

1. Is there any significant difference in listening or writing of the participants who receive computer-assisted instruction (CAI) and those who receive paper-based instruction?
2. Is there any significance difference in reading comprehension of the English and non-English major students who receive a computer-assisted instruction?
3. Is there any significance difference in reading comprehension of the learners having different levels of motivation after receiving computer-assisted instruction

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