

## A Comparison of Six Versions of Science Library Instruction

*This study was designed to investigate the instructional effectiveness of six methods of library instruction. University students were randomly assigned to treatment groups, received verbal instruction with/without supplementary visual illustrations and readings. Results indicated that the self-paced audiovisual tutorial study followed by a summary and question/answer session was the most effective way of increasing student achievement on the ninety-item objective test designed to measure the comprehension and retention of the content.*

A WIDE RANGE OF LIBRARY ORIENTATION has been reported in books and journals but there is little empirical evidence available to serve as a guide for a librarian to refer to in selecting visuals and media which will be most effective in facilitating student achievement of specific objectives.<sup>1</sup>

A randomized block design was employed to investigate the relative effectiveness of different types of library instruction as compared with the conventional library lecture at the Science Division of the Portland State University Library.

### METHOD

*Subjects.* The subjects for this study were students enrolled in summer classes at Portland State University. More than 200 subjects were randomly assigned to seven groups.

*Treatments.* In order to facilitate comparisons, only one or two variables were varied in the treatments described below.

Conventional	Library	Lecture
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(Group L). Students in this group participated in a live lecture given by a science librarian who also prepared and narrated the script used in the other treatments. The live lecture covered basically the same contents as the script and in many instances examples were cited almost verbatim. No visual aids other than printed materials (reference books and hand-outs) were used to complement the librarian's oral lecture. Time was limited to one class period of fifty minutes.

Audio Instruction (Group A). Students in this group listened to the audio-taped instruction via headsets without using any visuals. The total length of the narration was forty-six minutes. The same recorded narration was used in all other treatments.

Slide/Audiotape Instruction (Group S). A total of 179 color slides were produced to illustrate the audiotape instruction. Students in this group viewed the slides synchronized to the tape for automatic advancement at a predetermined time.

Television Instruction (Group AT). In addition to notebooks, students in this group independently studied a film-

strip duplicated photographically from the slides used in Group S. A cassette tape with audible change signals instead of an open reel tape with inaudible signals was used. The notebook included some illustrations, sample pages, annotations and comparison tables of the materials covered in the audiotape instruction to help clarify information. Students were allowed to spend as much time as needed by themselves in their spare time without any additional assistance from librarians.

**Audiovisual Instruction (Group AV).** Students in this group prepared themselves by the audiotutorial method before joining a fifty-minute follow-up session led by a librarian. The librarian used overhead transparencies copied directly from the notebooks to reinforce the main points and also answered questions asked by the students, thus giving both the librarian and students opportunities to interact with one another.

**Criterion Test.** A ninety-item objective test was administered to all groups immediately after the treatments. The control group (Group C) drawn at random from the population received no library instruction at all but took the same criterion test.

The test was prepared by two persons who were familiar with the subject matter and test measurement. The Spearman-Brown Prophecy Formula reliability coefficient for the odd-even test items was .80.

The test items were evenly distributed to three parts: Part I—Card Catalog

(thirty items); Part II—Readers' Guide, Dictionaries, and Encyclopedias (thirty items); and Part III—Biological Abstracts and Science Citation Index (thirty items). The means for the control group were 12.4 (Part I); 5.5 (Part II); and 1.7 (Part III) out of thirty possible points. It was reasonable to assume that subjects in this sample had not much library knowledge of Parts II and III before the treatments.

In order to discourage guessing, a penalty was applied for wrong answers by using the correction formula: " $R-W/(n-1)$ ," where "R" is the number of questions answered correctly; "W" is the number of questions answered incorrectly; and "n" is the number of answer choices for an item.

#### RESULTS AND DISCUSSION

The summary of the analysis of variance of all groups is given in Table 1.

The analysis indicates that significant differences exist among the means of all groups ( $F = 53.2$ , d.f. = 6/98,  $p < .001$ ).

Comparisons among the individual means of the six treatment groups and one control group by Duncan's New Multiple Range Test were further conducted to determine the effectiveness of the various treatments in improving student achievement on the criterion tests.<sup>2</sup> The observed means, each based upon fifteen observations are rearranged in order of magnitude in Table 2 for statistical analysis.

Analysis of the differences between means indicated that all treatment

TABLE 1  
ANALYSIS OF VARIANCE FOR THE RANDOMIZED GROUPS DESIGN

Source of Variation	Sum of Squares	d.f.	Mean Square	F
Between groups	25,200.51	6	4,200.08	53.16*
Within groups	7,769.50	98	79.28	
Total	32,970.01	104		

\*  $P < .001$

TABLE 2  
DUNCAN'S NEW MULTIPLE RANGE TEST APPLIED TO THE DIFFERENCES  
BETWEEN SEVEN MEANS

Means	(1) C 18.7	(2) A 38.1	(3) L 39.1	(4) TV 41.6	(5) S 48.3	(6) AT 60.4	(7) AV 70.4	Shortest Significant Ranges $\alpha = .01^*$ $\alpha = .05$	
(1)C 18.7	—	19.4	20.4	22.9	29.6	41.7	51.7	$R_2 = 8.58$	6.46
(2)A 38.1		—	1.0	3.5	10.2	22.3	32.3	$R_3 = 8.92$	6.78
(3)L 39.1			—	2.5	9.2	21.3	31.3	$R_4 = 9.18$	7.02
(4)TV 41.6				—	6.7	18.8	28.8	$R_5 = 9.36$	7.20
(5)S 48.3					—	12.1	22.1	$R_6 = 9.50$	7.31
(6)AT 60.4						—	10.0	$R_7 = 9.63$	7.43
(7)AV 70.4							—	$R_8 = 9.73$	7.48
	C	A	L	TV	S	AT	AV		

\* Any two means not underscored by the same line are significantly different at the .01 level.

° Any two means underscored by the same line are not significantly different at the .01 level.

groups which received various methods of library instruction achieved significantly higher scores on the criterion tests than the control group.

The results also indicated that neither the conventional library lecture (Group L) nor the televised instruction (Group AT) was consistently more effective in facilitating student achievement in scores than the oral instruction without a librarian (Group A) or visual illustrations (Group S). The fact that visual illustrations shown on printed books or 22 inch monitor screens were too small to be perceived clearly by all students may be attributed to nonsignificant differences. Another possible explanation may be that in the audio instruction there was no obscure visual stimuli to distract attention from verbal information received through earphones.

The slide/audiotape method (Group S) was found to be more effective than audio instruction and conventional library lecture at the .01 level of significance and than the television instruction at the .05 level of significance. Students who viewed both the slides and the videotape commented on the vividness and clarity of the color slides and the loss of visual quality as a result of television transmission. It was noted

that for a given amount of time, unintelligible visual stimuli might have impeded rather than facilitated the subject's concentration in absorbing information from verbal instruction. The data obtained in this study coincide with the results of Dwyer's study.<sup>3</sup>

Students receiving the audio tutorial instruction (Group AV) achieved significantly higher scores than did students receiving the slide/audiotape instruction (Group S). One possible explanation may be that since the slides were uniformly externally paced, students did not have adequate time to pay attention to the details of the illustrations. Students in the self-study group were able to set their own learning pace, to review the parts where they experienced difficulty, and had sufficient time to absorb additional information.

Contrary to Kirk's findings, Group AV in this study was found to be superior to the independent study group without attending the follow-up lecture-discussion session.<sup>4</sup> However, it should be noted that the Group AT in this study did not do exercises, as in Kirk's. The fact that students in Group AV had opportunities to ask questions of the librarian and vice versa may account for the success of this treatment. Further

research is needed to study the human variables in library orientation.

#### CONCLUSIONS

Results of this study lead to the following conclusions:

1. The use of certain types of visuals to complement oral instruction do not automatically improve student achievement in the criterion test, as demonstrated in Groups L and TV.

2. When the identical illustrations were presented via television and slides, the slide, but not the television presentation, was found to be more effective than the audio presentation alone.

3. An increase in visibility of illustrations and intelligibility of information by means of the illustrated notebook also produced a corresponding gain in the degree of comprehension and retention, if a student had sufficient time to assimilate the information, as shown in the self-paced instruction of Group AT.

4. Even though sufficient time was

available for studying, not all students comprehended the illustrated materials equally well. The use of a librarian to clarify the ambiguous points and to focus students' attention to relevant visual cues by means of overhead transparencies in an externally paced instruction (Group AV) was more effective than the self-paced audio tutorial instruction without the librarian's assistance (Group AT).

#### REFERENCES

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2. Allen L. Edwards, *Experimental Design in Psychological Research* (New York: Holt, 1964), p.136.
3. Francis M. Dwyer, "When Visuals Are Not the Message," *Educational Broadcasting Review* 2:38-43 (Feb. 1968).
4. Thomas Kirk, "A Comparison of Two Methods of Library Instruction for Students in Introductory Biology," *CRL* 32:465-74 (Nov. 1971).