영어교육 51권 4호 1996년 겨울

The Effect of Multimedia Instruction on the L2 Learner's Achievement: An Experiment*

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Kim, Soon-bok. (1996). The effect of multimedia instruction on the L2 learner's achievement: An experiment. *English Teaching*. *51*(4), 57-73.

This experimental study was designed to investigate the effect of the use of multimedia technology in the English program at Sejong Univ. All four of the treatment groups as experimental or control were taught differently in instructional technology: multimedia vs non-multimedia, and the teacher's language of instruction: target language(TL) vs source language(SL). Multimedia instruction refers to the computer-mediated audio-visual class via an electronic text, CD-Rom, and non-multimedia to a traditional class via a printed text. The empirical findings are as follows: 1) multimedia instruction did facilitate L2 learning process in which the multimedia groups demonstrated superior performance on the posttests. 2) Teacher's language didn't seem to matter with L2 learning since their comparison turned out to be insignificant and the groups with either native or non-native teacher all exhibited almost the same level of achievement. This result may lie in the nature of the rather short-term experiment study or in the testing tool. This limit is to be investigated in further studies.

I. INTRODUCTION

Since the 1960s, some form of computer-assisted language learning (CALL) has been going on(Underwood 1984:41). However, negative views of

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* An earlier Korean version of this paper was presented at the Symposium on the Multimedia Technology and English Education, May 11 1996, Korea Military Academy, Seoul, Korea

the use of computer in foreign language(L2) learning/teaching claim that the computer cannot initiate, or evaluate, communicative activities but help with achievement of linguistic competence(Garett 1987). The limits of the computer can be overcome by turning the computer into a device which provides elements of caretaker speech and a focus on meaning rather than form.

As the 1990s have progressed, the technology of 'multimedia' has become available for L2 instruction. At its simplest form, multimedia means the addition of sound and video to personal computers. At its grandest form, it means the melding of technologies, such as PCs, TVs, and telephones, as well as melding of the computer, consumer electronics and telephone industries(Naisbitt, 1994:94).

This new technology couldn't have accelerated the use of multimedia computer in L2 teaching without development of the electronic text, i.e. CD-ROM(computer disc - read only memory). CD-Roms are basically compact audio-discs except that instead of only music, the disc also holds written text and graphics, from which L2 learners greatly benefit for meaningful learning. Recent research(Chang & Smith 1991) has empirically shown that multimedia instruction in combination with cooperative learning greatly helped the L2 learners with motivation and communicative learning especially in pairs of learners.

Previous studies conducted by Herron(1994) and Borras(1994) in an American setting have yielded supporting evidence for the use of multimedia technology in foreign language teaching. Other studies (Choi, 1993, 1995; Han, 1995) carried out in Korean settings have also reported that the multimedia approach facilitated L2 learning more effectively than other approaches to L2 instruction.

The recent advent of CD-Rom accentuates the need to assess in what ways the multimedia instruction with the use of the CD-Rom may be better or worse than more traditional instruction in L2 instruction. Nevertheless, very little empirical research seems to have been undertaken in Korean schools. Thus, this research has come to be undertaken to empirically determine the effects of multimedia instruction since Sejong is the first Korean university to initiate implementing the multimedia system for its English program.

This present study purports to investigate the effect of multimedia instruction on student achievement in English learning at the university level. The multimedia instruction refers to the computer-mediated audiovisual instruction in which an electronic text, i.e. interactive videodisc or CD-Rom, is covered and only the teacher has the control over the multimedia computer.

Four groups of the subjects(N= 96) were drawn from those curriculum English classes who were enrolled in English Conversation 101 or English Conversation 201 offered as compulsory courses at Sejong Univ. Two of them were referred to as 'multimedia' or experimental groups, because they were to be taught via multimedia instruction. The other two groups were referred to as 'non-multimedia' or control groups, because they were to be taught via non-multimedia instruction.

Prior to their lessons the subjects were pretested on their proficiency in English. The pretest was designed to determine whether the subject groups were reliable to be compared over the effect of difference in instructional technology, i.e. with or without the use of multimedia. All subjects equally had four 50-minute lessons in their respective groups and were posttested on their achievement with two sets of tests. Thus, a two-week instruction, one-week testing, and statistic processing of the test results constituted this study.

The pretest results proved that the subject groups were reliably compatible with each other in terms of their ability in English. The posttest results were statistically processed to detect any effect of difference in technology on the subjects' achievement.

II. EXPERIMENT

1. Experiment Design: Variables and Subjects

This experiment was designed to determine how effectively multimedia technology facilitated the students' L2 learning. In this experiment there were two independent variables, multimedia instruction and the teacher's language of instruction, i.e. all English as the learners' target language(TL), or mostly Korean as their source language(SL), and one

dependent variable, i.e. achievement test.

Four regular English classes at Sejong Univ. were chosen on the basis of their school and year in college to be assigned to an experimental or control group. Among these selected English classes, two classes as experimental groups were taught via multimedia technology in which the electronic text was commonly used in both classes but with a difference in the teacher's language of instruction, TL or SL. On the other hand, the remaining two classes as control groups were taught via 'non-multimedia' or traditional technology in which the printed text was commonly used in both classes. However, the teacher's language of instruction was different in each of the control groups.

Each of the subject groups was respectively referred to as E-1, E-2, C-1, and C-2 by the nature of treatment, by their school, and by their year in college. The following table summarizes the subject groups in relation to two independent variables: instructional technology and teacher's language of instruction.

Table 1

Description of the Subjects

Groups	N	School	Year	Instruction Media	Text form	Teacher's language of instruction
E-1	26	liberal arts	1	multimedia	CD-Rom	only TL
E-2	22	business	2	〃	〃	mostly SL
C-1	26	liberal	1	non-multimedia	printed book	only TL
C-2	22	business	2	〃	〃	mostly SL

TL = the target language, i.e. English
SL = the source language, Korean

Apart from their regular English classes, the subjects had extra two weeks experiment classes under the controlled lesson plans. A story, *Arthur's Birthday* by Mark Brown, was to be completely covered in the form of CD-Rom or printed book.[1] Being native or non-native, four

1) A CD-Rom text produced by Living Books, A Random House/Broderbund Company Little, Brown and Company, Boston New York 1989.

teachers were asked to focus on the same teaching points of idiomatic expression, vocabulary, and structure. They gave lessons to their respective class in the designated instructional method: multimedia or non-multimedia. And their language of instruction was either TL or SL, being the other independent variable in this experiment.

After completion of their two weeks of learning, the subjects were posttested via two different tests on their achievement. This posttesting was administered to determine any effect of multimedia technology and of the teacher's use of TL or SL on performance of the treatment groups. The two tests were constructed and administered in such a manner that the subjects' achievement in their learning could be impartially measured with no discrimination against variables in instructional technology, i. e. multimedia vs non-multimedia, and in language of instruction, i. e. TL or SL. Hence, each subject was to be tested twice, once with a test constructed by non-native multimedia teacher and once more with a different test constructed by native non-multimedia teacher.

All the results of the pretest and posttests were to be computed for comparison on the bases of the ANOVA test.[2)]

2. Working Hypothesis

As the term indicates, the multimedia instruction comes with the use of CD-Rom. The CD-Rom text was programmed to provide L2 learners with authentic sounds, meaningfully contextualized images, still or motion pictures, and interactive responses by the click of the computer mouse. Because of the variety of input sources, it was not difficult to assume that any mode of multimedia instruction would facilitate L2 learning much more effectively than other kinds of instruction. This assumption was required to be positively confirmed by the superior performance of the multimedia groups on the achievement tests than the non-multimedia groups.

The working hypotheses in this study have been drawn from the perspectives of the two independent variables: instructional technology, the teacher's language of instruction. They are as follows:

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2) It refers to an analysis of variance to detect any statistical significance of comparison among multiple treatment of variables.

1) The four subject groups in this study would be proved to be all homogeneous groups in respect to their English proficiency on the grounds of one-way ANOVA test. 2) The experimental groups, i. e. E-1 and E-2 were assumed to get higher scores on the achievement tests than the control groups, C-1 and C-2, as the multimedia instruction helped provide the students with variety of sources for communicative learning. 3) The experimental group, E-1, would manifest a better performance than the other experimental group, E-2. This is simply because the teacher's use of the TL in class was hypothesized to provide more input for L2 acquisition according to the Input Hypothesis of Krashen's L2 theory(1982, 1987). 4) Likewise, the C-1 group would outperform C-2, because of the teacher's use of the TL in class.

3. Teaching: Material and Procedure

As for teaching material in this study Marc Brown's story, *Arthur's Birthday*, was chosen on the grounds of its availability in two forms for presentation in class, i. e. CD-ROM text or printed text. Its electronic text was used in the multimedia classes for the two experimental groups, while its printed text was in the non-multimedia instruction for two control groups.

Regardless of difference in their language of instruction all teachers covered the same designated teaching points in each class in accordance with the teaching plan.

Likewise, all subject students were exposed to the same text in their respective class, but with a difference in its form of presentation and in teacher's language of instruction. All classroom instructions were conducted entirely in the L2 learner's target language, English, with the E-1 and C-1 groups. while mostly in the L2 learner's source language, Korean, with E-2 and C-2 groups in this study.

The following table shows how each group was taught with reference to instructional technology, major activities of the teachers and the students in class.

Table 2

Class Activities - Presentation in Teaching & Learning

Group	Text	Presentation of material	medium of instruction	Activities	
				Teacher	Students
E-1	CD-Rom	sounds, visual images graphics, pictures, still, motion	all English	- CD-Rom text-presentation - explanation in all English - Yes/No questions for comprehension - click on the teaching points	- see, listen, guess the meaning in context - listen - listen and speak - listen and repeat
E-2	〃	〃	mostly Korean	〃	〃
C-1	Printed book	written text	all English	- read the text aloud - read as a model reader - write the teaching points out on the board - explain the meaning and the usage - check the learner comprehension by Yes/No questions	- listen - repeat and speak - see - listen, guess and understand - listen and speaks
C-2	〃	〃	mostly Korean	〃	〃
〃	refers to the same as the described above				

All the groups, experimental or control, had their lessons in their multimedia laboratory where they have their curriculum English conversation classes. However, only the two experimental groups were exposed to the multimedia instruction.

Based on the teachers' written report and the comments on the classroom activities, the advantages and disadvantages of two types of instruction are as follows:

Table 3

Drawbacks & Advantages of Each Teaching Type

	Multimedia	Non-multimedia
Advantage	1) Contextualized presentation accompanied by teacher's additional explanation 2) Easy drawing the student's attention on the material and eliminates boredom 3) Enormous coverage in class because of quick and easy presentation 4) Most effective in teaching verbal actions due to moving actions by the visual presentation 5) Less dependency on teacher for comprehension	1) No technical malfunction 2) No disaster in classroom management 3) Highly humanistic lesson
Disadvantage	1) Much preparation in advance to be familiar with the location of hidden actions computerized 2) Technical malfunction 3) High technicality of the lesson	1) Limited in the form of presentation: graphic, pictures in the book 2) Not contextualized presentation 3) almost complete dependency on teacher for comprehension 4) Heavy work load on the classroom teacher: reading aloud, writing on the board, verbal explanation with even gesture

4. Testing for Proficiency and Achievement

It was assumed that any effectiveness of the variable at issue in this experiment could be determined by contrastive analysis of the subject's performance on the achievement test. However, reliability of the subject groups had to be verified by the virtue of the fact that the experimental groups and the control groups are not different in their proficiency level. Thus, all subjects by group were pretested on their proficiency.

1) Pretest on English Proficiency

To begin with the subject groups were chosen on a basis of homogeneity in their school and year in college for the same level of English proficiency. However, the subjects in both experimental and control groups were pretested on their proficiency in English. The pretest was so designed to measure their proficiency in English that the cloze technique(Taylor:1953) was employed in the construction of the test. A short article on computers was drawn from a book and every 5th or 6th word of the passage was deleted to be filled by the subject's choice. After all, the 20-question-item pretest was administered to verify whether the experimental or control groups were compatible with each other in terms of their proficiency in English. The pretest results were processed in a One way ANOVA and indicated that the treatment groups did not differ from each other with significance, i. e. $p < .05$.

2) Posttests on Achievement: A-E and A-K tests

Upon the completion of the two-week L2 instruction, the subjects were posttested on their achievement. In order to get rid of any possible discrimination against difference in the teacher's language, all subjects were posttested on two types of achievement tests. They were first tested with the test constructed by the non-native Korean teacher and then with the other test constructed by the native English teacher.

The first test was referred to as A-K and the second was to as A-E. The two sets of achievement tests were developed based on the teaching points commonly covered in each class. The question items tested the learners' comprehension of the story, idiomatic expressions, vocabulary, and structure. Comprehension check items were constructed in terms of wh-words of question: what, how, where, who, why and where. The numbers and types of test items were not uniformly controlled, so the two sets of the tests were not the same in number of question items and question types. However, what mattered in testing was that each subject must be tested on their achievement under the same conditions, despite the difference in the instructional technology. By the same conditions it was meant that the subjects' achievement were assessed twice: once by the teacher of multimedia instruction and one more time by the teacher of non-multimedia instruction.

III. DATA ANALYSIS AND RESULTS

As every subject was tested twice on the same contents but by two different types of tests, so their performance on the two achievement tests were measured separately in terms of A-E, A-K, and A. A-E score refers to the one measured by the native speaker's test, A-K score refers to the one measured by the non-native speaker's test, and A refers to the average score of A-K and A-E tests results.

The following table illustrates the mean scores of the achievement tests per group.

Table 4

Mean Scores of the Achievement Tests per Group

Groups	Scores A-E	A-K	Average
E-1	86	81	84
C-1	73	44	58
E-2	81	61	71
C-2	71	50	61
Multimedia (E-1 + E-2)	84	71	78
Multimedia (C-1 + C-2)	72	47	60

However, the two sets of scores of the subjects per group were computed and processed statistically in relation to two variables: instructional technology and the teacher's language. The statistical process was performed based on a one-way ANOVA test and Bonferroni test to determine any significance of multiple comparison among the treatment groups: E-1, E-2, C-1 and C-2. As shown as in tables below the comparison of the achievement scores of the treatment groups turned out to be significant. All the statistical tests were carried out by the use of the SPSS package.

Table 5

Achievement per Group: E-1, E-2, C-1, C-2

Test Groups	Test			
	A-E	A-K	A-E	A-K
E-1	25.8182	24.6818	3.1265	2.5891
C-1	23.0000	13.0385	2.9933	3.0787
E-2	24.5385	18.1923	3.2891	4.2144
C-2	25.1364	18.2273	3.0284	3.7152

As shown in Table 5, the results of achievement tests have shown a high significance of comparison: by A-K test f(D. F. 3, 95) = 37.57, $p < .01$, and by A-E test f(D. F. 3, 95) = 3.62, $p < .05$. An additional Bornferroni test was carried out to determine which particular group is more or less affected by the instructional technology.

According to the results of the A-K test, the multimedia group with native teacher, E-1, outperformed the control groups, C-1 and C-2, and even the multimedia group with a non-native teacher, E-2. However, Bornferroni test results of the A-E test scores indicate that the comparison between the multimedia group with native teacher and the control group with native teacher is significant. It means that under the same conditions in which the TL was used for instruction the multimedia group certainly outperformed the non-multimedia group. This statistical result confirms that multimedia instruction is more effective in L2 learning. Overall, the multimedia groups in TL or SL instruction performed better on both achievement tests, implying that the multimedia technology significantly affected better learning in L2 situation.

Looking at the result scores of the tests from the perspectives of the experimental group as compared with the control group, the following table exhibits their performance on the achievement tests.

Table 6

Achievement Tests Scores per Group: Experimental vs Control

Group by technology	N	Mean		SD	
		A-E	A-K	A-E	A-K
experimental	48	25.1250	21.1667*	3.2461	4.8084*
control	48	23.9792	15.9583*	3.1656	3.9570*

* $p < .05$

The comparison between the groups turned out to be meaningful in determination of the treatment effect by f(D.F. 1, 95) = 33.58, $p < .01$. This statistical significance of comparison is only true with A-K test result, not with A-E test results, $p < .05$.

This means that the multimedia groups, regardless of the difference in teacher's language, manifested superior performance only on the A-K test. The reason for partial significance may be that A-E didn't seem to have served as a valid and reliable tool for evaluation of the effect of multimedia instruction. However, at least the A-K test succeeded in serving as a reliable tool for determination in this study.

When looking at the test scores in relation to teacher's language, i. e use of the TL or the SL, the native groups and the non-native groups exhibited almost the same level of performance on the tests. However, the value of $p < .05$ informs that the comparison between the two groups over the treatment variable is of no significance.

Hence, TL or SL as teacher's language of instruction doesn't really matter with L2 learners in facilitating their learning process. Overall, the better performance of the multimedia group with native teacher is not because of the teacher's language but more because of the use of multimedia technology. Thus, the instructional method matters more with L2 learners in facilitating the learning process than the teacher's use of TL or SL. The statistic computations are as given in terms of mean scores and SD as in Table 7.

Table 7

Achievement Scores by Native vs Non-native Teacher

Group	N	Mean		SD	
		A-E	A-K	A-E	A-K
Native (E-1 & C-1)	48	24.8125	18.2043	3.1532	3.9516
Non-native (E-2 & C-2)	48	24.2917	18.9167	3.3387	6.0629

$p < .05$

As for p value of significance of comparison, Table 8, illustrates the overall results of ANOVA tests:

Table 8

ANOVA Test Results of Independent and Dependent Variables: Technology and Teacher's Language

	dependent variable	Achievement Tests	
		A-E	A-K
comparison groups (independent variables)			
Technology: multi vs non-multi (E-1+E-2) vs (C-1+C-2)		.032*	.001**
Language: TL vs SL (E-1+C-1) vs (E-2+C-2)		.048*	.028*

** $p < .01$ * $p < .05$

After computing and processing all the test results, the significance of multiple comparison over the variables were measured in terms of f-probability. The table above indicates that the variable of instructional technology has a meaningful p value, $p < .01$, with reference to A-K test results. Accordingly, the finding that the multimedia instruction has a great impact on the L2 learning process to make L2 learners outperform

L2 learners in any other instruction. It is quite a pity that the variable, teacher's exclusive use of TL, has not been strongly and empirically supported as an effective factor in L2 instruction.

IV. INTERPRETATION AND DISCUSSION

The statistical findings strongly support some of the initial hypotheses and disprove the other some of the hypotheses. To begin with, the assumed homogeneity of the subject groups has been statistically proven by the insignificance of the comparison ($p < .05$). The two experimental groups and two control groups didn't exhibit any noticeable difference in their performance on the pretest of English proficiency. It is implied that the groups were at the same level of English ability prior to their experimental lessons.

It has been statistically proven that any multimedia group would learn more effectively and so outperform any control group because of the effect of multimedial instruction. It may be interesting to notice that the multimedia group, E-1, more remarkably manifested their superior performance on A-K test than on A-E test.

In other words, the superiority of the group manifested more on the non-native teacher's test than on their own native teacher's test. This may be because the Korean subjects are more accustomed to taking tests that are constructed by non-native teachers.

Given that the comparison between E-1 and E-2 is meaningful, based on Bonferroni test result($p < .01$), the outperformance of E-1 should be accounted for on the grounds of the effect of the teacher's language. The teacher's exclusive use of TL must have facilitated L2 learning more than the use of SL in the same multimedia instruction. In fact, the exclusive use of TL has been supported in second language acquisition theory of Krashen, and in Leonard's arguments(Leonard, 1970:45). However, effectiveness of teacher's exclusive use of TL has been counter-proven within the control groups. Is it probably because the use of TL facilitate the learning process only in multimedia instruction? This question must be further inquired into in a study to be undertaken soon.

Neither the A-E nor the A-K test results proved any significance of comparison between C-1 and C-2. Thus, the last hypothesis of this present study failed to be positively proven. The only meaningful comparison between the two groups was totally different from the initial hypothesis that C-1 with a native teacher would outperform C-2 with a non-native teacher. Our empirical evidence did not confirm that the teacher's exclusive use of TL would facilitate as much as assumed in various claims.

V. CONCLUSION

The following conclusions are drawn from the statistical findings. First, the multimedia classes, i. e. experimental groups, did better on their achievement tests than the non-multimedia classes, i. e. control groups, implying that the multimedia instruction worked more effectively with the students of English. Secondly, the control group that had non-multimedia instruction with a native teacher ended up with poorer achievement, implying that Krashen's input hypothesis may matter less than L2 instruction method. In other words, the instructional technology matters more with L2 learners that the teacher's language in class.

Overall, the empirical evidence found in this study supports the positive effect of multimedia instruction in L2 context on the L2 learning process. On the achievement tests, the superior performance of the multimedia groups can possibly be explained by the inherent strength of multimedia instruction. A picture on a computer screen contains far more information that a picture in a book because the characters and figures on a computer screen are made to act for communicative learning on the student's part. Through the character's performance of verbal actions the difference of a shout, a whisper, and even a murmer can easily and interestingly demonstrated in sounds, motions and context.

However, the statistical finding does not support the exclusive use of TL, English in this study, as the valid and reliable element in L2 learning(see Table 8). This claim is made on the grounds of statistical insignificance of comparison over the issue($p < .05$). The reasons for the above result may be found in the nature of this experiment and in the

validity and reliability of the dependable variable, a tool for testing L2 learner's achievement. The short-term nature of this study is likely to have influenced the learning outcomes as well.

The result of this study offered some evidence on the usefulness of the multimedia instruction in L2 context. On the practical side, this study also provides empirical data for decision making for institutions under budgetary constraints interested in installing the multimedia technology. The limitations of this study will be further developed in a study to be carried out soon.

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