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An Experimental Study of the Use of Visual Illustrations Used to Complement Oral Instruction on Television.

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Five slide sequences, each containing 39 black-and-white slides designed to complement oral instruction, and carrying a 32 minute oral instructional unit on the heart, were presented to 269 college students in five groups through a television receiver. The purpose was twofold: to determine if redundant information presented simultaneously through eye and ear results in more effective learning than if the information is presented through the ear alone, and to measure the relative effectiveness of varied types of visual illustrations used to facilitate student realization of varied educational objectives. The results of the tests indicated that visual aids are effective when learning objectives are similar to those measured by a drawing test, but that they are unnecessary and even distracting when the learning objectives are similar to those measured by terminology, identification, comprehension, and total criterion tests. This may be because college students have already been selected for their verbal and conceptual ability. In televising presentations, therefore, for college level instruction, visual materials should be used only insofar as they are justified by learning objectives and achievement. (GO)

An Experimental Study of the Use of Visual Illustrations Used to Complement Oral Instruction on Television

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Introduction

Instructional television presentations utilize a variety of visual materials including charts, films, slides, newspaper clippings, drawings, photographs, etc., in an attempt to improve the quality of teaching and learning. There are a number of reasons for the extensive use of the visual media on television. Among the reasons are: (a) many types of visuals can be prepared with a minimum of effort, (b) visual materials are readily available from a number of sources, (c) visuals can be incorporated into a presentation with a minimum of effort by the television director, and (d) it is generally agreed that the appropriate use of visual aids has much to contribute to student learning. Previous research appears to support the contention that the use of carefully prepared visual aids in instructional presentations can improve student achievement. However, the prevailing situation does not appear to be one governed by the prudent use of visual materials. Much of the visual material appears to be incorporated in instructional presentations merely for the purpose of filling the video channel with very little regard given as to whether visual materials are actually necessary in teaching for a particular objective or whether the use of a particular type of visual illustration is any more effective than any other type in improving student achievement of specific educational objectives. Obviously, if financial economy and instructional effectiveness are to be realized in instructional television we need to experimentally determine the efficiency with which particular types of visual materials facilitate

student achievement of varied educational objectives.

Hoban (3: 102) commenting on the need for research on visual aids has stated:

> Various research studies ... have shed little light on the differential and interacting roles of pictures and language in films. Without a fundamental understanding of the roles of each medium, it is difficult to deal with the problem of best employing them, simultaneously or sequentially. Yet, this is what must be done in practice with illustrated books, titled or sound film strips, motion pictures, and television.

Apparently we need to evaluate experimentally the effectiveness of those types of visual illustrations used on television to find out whether or not one type of visual is any more effective than another in transmitting specific types of information. Once we have identified the capabilities of various types of visual illustrations in promoting specific types of learning, we can begin to organize this data into definite rules or principles which can be used as guides in selecting the appropriate types of visual illustrations.

Objectives

The purpose of this study was twofold: (a) to determine if redundant information presented simultaneously through two perceptual systems (eye and ear) results in more effective learning than if the information is presented by means of the oral system alone, and (b) to measure the relative effectiveness of varied types of visual illustrations used to facilitate student achievement of varied educational objectives.

Procedure

In order to achieve the objectives of the study a thirty-two minute oral instructional unit on the heart was used. This content material was selected because it permitted the evaluation of several types of objectives. The script described the heart, its parts, its internal functioning, and the simultaneous processes which occur during the systolic and diastolic phases. The five slide sequences used in this study, each containing 39 black and white slides, had been developed previously (Dwyer, (2)) and were designed specifically to complement the oral instruction, i.e., the information presented usually by the slides was the same as that which was being presented orally; however, each sequence of slides differed with regard to the amount of realistic detail which it possessed.

The oral instruction was tape recorded and presented to the students by means of the television receiver. The taped instruction contained audio signals which cued the television director to change the slides at the appropriate time so as to synchronize the oral and visual components of the instruction.

Treatment Groups

The experimental population for this study consisted of 269 students enrolled in the Speech 200 Class at The Pennsylvania State University. Students were randomly assigned to one of the

five treatment groups. Each treatment group received their respective instructional presentation in conventional television classrooms via 22" monitors. The four groups receiving visuals of the heart were the experimental groups and the group which received no visuals of the heart was the control group. The five treatment groups were as follows: students in Group I, the control group, received no illustrations of the heart; however, they viewed slides containing the names of the parts and processes of the heart as they were mentioned orally. Group II viewed simple line representations of the heart; Group III viewed detailed, shaded drawings; Group IV viewed photographs of a heart model, and Group V viewed realistic heart photographs. All treatment groups received the same oral instruction and viewed their respective type of visual illustrations for equal amounts of time.

Criterion Measures

Each student in each treatment group received a pretest, participated in his respective instructional presentation and then received four individual criterion tests. Scores received on the four criterion tests were combined into a 78-item total criterion test. The Kuder-Richardson 20 reliability coefficient for the five criterion measures were: drawing test, .82; identification test, .79; terminology test, .85; comprehension test, .74; total criterion test, .91. The objective of each test was as follows: (a) drawing test - to evaluate student

knowledge of specific locations of the various patterns, structures, and positions of the parts of the heart; (b) identification test - to measure student transfer of learning, i.e., the ability to identify numbered parts of the heart on a diagram from information presented via the instructional presentation; (c) terminology test - to evaluate student knowledge of referents for specific symbols; (d) comprehension test - to measure student understanding of the heart and its internal processes, and (e) the total criterion test - to measure the student's total understanding of the concepts presented in the instruction.

Results

The Hartley test for homogeneity of variance (4: 94-95) was used with the pretest and posttest scores for the five treatment groups. In no case did the observed value of the F max statistic reach the critical value for a .05 level test. Thus, it appeared that the treatment groups were drawn randomly from populations with common variance.

Significant differences were found to exist among the means of the five treatment groups on four of the five criterion tests: drawing test ($F = 7.38$, $df = 4/263$, $p < .01$), identification test ($F = 3.27$, $df = 4/263$, $p < .05$), comprehension test ($F = 3.02$, df 4/263, $p < .05$), total criterion test ($F = 3.98$, $df = 4/263$, $p < .01$). Table 1 presents analyses of the differences between pairs of means on the five criterion measures.

Table 1. Dunn's c-Procedure (1) for Differences Between Pairs of Means

A. Drawing Test

TREATMENT	N	S.D.	MEAN PRETEST SCORE	MEAN	ADJUSTED MEAN	GRP II 13.71	GRP III 13.14	GRP IV 12.19	GRP V 11.47
Oral Pres. (Grp I)	62	2.9	24.07	10.89	10.65	**4.81	**3.91	2.38	1.25
Abstract Line (Grp II)	54	4.3	23.98	13.93	13.71		.87	2.28	*3.30
Drawing Pres. (Grp III)	54	3.8	22.02	12.87	13.14			1.42	2.46
Heart Model Pres. (Grp IV)	51	2.8	23.00	12.16	12.19				1.05
Photographic Pres. (Grp V)	48	4.0	22.31	11.27	11.47				

B. Identification Test

TREATMENT	S.D.	MEAN	ADJUSTED MEAN	GRP II 14.27	GRP III 14.42	GRP IV 14.33	GRP V 12.52
Oral Pres. (Grp I)	3.4	13.39	13.08	1.86	2.09	1.92	.83
Abstract Line (Grp II)	3.7	14.56	14.27		.22	.09	2.54
Drawing Pres. (Grp III)	4.0	14.06	14.42			.13	2.76
Heart Model Pres. (Grp IV)	3.4	14.29	14.33				2.60
Photographic Pres. (Grp V)	4.2	12.25	12.52				

C. Terminology Test

TREATMENT	S.D.	MEAN	ADJUSTED MEAN	GRP II 12.32	GRP III 12.32	GRP IV 13.05	GRP V 11.04
Oral Pres. (Grp I)	3.6	13.15	12.64	.25	.44	.56	2.14
Abstract Line (Grp II)	4.3	13.28	12.82		.67	.30	2.31
Drawing Pres. (Grp III)	5.6	11.72	12.32			.96	1.66
Heart Model Pres. (Grp IV)	3.7	12.98	13.05				2.57
Photographic Pres. (Grp V)	5.3	10.60	11.04				

D. Comprehension Test

TREATMENT	S.D.	MEAN	ADJUSTED MEAN	GRP II 12.11	GRP III 12.08	GRP IV 12.66	GRP V 10.61
Oral Pres. (Grp I)	3.5	11.68	11.31	1.31	1.26	2.18	1.11
Abstract Line (Grp II)	3.6	12.44	12.11		.05	.86	2.31
Drawing Pres (Grp III)	4.4	11.65	12.08			.91	2.26
Heart Model Pres. (Grp IV)	3.5	12.61	12.66				3.11
Photographic Pres. (Grp V)	3.4	10.29	10.61				

E. Total Criterion Test

TREATMENT	S.D.	MEAN	ADJUSTED MEAN	GRP II 52.94	GRP III 51.74	GRP IV 51.83	GRP V 45.51
Oral Pres. (Grp I)	11.1	49.07	47.64	2.47	1.91	1.83	.06
Abstract Line (Grp II)	13.3	54.24	52.94		.54	.49	*3.25
Drawing Pres. (Grp III)	15.5	50.07	51.74			.04	2.72
Heart Model Pres. (Grp IV)	10.6	51.65	51.83				2.73
Photographic Pres. (Grp V)	14.6	44.29	45.51				

*(p < .05)
**(p < .01)

Analyses of the differences between treatment means (Table 1) indicated that (a) for learning objectives similar to those measured by the identification, terminology, comprehension, and total criterion tests, the oral presentation complemented by printed word symbols was as effective in promoting student achievement as were those presentations complemented by visual illustrations of the heart, and (b) on the drawing test students viewing the abstract line presentation and the drawing presentation achieved significantly higher scores than did those students receiving the oral presentation (Grp II > Grp I, c = 4.81, m/v = 10/100, $p < .01$; Grp III > Grp I, c = 3.91, m/v = 10/100, $p < .01$).

Discussion

A number of possible explanations may be advanced to explain the results obtained in this study:

(a) Since college students are generally selected from the upper two thirds of the population in terms of verbal and conceptual ability, it seems that they are in a highly favorable position in terms of being able to learn from oral instruction. If this assumption is accurate, then the use of visual illustrations is not necessary to complement oral instruction designed to promote learning objectives similar to those measured by the identification, terminology, comprehension, and total criterion tests.

(b) The realistic detail contained within the visual illustrations used to complement the oral instruction may have had the net effect of distracting the attention of the students from the essential learning cues, thereby interfering with rather than facilitating student achievement.

(c) Since students in each treatment group viewed their respective televised presentation for equal amounts of time, those students who viewed the more realistic types of visuals may not have had sufficient time to study and comprehend adequately the additional information contained in the visual illustrations presented to them.

The results of this study seem to indicate that visual illustrations are not needed to complement oral instruction when the students are required to achieve objectives similar to those measured by the terminology, identification, comprehension, and total criterion tests. Apparently, visuals should be used for college level instruction when the student is required (a) to draw together concepts in forming generalizations and/or comparisons, or (b) to conceptualize precisely specific abstract concepts and relationships in order to comprehend some manipulative task or process. For example, the drawing test required that the student draw a representative diagram of the heart and locate the various parts and structures in their respective positions on the diagram. Since the students viewing the abstract line

presentation scored significantly higher on the drawing test than did students receiving the oral presentation, it seems that the type of information necessary to complete a task similar to that required by the drawing test can not be transmitted very well by oral communication alone. The results seem to substantiate the use of visual aids in promoting student achievement of learning objectives similar to those measured by the drawing test. Resulting from this study is also the implication that if we intend to produce televised presentations of optimum instructional quality, we need to reorganize our thinking regarding the use of visual materials for college level instruction since their use can be justified only insofar as they contribute to increased student achievement.

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