A Mobile-Device-Supported Brain-Friendly Reading System

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Abstract

The purposes of this study were to implement a brain-friendly learning environment for EFL early reading by a mobile-device-supported computer assisted reciprocal early English reading (CAREER) system and evaluate its effect upon elementary EFL learners' early reading skills. Results appeared that the students were benefited by collaborating with each other with the support of CAREER.

1. Introduction

From a brain research perspective, an effective instruction to enhance children's acquisition of the early reading skills should be possessed of three essential components. Firstly, it should support the two-way direction of neural activity. Secondly, an effective instructional approach should provide children with plenty opportunities to construct and consolidate their own skills and knowledge [1] because the brain learns best when it "does" rather than when it "absorbs" [2]. Thirdly, during the process of learning and teaching, the interactive feedback should be specific and immediate [3] to establish and facilitate the connections among neural networks [4]. In order to provide EFL learners with a brain-friendly early EFL reading environment and to add to the literature on MALL studies, the purpose of this study is first to construct a mobile-device-supported balanced reading system, and then to evaluate its effect upon EFL learners' collaboration as well as their early reading skills. The next sections give a brief description of CAREER system, methodology, results, and finally a discussion and conclusion.

2. Computer Assisted Reciprocal Early English Reading (CAREER) System

CAREER consists of three modules: a sight word module, a phonetic word module, and a peer assessment module. In order to promote each learner's individual accountability, the presenting approach of each reading task was revised as four partial subtasks and then one subtask was randomly assigned to each student according to their number in a collaborative reading group or login ID. In summary, in CAREER, the workflow for early reading instructions is designed according to the balance-based foundation and gradually faded scaffolding strategy as well, which proceeds as modeling, coaching, collaborative learning, and finally independent learning. After login CAREER, each student will be randomly assigned a partial reading task and also asked to accomplish each one's own task by the supports of CAREER. Then each one will be asked to contribute their learning results to the group goal (to be a teacher in turn to teach each other), and that is to successfully organize the complete story as well as to win the oral reading contests. Figures 1 and 2 show the examples of text reading and peer assessment activities.

Figure 1. An example of paragraph reading activities.

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Figure 2. An example of peer-assisted assessment.

3. Methodology

The participants of this experiment were 52 forth graders in 2 classes (each has 26 students, 14 boys and 12 girls) from an elementary school of Taipei, Taiwan. This study used a quasi-experimental design. The two classes were randomly assigned into control and experimental groups, and the students' scores for two early reading skills (ORF and RTF) were collected before and soon after the experiment. For data analysis, a two-way mixed design analysis of covariance was conducted to see how students in different groups differ in the various dependent variables. The independent variables in this experiment included group (experimental or control) and test (pre- or post-test). The dependent variables included the scores for the early reading skills (ORF and RTF). The covariate was the students' scores in EFL in the previous semester.

3.1 Procedure

In the first two-period activities, soon after the EFL teacher's direct instruction, a different subset of the teaching materials which focused on the training of low level linguistics knowledge (sight words or phonetic words) was randomly assigned to each student. Next, students were asked to read out the subset of words individually. Then, when they finished their individual learning activities, they were asked to teach the other groupmates the subset of words which were assigned to them and also learn the other subsets of words from others. Finally, one student from each group was picked, by drawing lots, to represent their group and attend the speed reading contest. If the attendant won then her/his team won. After the contest, three rewards were given: one was for all the groupmates of the winning team, one was for the support providers of every group, and the last one was for the team which collaborated most effectively.

In the second two-period activity, six steps were carried out step by step. Firstly, students reviewed the materials (sight words and phonetic words). Secondly, a different paragraph of a written text was randomly assigned to each student, and they were asked to read out the paragraph individually. Thirdly, after they finished their individual learning activities, they were asked to tell the meaning of the paragraph which had been assigned to them to their group. Fourth, students were asked to collaboratively organize the different paragraphs into a complete story (story map) and answer the comprehension questions with their groupmates. Fifth, they were asked to do intra-group reading assessments. Each group member read out a paragraph in turn to their group and each group member would assess her/his oral reading. And sixth, one student from each group was picked, by drawing of lots, to represent their groups to attend the oral reading contest. After the contest, three rewards were given for the same standards as that of the first two-period activity.

Each student in the experimental group received a Tablet PC with a stylus and a headset which the students used for individual and collaborative reading activities with the support of CAREER system. In comparison with the experimental group, the students of the control group were given identical printed reading materials to do the same activities that the experimental group did.

When the treatment finished, all subjects were given a post-test of the two early reading skills (ORF and RTF).

4. Results

Before and after the treatment, all students were given individual tests on early reading abilities. Alpha was set at .05.

Regarding the scores of ORF, the homogeneity test of regression coefficients was not significant ($F(1,48) = 1.45$, $p > .05$). Table 1 is the means and standard deviations for the scores of the early linguistic ability in ORF. The standard deviations of the two groups were much higher than expected because the range of the raw data was big. The pretest of scores of the experimental group was in the range of 8 to 88, and it was in the range of 0 to 75 for the control group. The range of scores of the post-test was from 0 to 89 for the experimental group, and it was from 0 to 107 for the control group.

Table 1. The Means and Standard Deviations for the Scores of the Early Linguistic Ability in ORF

Test	Experimental group (N = 26)		Control group (N = 26)	
	M	*SD*	*M*	*SD*
Pretest	33.00	25.43	38.43	25.41
Post-test	40.35	26.86	46.35	30.67

Note. Means have been adjusted according to the value of covariate.

The results from the two-way (test × group) analysis of covariance on students' scores in ORF shows that the group is not significant ($F(1,49) = 0.59$, $p > .05$), meaning that there is no difference between the scores of the two groups. The test is significant ($F(1,50) = 22.63$, $p < .05$),

meaning that the pre- and post- test scores might be different. The interaction between group and test is not significant ($F(1,50) = 0.03$, $p > .05$), which means that there are no differences which vary according to levels. From Table 1 it can be seen that although both groups made progress as a result of training, the standard deviation for the control group is much larger than the experimental group. A careful check of the raw scores shows that the main improvement made by the control group centered on the high-ability students. By comparison, the improvement in ORF ability was almost averagely made by most of the students of the experimental group.

In comparing the scores of RTF, the homogeneity test of regression coefficients was not significant ($F(1,48) = 0.07$, $p > .05$). Table 2 is the means and standard deviations for the scores of the early linguistic ability in RTF. By checking the raw data, it was found that the big range of the raw data had led to the standard deviations of the two groups to be much higher than expected. The pretest of scores of the experimental group was in the range of 0 to 30, and in the range of 0 to 33 for the control group. The range of the scores of post-test was from 0 to 33 for the experimental group, and from 0 to 35 for the control group.

Table 2. The Means and Standard Deviations for the Scores of the Early Linguistic Ability in RTF

Test	**Experimental group (N = 26)**		**Control group (N = 26)**	
	M	*SD*	*M*	*SD*
Pretest	2.40	6.54	2.83	6.71
Post-test	5.56	9.09	2.37	7.19

Note. Means have been adjusted according to the value of covariate.

The results from the two-way (test × group) analysis of covariance on students' scores in RTF. The table shows that the group is not significant ($F(1,49) = 0.63$, $p > .05$), meaning that there is no difference in the scores of two groups. The test is significant ($F(1,50) = 4.36$, $p < .05$), meaning that the pre- and post- test scores might be different. The interaction between group and test is significant, too ($F(1,50) = 7.87$, $p < .05$), which means that the magnitude of differences varies according to levels.

The simple main effect analysis shows that there is not a statistically significant difference between the two groups in the RTF pre-test ($F(1, 98) = 1.23$, $p > .05$), and there is no significant difference in the post-test ($F(1, 98) = 2.29$, $p > .05$), either. This revealed that in both pretest and post-test there are no differences between the two groups.

For the comparison of pre- and post-tests, the simple main effect analysis shows that there is a significant difference in the experimental group ($F(1,50) = 11.97$, $p < .05$), but not in the control group ($F(1,50) = 0.26$, $p > .05$). This indicates that only the experimental group made significant progress as a result of training.

4. Conclusion

Based on the results of early English reading skills, CAREER benefited the oral reading skill development of most of the EFL learners rather than just benefiting the high-ability students. Furthermore, the experimental group made significant progress in their reading comprehension ability (RTF) as a result of training, yet the control group did not. However, the RTF scores of the two groups were much lower than expected. A further interview with the participants told the urgent need of developing the standardized measurement instruments especially for Taiwanese EFL learners. Most of the participants expressed that they could comprehend the text, but they were unable to retell the story immediately or even didn't know how to retell it in English. Thus, students' oral ability became a bias against the validity of the measurement of RTF. The results reveal that it is necessary to redesign a set of measurement instruments based on the population of Taiwanese EFL learners to avoid the biases which probably influence the validities of the measurements.

We can conclude that the proposed mobile reading system, CAREER, reduced the problems that the students had in a conventional collaborative learning environment, and the students benefited by collaborating with each other with the support of mobile technology. CAREER is capable of giving the learners immediate and specific feedback, providing them with necessary learning supports, and especially "forcing" each EFL learner facing their learning responsibility and exactly doing individual accountability. It is able to provide elementary EFL learners with a brain-friendly learning environment.

5. References

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