Comparative and Experimental Study of the Effectiveness between Audio-modality and Video-modality in Teaching English— Preliminary Report of a Case Study*

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1. Introduction

This is a preliminary case study for better understanding the use of educational media.

It is important to know a specific case in a particular community or group in order to find out an appropriate teaching method for a particular group rather than just applying general ideas of teaching methods. Thus the case study in each school is essential to see the trends and effectiveness of teaching English.

The present advanced technology of teaching materials for English language is prominent in Japan; especially the use of videocassettes in a language laboratory is becoming popular at all levels of school. Neuropsychologically speaking, it has been considered that using audio-visual modality is more effective than using only audio-modality when

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comparing retention between using the two modalities. And it is said that the correlation of the information input capability between the eyes and ears in the case of using audio-visual modality is 83 to 11.[1]

There are several experimental reports on the situational approach by using videocassette films. The research emphasizes the effectiveness of non-verbal communications, such as gestures and the reality of movies. Professors Louis Forsdale and Gerald Dykstra of Teachers College, Columbia University found the advantages in teaching languages by using 8 mm movie film and stressed "the realism of moving picture film, the motivation of far more, and more significant, student participation, the interaction with a range of native speakers of the language being learned, the constant presence of language-related cultural features and habits." [2] There are also many teachers who utilize videotape recorders and find it effective in teaching English in Japan. Mr. Teruo Sekiya reported an experimental study of rapid reading, making effective use of videotape recorders in which he used the language laboratory with each booth equipped with a small television set and the master console equipped with a response analyzer. The target zone for rapid reading practice was set up as the average comprehension speed of 150 words per minute or above, and in his conclusion he said, "Precisely speaking, 24% improved their

1 Toyoo Tanaka, "Gaikokugo Gakushū ni okeru Bideokatsuyō no Hōhōron (1) [Methodology of Using the VTR in Learning Foreign Languages]," *Bideo wo Riyōsuru Gaikokugo Gakushū no Jissenteki Kenkyū (1) : Kyōiku no Kindaika wo Motomete* [*Practical Study of Learning Foreign Languages by Using the VTR: in Search of Educational Modernization*] (Gaikokugo LL Video Kyōkai Kenkyūkai, 1980), p. 17.

2 Louis Forsdale and Gerald Dykstra, "An Experimental Method of Teaching Foreign Languages by means of 8 mm Sound Film in Cartridge-Loading Projectors," *Language Learning*, Vol. XIII, No. 1, (1963), p. 9.

reading ability enough to reach the target zone, called the rapid reading zone." [3]

The present paper proposes to compare which is the more effective method in the language laboratory, using the audio-modality, or the video-modality in teaching English at the Otaru University of Commerce. It is commonly considered that using audio-visual (video) modality is more effective for learning languages than using audio-modality only. Then the author's hypothesis is that the group using video-modality would have significantly better scores in an experimental test than the one using audio-modality only. In this experiment, the author used another group in comparison, to which a native speaker of English in person gave a lecture about the content of the experimental test, in order to see how different in effectiveness the latter is from the former two groups.

2. The Method

The way the author chose the classes and students for each experimental group was random choice out of freshman English conversation classes offered at the Otaru University of Commerce in the academic year of 1983. There are four minor departments in this university: Department of Commerce, Economics and Management Science; and Senior High School Teachers' Training Course in Commerce. The total enrollment in 1983 was 1,591, and the number of freshman was 418. English is taught as a foreign language in liberal arts. Freshman English courses are largely divided into three sections: Reading, Grammar and Conversation. Conversation courses are taught by native speakers of

3 Teruo Sekiya, "An Experimental Study of Rapid Reading Making Effective Use of a Videotape Recorder," in Tatsuo Hattori et al. (ed.), *Proceedings of Fleat Conference: Final Reports* (Tōkyō: The Language Laboratory Association of Japan, 1981), p. 89.

English, and the classes are numbered from E121 through E129. The author took two classes for a control group: the class numbers were E121 and E127; three classes for an audio-modality group: the class numbers were E123, E125 and E129; three classes for a video-modality group: the class numbers were E122, E126 and E128; and one class for a group to which a native speaker of English gave a lecture and explained the meanings and the usages of the target idiomatic words. In the class number E124, Dr. Michael Carr, who is from Kansas in the United States and is a teacher of English conversation courses at the Otaru University of Commerce, explained the usages and meanings of the fifteen English idioms used in the story of a video film. In this class the video film was shown twice: before and after the lecture about the idioms, and the lecture itself was video-taped with a video camera; the taped video film was to be shown to the video-modality group and also only the sound of this video film was to be played without showing the picture of the film to the audio-modality group. The fifteen idioms in the story were written on a white board so that the students recognized them while Dr. Carr was explaining their meanings and usages in English. Generally speaking, it is quite difficult for adults in Japan to learn English through the ear alone. Dr. Clifford H. Prator has said as much in his paper:

> Many teachers also note that their students — especially their adult students—find it difficult to learn through the ear alone. These students' experience and education have made them visual minded. They cannot really grasp or remember a word until they have seen it in written form.[4]

4 Clifford H. Prator, "In Search of a Method," in Kenneth Croft (ed.), *Readings on English as a Second Language*, second ed. (Bos-

This is also true for most students of this experimental groups at the Otaru University of Commerce. During their high school days, they have been taught English mainly through the eyes in reading and writing, known as the Reading-Translation method. The situation of teaching English at high school by this method is well described by Dr. Sumako Kimizuka:

> Since universities have more applicants each year are highly competitive.... Consequently, the influence of entrance examinations upon the education of upper secondary schools is great.... Entrance examinations not only influence the selection of subjects of study but also the content and method of teaching such subjects. For example, translation from English to Japanese and grammatical analysis of complicated sentences are the main contents of English courses in upper secondary schools.... [5]

First, students in this group watched the story in the video film, in which fifteen idioms were used at random. After a brief explanation of the meanings and usages of fifteen idioms, Dr. Carr gave the students a lesson of repetition: students together repeated the idioms after him twice. Then they watched the story in the video film again. Immediately after watching the film the second time, they took a short test on the idioms.

In all four groups, the purpose of the experiment and the questions were explained in English by the author, and the students were informed that this was an experiment and had nothing to do with their grades. They

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ton: Little, Brown and Company, Inc., 1980), p. 15.

5 Sumako Kimizuka, *Teaching English to Japanese* (Moab: Tail Feather, 1977), p. 14.

had ten minutes to finish the test for the experiment.

In the control group, students were only tested on the idioms without being presented to the lecture or watching the video film.

In the video-modality group, a video film was shown to the students and the test was given. The video film was edited to include the story and the lecture given to the group (the class number E124) by Dr. Carr. In the video film, the story comes first, the lecture follows and at the end the same story comes again. Since the lecture was video-taped, students in the video-modality group were able to read the idioms on a screen and to repeat them after Dr. Carr in the video. In this way, the experimental conditions were assimilated by the group lectured by Dr. Carr.

In the audio-modality group, the visual-track of the film was not shown; instead, only its sound-track was given to the students of the group. To equalize the experimental conditions with the other groups, fifteen idioms were written on a sheet of paper and shown the students of the group by using a text projector in the language laboratory, while they listened to the lecture given by Dr. Carr on the tape. They listened to the story, the lecture and the same story again in the same order as the other groups; and then took the same test.

The videocassette film of the story is titled "The Carters of Greenwood" (intermediate course), produced by Halas and Batchelor and edited by L. G. Alexander. This film contains twelve stories, and the first story, "Friends and Neighbours", was used in this experiment. This is an animated cartoon film in full color. There are five characters and a narrator in the story. The excerpt from the story follows:

> Narrator: The houses in Greenwood are very much alike. The Carters live at 23 North Street, next door to Miss

Agatha Grundy. Ted Carter usually spends the weekend pottering about in the garden. He is a keen gardener. But mowing is hard work and he is beginning to *feel the strain.* His wife, Pat, has been looking on anxiously. She knows he must be feeling tired.

Pat: *Take it easy,* Ted! You mustn't overdo it.

Ted: I think I'd better *call it a day,* Pat.

Narrator: Abandoning the lawnmower, Ted went to the kitchen.

Pat: *Help yourself* to some beer, Ted.

Ted: *I could do with* a glass of beer, Pat. This stuff should *put me right soon enough.*

Narrator: While Ted was drinking a long, cool glass of beer, his two children, Jill and Ronnie, entered the kitchen. Ted still looked so exhausted that Jill *couldn't help remarking* on it.

Pat: Your father's having a rest, Jill. I suggest you both go out into the garden. Don't *get up to any mischief,* either.

Jill: Trust us, Mum.

Jill: I wonder what we can do to help Dad, Ronnie?

Ronnie: I suppose we could water the garden.

Jill: *That's not a bad idea.*

Narrator: The children dashed to the garage to get the garden hose.

Ronnie: What should we water first?

Jill: How about those sunflowers?

Narrator: The children were making a great deal of noise. Miss Grundy was about to drink her fifth cup of tea when she heard the children shouting next door.

Miss Grundy: I wonder what they're up to now.

Narrator: If only she had known! Unaware of Miss Grundy's presence, the children were preparing to water the sunflowers.

A powerful jet of water gushed out of the tap and the hose bounded across the lawn. The children not only succeeded in watering the flowers, but they managed to drench Miss Grundy as well. Dropping her cup in alarm, she yelled *like mad* and the children made for the garage *for all they were worth.*

While Ted was drinking his beer, he was rudely interrupted by the shouting in the garden. Quickly depositing his glass on the table, he rushed outside.

Ted: Whatever's the matter? *What on earth's going on?*

Miss Grundy: That is precisely what I would like to know, Mr. Carter!

Ted: *I beg your pardon,* Miss Grundy? Good heavens! I must apologize, Miss Grundy. The children *didn't mean any harm.*

Miss Grundy: That may, of course, be true, Mr. Carter.

Ted: I'll turn it down immediately.

Miss Grundy: When I was a girl, children were seen and not heard![6] (Author's italics.)

The verbal idioms extracted from this story for the test, as in the workbook of this film, are following:

feel the strain	take it easy
call it a day	help yourself
I could do with	put me right
soon enough	couldn't help remarking
get up to any mischief	that's not a bad idea
like mad	for all they were worth
what on earth's going on?	I beg your pardon?
didn't mean any harm.[7]	

6 L. G. Alexander, *The Carters of Greenwood: Cineloops for English as a Foreign/Second Language*, Intermediate Workbook (London: Longman, 1975), pp. 1-2.

7 *Ibid.*, p. 3.

3. The Results

The total number of students involved in this experiment is 298. The number of students, means of the score and standard deviations for each group are following:

Control group: The number of students is 76. The mean of the score is 8.88 out of 15. The standard deviation is 2.70.

Lecture group (the group to which Dr. Carr gave a lecture on the idioms): The number of the students is 32. The mean of the score is 12.90 out of 15. The standard deviation is 2.45.

Table 1.

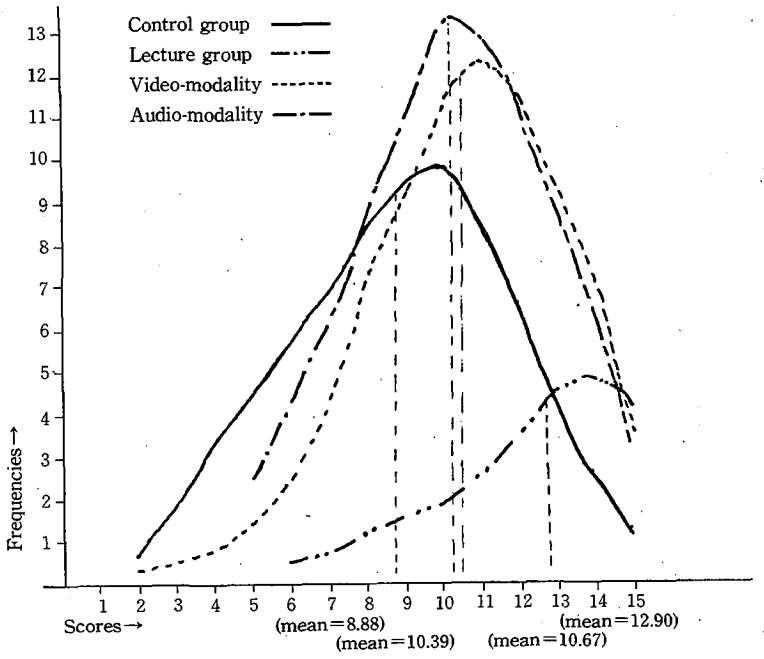
Scores	Control group	Lecture group	Video-modality group	Audio-modality group
1	0	0	0	0
2	1	0	1	0
3	1	0	1	0
4	1	0	0	0
5	9	0	2	7
6	4	1	2	2
7	7	0	3	8
8	5	2	8	7
9	16	1	12	11
10	9	1	8	16
11	12	2	19	12
12	3	4	13	11
13	7	6	11	14
14	0	1	2	0
15	1	14	9	11
Total	76	32	91	99

Video-modality group: The number of students is 91. The mean of the score is 10.67 out of 15. The standard deviation is 2.68.

Audio-modality group: The number of students is 99. The mean of the score is 10.39 out of 15. The standard deviation is 2.77. Table 1 shows the distributions of the number of students in each score.

In order to compare the distributions among the groups, we use the running average method of statistics: we smooth the frequency distribution by averaging the obtained frequency with the two immediately neighboring frequencies to help determine the expected frequency in any class of scores.[8] In Table 2, the obtained frequencies, or numbers of students,

Figure 1.



8 J. P. Guilford, *Fundamental Statistics in Psychology and Education* (New York: McGraw-Hill, 1956), pp. 47-48.

Table 2.

Scores	Control group				Lecture group			
Class	f	f1	f2	f3	f	f1	f2	f3
2	1	0.67	0.56	0.78	-	-	-	-
3	1	1.00	1.78	1.82	-	-	-	-
4	1	3.67	3.11	3.30	-	-	-	-
5	9	4.67	5.00	4.56	-	-	-	-
6	4	6.67	5.56	5.89	1	0.33	0.44	0.40
7	7	5.33	7.11	6.96	0	1.00	0.77	0.77
8	5	9.33	8.22	8.63	2	1.00	1.11	1.03
9	16	10.00	10.55	9.63	1	1.33	1.22	1.33
10	9	12.33	10.11	9.96	1	1.33	1.66	1.81
11	12	8.00	9.22	8.52	2	2.33	2.55	2.51
12	3	7.33	6.22	6.63	4	4.00	3.33	3.58
13	7	3.33	4.44	4.26	6	3.66	4.88	4.47
14	0	2.67	2.11	2.52	1	7.00	5.22	4.70
15	1	0.33	1.00	1.04	14	5.00	4.00	3.03

Scores	Video-modality group				Audio-modality group			
Class	f	f1	f2	f3	f	f1	f2	f3
2	1	0.67	0.45	0.41	-	-	-	-
3	1	0.67	0.78	0.52	-	-	-	-
4	0	1.00	0.33	0.89	-	-	-	-
5	2	1.33	1.55	1.51	7	3.00	2.89	2.56
6	2	2.33	2.66	2.66	2	5.67	4.78	4.78
7	3	4.33	4.78	4.85	8	5.67	6.67	6.67
8	8	7.67	7.11	7.30	7	8.67	8.56	9.15
9	12	9.33	10.00	9.67	11	11.33	12.22	11.48
10	8	13.00	11.89	11.81	16	16.67	13.67	13.30
11	19	13.33	13.55	12.52	12	13.00	14.00	12.96
12	13	14.33	12.11	11.92	11	12.33	11.22	11.63
13	11	8.67	10.11	9.59	14	8.33	9.66	9.22
14	2	7.33	6.56	6.78	0	8.33	6.78	6.81
15	9	3.67	3.67	3.41	11	3.67	4.00	3.59

are given in column f. Here we average the frequencies three times to get smoother curves of the distributions. The first expected frequencies obtained by running averages are given in column f1, the second ones in column f2 and the third ones in column f3. Figure 1 shows the smoothed distribution curves for the scores of each group obtained from column f3 of Table 2.

So far we have means and standard deviations in each group by means of statistics. There are some differences among the means. However, we cannot jump to the conclusion that these differences are always significant in the effectiveness of teaching methods. We should examine the correlations among mean differences to see if they are actually significant or not: They may be only one of the chance deviations from no difference at all.

Then the statistical question is "How reliable is the difference between means?" We usually use a null hypothesis. According to the null hypothesis, we assume a sampling distribution of differences with the means at zero (Ho: $m1-m2=0$). In other words, if we can take this hypothesis from the point of view of statistical probabilities, there is no significance in the difference between two means. On the other hand, if we reject the hypothesis judging from statistical probabilities, there must be significance in the difference between two means.

The statistical probabilities standard adopted for rejecting the hypothesis is sometimes called α. These probabilities not only represent a scale of significance but also tell us the chance we take of being wrong. Thus, the smaller α is, the less risk we take of being wrong when we reject the null hypothesis. By common consent an arbitrary choice of α has been taken to adopt two particular levels of confidence. One is known as the five percent level, or 0.05 level; and the other as the one percent

level, or 0.01 level. We assume that the sampling distributions in this experiment are interpreted as approximately normal distributions (shown in Figure 1), which is known as "*t*-distribution" in statistics. From the table of *t*-distribution,[9] we get the *t*-values of the 0.05 and 0.01 levels as 1.65 and 2.33 respectively. These values are due to the one-tailed *t*-test[10] which we adopt for this experiment since the values of all standard deviations in this test are close to each other. Consequently the standard-score value (Z) will be computed and evaluated within the significant limits in the *t*-distribution. All significant values of the mean differences are given by the formula: $Z=\frac{\bar{X}_1-\bar{X}_2}{\sqrt{\frac{S_1^2}{N_1}+\frac{S_2^2}{N_2}}}$ (the difference between means is divided by the standard error.)[11] From the result of using the formula, the standard-score value of mean difference is greater than 0.05 or 0.01 levels of significance, then the null hypothesis is rejected and the value of mean difference is interpreted as significant. The standard-score values or significant values of the mean differences in this experiment are summarized in Table 3.

1) The standerd score values of difference of the means between control group and the other groups are all significant: $Z>1.65$ ($\alpha=0.05$) and $Z>2.33$ ($\alpha=0.01$). This means that we could conclude the test we used for this experiment is significant to evaluate the effectiveness of teaching methods.

2) The most significant difference is between the control group and

9 Tadashi Hidano et al., *Shinri Kyoiku Tokeigaku* [*Statistics in Psychology and Education*] (Tōkyō: Baifūkan, 1983), p. 295.

10 The one-tailed *t*-test is the test to examine the probability of the difference of means in one side of the distribution curve.

11 $\bar{X}$: means of scores, S: standard deviation, and N: number of students.

Table 3.

	1	2	3	4	5	6
Z	7.55	4.28	3.63	4.32	4.88	0.71

Null hypothesis is rejected: if $Z \geqq 1.65$ at the level of $\alpha = 0.05$, or $Z \geqq 2.33$ at the level of $\alpha = 0.01$.

1: the difference of means between control group and lecture group.
2: the differece of means between control group and video-modality group.
3: the difference of means between control group and audio-modality group.
4: the difference of means between lecture group and video-modality group.
5: the difference of means between lecture group and audio-modality group.
6: the difference of means between audio-modality group and video-modality group.

the lecture group: $Z = 7.55$. It is commonly believed that no medium can substitute for a live teacher in a class room, and the result of this expriment proved that true. It was, however, a little surprising that the mean of the score for the lecture group was this much far beyond the means of the scores for any other groups. Students of the lecture group were well motivated and stimulated by the presence of a teacher and concentrated on what he was explaining in the class. Needless to say, the best way of teaching English is to have a teacher in person rather than to use only media such as videocassette tapes or audiocassette tapes in the language laboratory.

3) The standard-score value of the mean difference between audio-modality and visual-modality is only 0.76, which means that there is very little difference between the mean of audio-modality group and visual-modality group: $Z < 1.65$ ($\alpha = 0.05$) and $Z < 2.33$ ($\alpha = 0.01$). Therefore, we could not find any significance in the difference between the two means: we could guess at some affective reasons for this small difference other than the significant difference of the two modalities. For example, possible

affective factors are the English proficiency of the students, the conditions of the day when they had the test, or individual personal reasons, which vary in different groups.

However, it is a fact that there is a difference, even though it is small, between the two means: the mean of visual-modality group is slightly greater than the one of audio-modality group in this experiment though the difference is not statistically significant.

We have some other data to show the students at the Otaru University of Commerce favor video-modality when they learn English. Table 4 shows the numbers of students at the university who used the language laboratory outside their regular class hours from April through December in 1983: The first column shows the number of students who came to watch video films at the language laboratory. The second shows the number of students who came to use the audiocassette printer. And the third shows the number of students who came to listen to audioassette

Table 4.

1983	VTR	Audiocassette printer	Audiocassette booth	Total
April	24	8	0	32
May	94	42	30	166
June	106	31	35	172
July	83	24	28	135
Aug.	12	9	6	27
Sep.	39	29	9	77
Oct.	11	9	0	20
Nov.	121	15	13	149
Dec.	62	23	5	90
Total	552	190	126	868
Percentage	63.6%	21.9%	14.5%	100%

tapes. The statistics show that about 64% of the total students who used the language laboratory during the time from April through December in 1983 came to the laboratory for viewing video films.

We also gave questionnaires to the students at the freshman English classes from E121 through E124 and asked about the learning materials: They used both audio-modality and video-modality material. Each class was split in half. And while half of students were studying a lesson taught by Dr. Carr in a class, the other half went to the language laboratory, and listened to a tape of the lesson or watched a video film for their comprehension practice under the instruction of an assistant. The audio-cassette tapes, which went with the workbook titled *Building Strategies*; [12] and the video film titled "Bid for Power" edited and produced by B.B.C. were used in the language laboratory.

The total number of students who answered these questionnaires is 133. As for the content of materials, students were asked whether it was difficult in the following five grades: 1) too easy, 2) easy, 3) fair, 4) difficult or 5) too difficult. The students were also asked whether the materials were interesting as follows: 1) boring, 2) between boring and fair, 3) fair, 4) interesting or 5) very interesting. The students were also asked how many times in a week they listened to the tape or viewed the video film outside the regular class hours: 1) none, 2) one time, 3) two times, 4) three times or 5) over four times. The results are summarized in Table 5.

As for the *Building Strategies*, five students or only 4% of the total students who responded to the questionnaires answered that the content was very difficult; eleven students or only 8% of the total students

12 Brian Abbs and Ingrid Freebairn, *Building Strategies: An Integrated Language Course for Learners of English*, Strategies 2 (London: Longman, 1980).

Table 5.

	Materials	very easy←→very hard				
		1	2	3	4	5
Contents	B. S.	3	18	69	38	5
	B. F. P.	1	4	7	53	68
Interest	B. S.	boring←→very interesting				
		1	2	3	4	5
		26	31	65	8	3
	B. F. P.	28	18	66	10	11
How many times a week	B. S.	none	once	twice	three times	over four times
		71	45	7	7	3
	B. F. P.	51	40	22	10	10

B. S.: *Building Strategies.*
B. F. P.: "Bid for Power"

responded that they were interested in the material; and sixty-two students or 47% of the total students answered that they listened to the tape at least once outside the regular class hours.

On the other hand, as for the "Bid for Power", sixty-eight students or 51% of the total students found the content very difficult; twenty-one students or 16% of the total students found the material interesting; and eighty-two students or 62% of the total students viewed the film at least once in a week outside the regular class hours.

Thus, students got more interested in the "Bid for Power" though they found the content was much harder than the *Building Strategies.* Though the materials are different each other, we could still comment on the results of the questionnaires as follows: There might be a correlation between the difficulties of the contents and the interest in the materials, but by common consent it is not necessarily true that the harder the more interesting: it may come out with rather negative results if the content

is too hard for students. In this case the statistics of the questionnaires show that the "Bidfor Power" is considered thirteen times harder than the *Building Strategies*, and yet the interest in the "Bid for Power" is almost twice as much as the one in the *Building Strategies*.

Here, the result goes against the common belief, and we can assume that the difference of the students' interest between two materials is due to the different effects between audio-modality and video-modality. Thus the students are apparently more motivated to learn English by the use of video-modality than by the use of audio-modality only.

4. Conclusions

We saw the comparative effectiveness of teaching media through audio-modality and video-modality from the results of small experiment and questionnaires done in the freshman classes at the Otaru University of Commerce.

Though we hypothesized in the beginning that the video-modality group would have better scores on the idiom test than audio-modality group, the difference of the effectiveness between the two modalities did not come out as statistically significant in spite of a few differences between the means of two modality group scores.

However, considering the data of annual statistics of users of the language laboratory and the results of questionnaires on the two materials, audio-modality and video-modality, we can conclude psycholinguistically that students are better motivated in learning English by using video-modality than using audio-modality only.

It is very hard to draw a definite conclusion from this kind of small experiment. The knowledge of the students varies within groups or even among individuals. The video film we used was an animated film, which

did not show realistic movements in the picture. Also this experiment tested, in a sense, only the short term memory among the students in each group. We could have also tested the long term retention of the memory for comparing the effectiveness between audio-modality and video-modality.

As stated in the sub-title, this is a preliminary report on a comparative case study. The author would like to use this report as a stepping stone to continue to study an effective ways of teaching English to foreign students.

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