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Computer Assisted Reading (CAR) Versus Traditional Print Format in EFL Academic Reading Comprehension

S. Vahdat*

Abstract

In this study two modes of reading (CAR and Print reading mode) were compared with regard to their effectiveness for L2 reading comprehension. A group of 120 English major students were divided into three classes: CAR, Print reading, and Control. Based on the English proficiency scores each class was divided into two groups (high and low levels of proficiency). Three classes were taught by the same teacher and covered the same materials in their weekly four-hour reading lesson over one semester. From the three classes only CAR and Print reading groups received reading strategies instruction. This study also investigated the effect of gender and the role of teacher in CAR class. The data came from English proficiency test, reading comprehension test (pre-test), questionnaire, reading comprehension test (posttest), observation, and students' emails. The results indicated that strategy instruction had an impact on reading comprehension. In other words, CAR and Print reading mode evoked better reading comprehension than the control group and CAR resulted in better performance when compared to the Print reading mode. Interestingly, EFL students with a higher proficiency level showed a significantly higher level of reading comprehension of the text when compared with those students with a lower proficiency level. Regarding the gender the findings indicated

* - Assistant Prof in University of Shahid Chamran, Iran,
E-mail: royavahdat@hotmail.com

that gender played no significant role in CAR class. Finally, based on the observation and students' emails the researcher concluded that the nature of the EFL teacher's role changed in CAR class when compared with the print reading and traditional classes.

Key words: Computer Assisted Reading, language proficiency, gender, Teacher's role

Introduction

The last two decades have witnessed a striking increase in computer development and technical advancement. Presently, the computer technology becomes more and more accessible due to the improvements in the efficiency and quality, and refinements in computers and software. Although there have been numerous uses of computers in the area of reading, the use of computer technology in the reading class has been reported to be minimal in comparison with the existing practices (Singhal, 1999).

With the advent of Internet age and the sharp increase of its use for academic purposes, electronic texts have proven to be an important source for students in addition to conventional texts presentation. Meanwhile, due to the explosion of information, EFL learners are required to examine a variety of text forms to actively create an individual learning environment. As a result, readers should possess a good command of reading skills and strategies to cope with academic reading embedded in conventional and electronic texts (Levin, Ferenz, and Reves, 2000).

A number of researchers have encouraged the use of a computer environment for reading instruction (Kemp, 1993; Chun, 1994; Singhal, 1998; Hancock, 1999). Computerized environments offer new possibilities to combine visual, verbal and auditory modes in multimedia presentations. The effectiveness of these capabilities available to L2 learners via multimedia has been the focus of several studies.

Chun and Plass (1996) examined the impact of multimedia on reading comprehension. The findings of their studies indicated that the use of multimedia facilitated overall reading comprehension and that vocabulary annotations consisting of both visual and verbal information were more effective than verbal information exclusively.

In contrast to this research, other studies on the effectiveness of computer multimedia were not able to prove that computers improve student performance. Donato and Coen (1987) contended that they failed to provide evidence that computer use resulted in higher achievement than traditional modes of instruction.

Although the effectiveness of computerized multimedia environment on L2 reading comprehension has been a focus of several studies, research so far yielded somewhat conflicting results, especially when computerized environment was directly compared with traditional print medium. It is also unclear whether lower proficiency learners benefit more from computerized reading when compared to higher proficiency learners. The present study compares the efficacy of these two presentational modes on reading comprehension among EFL students of two proficiency levels, and compares the nature of the EFL teacher's role in these modes of reading comprehension. Moreover this study examines the gender differences in dealing with instruction via computer software.

Research's Questions and Hypotheses

In this study an attempt was made to find answers to the following questions:

1- Is there a significant difference between the posttest reading scores of the two treatment groups (CAR and Print reading) and the posttest scores of the control group?
2- Is there a significant difference between the posttest reading scores of the two treatment groups?
3- Is there a significant difference between the posttest scores of the students with a higher proficiency score and those with a lower proficiency score?
4- Is there any significant gender difference in dealing with instruction via computer?
5- Is there any difference between the two treatment groups regarding the teacher's role?

To give logical answers to these questions, it is hypothesized:

H1: There is no significant difference between the posttest scores of the EFL students from the two treatment groups (CAR and Print

reading) and posttest scores of the EFL students from the control group.

H2: There is no significant difference between the posttest scores of the EFL students from CAR group and the posttest scores of the EFL students from Print reading group.

H3: There is no significant difference between the posttest scores of the EFL students with a higher proficiency score and the posttest scores of the EFL students with a lower proficiency score.

H4: There is no difference between males and females in dealing with instruction via computer.

H5: There is no difference between CAR group and Print reading group regarding the teacher's role.

Participants

The participants of this study were 120 college students of the English language. All students were from Shahid Chamran University enrolled for the Reading III. To measure the effect of gender, participants were divided into two equal groups of males and females. All the participants took an English proficiency test first, and then they were divided into two subgroups: those with a higher proficiency score and those with a lower proficiency score. The participants from each subgroup were randomly assigned to the computer assisted reading (CAR) group, print reading group and control group.

Instrumentation

For the purpose of data collection, the following instruments were used in this study:

1- English Proficiency Test: To divide the participants into high and low proficiency levels, the researcher gave them the Michigan proficiency test (Briggs, 1999). It was a multiple-choice test consisting of three sections: grammar section with 40 items, vocabulary section with 40 items and reading part with 20 items. Hence, the maximum total possible score was 100.

2- Reading Comprehension Pretest: A reading test (Phillips, 2006) was given to the participants to see how much they are familiar with reading strategies. It consisted of two passages each followed by a number of questions. The passages were lengthy readings

(600-700 words each) on academic topics. The questions were about vocabulary, pronoun references, the meanings of sentences, where sentences can be inserted, explicit and implicit details, inferences, rhetorical purpose, overall organization of ideas, and so on. Students had 40 minutes to read the passages and answer the questions.

3- Reading Strategies Questionnaire: After taking the reading test a questionnaire about reading strategies (Phakiti, 2003) was administered. Responding to this questionnaire, the participants gave a report on their strategy use. Having the participants assess their strategy use after the test, the researcher could assume that the participants' overall reading comprehension performance was influenced by their strategy use. This questionnaire allowed test takers to make strategy use on a 5-point Likert scale: 1 (never) 2 (sometimes) 3 (often) 4 (usual) 5 (always).

4- Reading Comprehension Posttest: At the end of the semester the three groups took another reading test (posttest) and the results were compared to see which group performed better.

It should be added that the analysis of students' emails used as evidence to support the research findings.

Treatment

Two types of treatment were used in this study: computer assisted reading program and print reading program.

Computer Assisted Reading Program

It is a computer program that the researcher made through which strategies of reading were instructed. This software is based on the reading textbook "Brush up Your English" written by Dr. Mehdi Nowruzi Khiabani. This book is a collection of activities suited to meet the demands of EFL readers.

Computer Assisted reading (CAR) program is designed for Iranian college students of the English language. CAR refers to instruction of reading strategies presented on a computer. Teachers can use this program to improve their students' reading strategies and help them build up their vocabulary. This program allows students to progress at their own pace and work individually. It provides immediate

feedback, letting students know whether their answers are correct or incorrect. Students may print out their answers at the end of each unit. Students submit their assignments, questions and request for clarification to the instructor through electronic mail. Not only does this program benefit the students academically, but also it may serve to reduce anxiety and promote motivation and an enhanced feeling of success in them.

Print Reading Program

The reading textbook "Brush up Your English" was a different version of the above program. The information given in the print version was identical to the information in the software. The researcher had to keep in mind intrinsic format differences between computer software and print media, that is, making necessary adjustments to both versions. For example, computerized graphics were replaced with static illustrations in the main body of the text. In this class reading strategies were taught in a conventional way using print reading format. It should be noted that the program was conducted in the classroom setting.

Procedures

The proficiency test, the reading comprehension test (pretest) and the questionnaire were administered in two separate sessions. The proficiency test which consisted of grammar, vocabulary and comprehension items was presented in the first session. The reading comprehension test and the questionnaire were presented in a separate session. After determining the proficiency levels of participants, they were divided into two experimental groups and one control group.

Computer assisted reading group (first experimental group) met in the university computer lab to receive the treatment. At the beginning of the semester the students received appropriate instruction in the utilization of this software. During the experimentation period which lasted one semester (4 hours a week) they were instructed on reading strategies by computer. The teacher was present in most sessions but she mostly assumed the role of an observer and facilitator. For two sessions, the teacher intentionally did not attend the class to see if the students can work on their own.

The second experimental group met in a conventional classroom to receive the treatment. In this class reading strategies were instructed

by the researcher (instructor) in the print reading format. Students followed the same aim and scope of the course and they were provided with a hard copy of the same reading material that students in the first experimental group received in electronic form.

Students in control group also met in a conventional classroom and they were taught in the traditional way of reading comprehension by the researcher. To be concrete, they were presented with the same material but received no reading strategies instruction.

Data Analysis

After scoring the tests, the results were statistically analyzed to provide answers for the research questions. The researcher used SPSS version 12 in the analysis of research data. Based on research hypotheses, inferential statistics such as analysis of variance (One-Way ANOVA), GLM Univariate Analysis, T-test, F-test, Levene test, and Scheffe test were used to test the hypotheses.

To test the first two hypotheses the researcher obtained the students' scores from pre-test and posttest. In the first hypothesis the researcher assumed that the performances of two experimental groups (CAR, Print reading format) will not be different from that of the control group and in the second hypothesis it was assumed that the there would be no significant difference in performance of the CAR group and the print reading group. In the light of inferential statistics, the researcher used One-Way Analysis with three groups. The results revealed the null hypotheses should be rejected and that there is a significance among different group means at an alpha level of 0.05 [$F(2, 117)= 82.56$; $p<.05$].

Table 1: Descriptive analysis of each group

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
CAR	40	7.1250	2.32255	.36723	1.00	11.00
Print reading	40	3.7750	1.88771	.29847	-1.00	7.00
Control	40	1.4250	1.72296	.27242	-2.00	5.00
Total	120	4.1083	3.07004	.28025	-2.00	11.00

Table 2: ANOVA of each group

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	656.467	2	328.233	82.56	.000
Within Groups	465.125	117	3.975		
Total	1121.592	119			

Once it was determined that significant differences exist among the mean scores, post hoc range tests namely Scheffe showed which means differ. Pairwise multiple comparisons tested the difference between each pair of mean scores, and yielded a matrix where asterisks indicate significant difference between the mean scores across the groups at an alpha level of 0.05. As we can observe in the following tables:

1. Table 3 indicates that the mean difference of CAR students' performance is higher than that of the print reading group (3.35) and the control group (5.70).
2. As it is indicated in Table 3 the mean difference of print reading students' performance is lower than the CAR (-3.35) but higher than the control group (2.35).

Table 3: Results of Post Hoc tests (Scheffe) and mean scores for three groups

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CAR	Print reading	3.35000(*)	.44584	.000	2.2446	4.4554
	Control	5.70000(*)	.44584	.000	4.5946	6.8054
Print reading	CAR	-3.35000(*)	.44584	.000	-4.4554	-2.2446
	Control	2.35000(*)	.44584	.000	1.2446	3.4554
Control	CAR	-5.70000(*)	.44584	.000	-6.8054	-4.5946
	Print reading	-2.35000(*)	.44584	.000	-3.4554	-1.2446

* The mean difference is significant at the .05 level

Table 4: results of Post Hoc Tests (Scheffe) for groups in homogeneous subsets

Group	N	Subset for alpha = .05		
		1	2	3
Control	40	1.42		
Print reading	40		3.77	
CAR	40			7.12
Sig.		1.000	1.000	1.000

The mean difference is significant at the .05 level

These results led to the conclusion that there was indeed a significant difference between posttest means of the three groups involved in the study. The analysis of the data showed that at the .05 level of significance there was noted a statistically significant difference between the posttest scores of the subjects from the CAR group as compared to the posttest scores of the subjects from the control group. Results of the analysis show that when leveled on their pre-test scores, the students who had received reading strategy instruction, either in CAR or print reading format, did score significantly higher than the participants from the control group. Consequently, the first null hypothesis was rejected.

The post hoc tests showed a significant difference between the posttest scores of the CAR group and the Print reading group. Thus the second null hypothesis was also rejected.

To test the third hypothesis after measuring students' English proficiency the researcher divided the subjects into two groups as low and high levels of proficiency. The researcher calculated this hypothesis with the use of t-test for the independent groups. According to the research null hypothesis there was not a significant difference between them in posttest reading. Table 5 indicates the number of cases, mean, standard deviation, and means difference for the dependent variable for each group. The results revealed that the null hypothesis is rejected and a difference had been observed. [T (118)=-8.023, p<.05].

Table 5: t-test analysis of high and low levels groups of proficiency

	proficiency level	N	Mean	Std. Deviation	Mean Difference	T	Df	Sig. (2-tailed)
Post-test	Low	60	22.21	4.58	-6.41667	-8.023	118	.000
	High	60	28.63	4.16				

A R Squared=.561 (Adjusted R Squared=.542)

Moreover, in order to find out whether the students' proficiency levels are different in three groups, the researcher did a GLM Univariate analysis. The results indicated that their level of proficiency had not been changed during the study. [F (2, 114) =1.228; P=NS].

The fourth hypothesis assumes that gender doesn't have any effects on students' posttest reading scores after the study. Here the researcher has just chosen CAR group and done a t-test analysis. Table 6 indicates the number of cases, mean, standard deviation, and means difference for the dependent variable for each group. The result of testing revealed that the null hypothesis is confirmed and a no significant difference was observed between male and female students. [T (38)=-.181; P=NS].

Table 6: T-test analysis of male and female scores in posttest

	Gender	N	Mean	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
Post-test	Female	20	28.4000	5.51934	1.23416	-.181	38	.857
	Male	20	28.7000	4.93217	1.10287			

With reference to the fifth hypothesis, i.e., the teacher's role in the computerized reading classroom, as compared to the teacher's role in the traditional classroom, some differences were indeed observed. Based on the researcher's observations in the computerized environment, the teacher's role could be described as that of an observer and facilitator. Through the use of computer, the teacher could interact with each student during every class meeting. As a result, the students in CAR groups had more opportunities to get individual assistance, and to clarify points. Moreover, the teacher-student interaction was conducted in complete privacy. The teacher

was free to talk to individual students while others were working. The teacher provided assistance when it was appropriate and necessary without interfering with the students' initiative regarding the pace of work. It also provided the teacher with an opportunity for observing individual work taking place at any computer. In this class students were allowed to determine their own rate, path, feedback, and schedule. Active participation and privacy of the student were emphasized. The researcher used the students' emails to support her statements.

In the print reading and traditional classes, the role of the teacher was much authoritative. In this class it was the teacher who determined everything. The teacher dictated the pace of work and the students were expected to follow it. In this class the teacher planned what the students should read, and decided what kind of help to extend and to whom.

During the semester the researcher did not attend the CAR class for two sessions to see if the students face any problem in her absence. The students' emails to the researcher indicated that they faced more problems in the researcher's absence than in her presence. This led the researcher to conclude that it is better for the teacher to be present in the class. Although the teacher acts as a facilitator alongside of the computer, it must be recognized that computer is not meant to replace the teacher. The teacher should be available for further assistance and questions so that students should not be deprived of human contact. From what was said above, we can conclude that the fifth null hypothesis is untenable.

Discusssion

In this study two modes of reading were compared with regard to their effectiveness for L2 reading comprehension: the computer assisted reading (CAR) and the print reading mode. It was expected that reading by computer would produce better performance than the traditional reading method. Consistent with Adamson (1995); Chun & Plass (1996); Hong (1997), the results of this study indicated that the medium of instruction had a significant impact on the level of reading comprehension, with the CAR mode resulting in better performance when compared to the print reading mode. The findings of the study

indicated significant improvement in students' reading comprehension as a result of computer assisted instruction. Analysis of students' scores on reading strategy pre- and post test revealed that strategy instruction positively affected students' reading comprehension. The overall significantly higher scores with the CAR are attributed to several features of this medium that were incorporated in the software including electronic dictionaries, animations and fast and convenient delivery of these multimedia reading supports through well-designed strategies.

Students in the CAR class expressed more positive responses than those in the traditional class to their learning environment. In the present study, students in the CAR class reflected on the numerous benefits they experienced by participating in the use of technology in learning reading strategies. The researcher extracted the following factors from students' emails and comments that help her describe the classroom environment.

First, the difference between the two classes was classroom interest. The students in the CAR class showed higher interest in their learning in the class than the students in the traditional class. In other words, students in CAR class showed that the materials were presented in an interesting way and the class was well organized. These findings are similar to findings of other studies related to computer assisted reading. The use of computers in language teaching appears to increase interaction with a variety of interesting, enjoyable and useful materials and tasks, which sustain and enhance the students' interest (Arroyo, 1992; Chun and Plass, 1997).

Second, students in the CAR class believed that the electronic medium had facilitated communication with the teacher, securing her assistance and support. In fact, participants consider their teacher as an expert who communicates enthusiastically with them and is more available for assistance. A comparison between the three classes suggests the possibility of a positive impact of the computerized environment in terms of this factor.

Third, reduction of anxiety is one of the advantages of the CAR class. An important factor in lessening anxiety during learning is privacy. If the instructor records all students' scores as the students work, it inhibits their use and enjoyment of the materials. In the CAR

class students saw the correct answers at the end of each exercise and the teacher planned to leave record-keeping optional and for final test scores only. Therefore, the question is no longer whether or not to use computers as an educational tool, but rather how they can be used most effectively as part of the learning process. The multimedia computer provides important potentials to assist in meet this challenge.

Based on the analysis of the questionnaires given to students after the pretest, it was found that students were not familiar with the reading strategies. After exposing the CAR and traditional groups to their respective treatments the results of the study indicated that reading strategy instruction has a significant effect on reading comprehension as the scores of control group showed compared with the scores of CAR and Print reading groups. Thus, these results concur with the findings of the studies of Anderson & Vandergift (1996); Chamot, Barnhardt, EI-Dinary & Robbins (1999); and Janzen (2001). These researchers believe that teaching readers how to use strategies should be a prime consideration in the reading classroom.

The results of the study demonstrated that the students with higher proficiency performed significantly better on the posttest reading than the students with the lower proficiency. According to Yorio (1971) "the reading problems of foreign language learners are due largely to imperfect knowledge of the language" (cited in Alderson, 1984). So, the relative attention should be given to this factor in foreign language reading pedagogy. Those readers of a foreign language with low proficiency level need to increase their ability in foreign language.

In agreement with Jenning & Onwuegbuzi (2001); Shaw & Gant (2002) and in spite of Collis (1985); Adams & Bruce (1993) and Murray (1993) who believe that male tend to be more interested in computers than females, the results of this study indicate that gender plays no significant role in dealing instruction via computer software and male and female students benefited equally from participation in CAR class. Both male and female students showed positive attitude toward computers. This may prove that the increasing number of female internet users indicate an improvement in women' attitude regarding computer. Over time, with greater adoption of technology

by women, the difference observed in the earlier studies may disappear in later studies.

And finally, consistent with Levin, Ferenz and Reves (2000) the results of the study indicate that computer might change the nature of the EFL teacher's role in the academic reading class. The teacher's role in a computerized EFL classroom is mainly of mentor and facilitator. The teacher provides assistance when it is appropriate and necessary. The Computer relieves teachers of some of the burden of preparing and correcting large numbers of individualized exercises in basic concepts and skills and of recording grades. In essence, computer assisted reading (CAR) approach to teaching reading holds great promise for becoming a powerful instructional tool that increase students' engagement in reading, and might serve to enhance reading comprehension, and improve reading strategies. By using such a tool, teachers can vary the pace of instruction, review and reinforce learning, teach and address specific skills and strategies, promote motivation, and provide immediate feedback. Another possibility that computers can offer, contrary to the traditional class, is privacy. When the reader works with the computer, only the machine and the teacher know his mistakes, so the student is freed from the fear of being ridiculed for his mistakes by his classmates. During traditional classes students having problems with reading comprehension very rarely volunteer to give an answer to a comprehension check question, as they are afraid they could be laughed at for not being able to master a level of reading skills and strategies which the majority of their group have already mastered. Eventually, they become passive readers and very often only skim through the text just to be on the safe side in case the teacher asks them for an answer. The computer encourages such students to try and become active. There is no set time for all the students to read the text, so the students who need more time to read the text can take their time and work at their own pace, which certainly increases comprehension. Since no colleagues judge their results, poorer students are not afraid to answer the questions. It frees them to focus on the further development of reading strategies, previously hindered by the fear of being mocked. Thus, computerized reading comprehension exercises may be particularly beneficial for learners regarding themselves as less able. Since the computer activity

of whatever kind, be it a text with questions, a maze, or a riddle, can not be completed without the learner's full participation, the student must be active all the time, which is easy taking into consideration the fun factor provided by the computer applications. The student can no longer just passively listen to the teacher, as it happens during the traditional classes. These features combined increase the likelihood that students' engagement in reading instruction will be increased.

It must be recognized that the computer is not meant to replace the teacher or reduce the number of teachers needed, but rather improve and enhance classroom reading instruction. The thrust of computer assisted reading is to raise the quality of education, not to reduce its cost. Well-designed multimedia computer programs can allow students to apply what they learn in meaningful reading activities that meet their individual needs, and such programs can also boost interest and increase motivation. Instructional programs can be developed to teach reading and comprehension skills and strategies that go beyond simple busy tasks that students often respond negatively to. Reading instruction via the computer has the potential to actively engage students in the reading and learning process due to its capabilities to satisfy their varying needs, and can help students perceive the value of success, and their own potential as readers. Teachers should look on computers as a new and powerful tool for helping them to teach their students more effectively.

Conclusion

The overall finding of this research is that computer assisted reading (CAR) has a positive impact on reading achievement. The applications of computer to teaching reading holds great promise as an instructional tool to increase students' engagement in reading, promote reading comprehension, and improve reading skills. CAR can assist teachers in developing a more individualized approach to reading instruction to meet the diverse range of students' needs in classrooms. Teachers can be empowered to vary the pace of instruction, review student learning, teach and reinforce specific skills and strategies, improve motivation, and provide students with relevant and timely feedback.

Reading instruction aligned with computer assisted reading can serve as a powerful teaching tool to assist teachers in helping students actualize their potential in reading.

Limitations

Similar to other studies, this piece of research has suffered from a couple of limitations. First, it should be noted that the experiment took place under conditions that were different from the usual reading classes. That is, the first experimental group was required to meet in the computer lab which was not large enough and well-equipped to seat a large population. Moreover, it took a while before students get accustomed to working with computers as they were not well-informed about computer use. These limitations may have affected the strength of the findings of the study.

Recommendations for Further Study

The results of this study showed the effectiveness of using computer assisted reading (CAR) software in EFL reading comprehension. Based on the findings of this study, the following recommendations merit consideration:

First, a replication of this study should be made to see if the results of this study will hold. Second, further studies involving the use of CAR are recommended since technology brings new applications and methods into language teaching and learning. Third, the relationship between students' learning style and CAR should be investigated.

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