TESTING VISUAL INFORMATION PRESENTED VIA TELEVISION: A COMPARISON OF TWO METHODS

Thesis for the Degree of M. A.
MICHIGAN STATE UNIVERSITY
THOMAS U. FOSTER
1970

ABSTRACT

TESTING VISUAL INFORMATION PRESENTED VIA TELEVISION:
A COMPARISON OF TWO METHODS

By

Thomas U. Foster

The Problem

The primary purpose of the research reported in this study was to investigate the relative effectiveness of conventional written/verbal tests and visual or picture type tests in measuring learning after visual information has been presented via television. The visual content in instruction is growing rapidly but most testing is still being done using the traditional written/verbal tests. Research needs to be undertaken to discover if visual testing would be more applicable in some circumstances.

Design

A five-minute thirty-second television lesson on Greek temple architecture was produced. This message had some information contained solely in the video channel and other information in both the audio and video channels.

Three multiple choice tests were designed in order to test the amount of learning after subjects viewed the televised lesson. The first test was entirely made up of

written/verbal questions. These questions covered the entire content of the televised lesson, whether the information had been presented via the audio channel or the video channel.

The second test was a combination of written/verbal questions and picture questions. The written/verbal questions covered the information contained primarily in the audio channel and the picture questions covered the information contained in the video channel.

The third test was exactly the same as the second, except the pictures used were one-quarter of the size.

The televised lesson was transmitted by closed-circuit television to 80 of the 124 subjects taking part in this experiment. The 80 subjects were the experimental group, while the remaining 44 were the control group. The control and experimental groups were each divided into three treatment groups with one treatment group from each taking one of the three tests.

The tests were administered to all 124 subjects immediately following the televised lesson. The subjects were randomly assigned to classrooms, groups, and treatment groups. This experimental population was made up of high school students attending a 4-H summer conference at Michigan State University.

Analysis of variance was used to test the significance of differences between the mean scores of the three tests.

Findings

1. The televised lesson did significantly increase the subjects knowledge of Greek temple architecture.

2. Neither of the two combination written/verbal and visual tests significantly measured learning more effectively than the written/verbal test.

3. The picture questions on the two visual tests did not significantly measure learning more effectively than the corresponding questions on the written/verbal test.

4. The three tests when submitted to item analysis proved to be reliable instruments.

Accepted by the faculty of the Department of Television and Radio, College of Communication Arts, Michigan State University, in partial fulfillment of the requirements for the Master of Arts degree.

Robert Schrader

Director of Thesis

TESTING VISUAL INFORMATION PRESENTED VIA TELEVISION: A COMPARISON OF TWO METHODS

By

Thomas U. Foster

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Television and Radio

1970

ACKNOWLEDGEMENT

The acknowledgements here are for more than this thesis. The thesis is only a symbolic end to the second of three steps which started in Hawaii in 1966. I have probably never properly thanked the people helping me on this adventure.

To my friends and instructors in Hawaii, San Diego, and East Lansing. They are too numerous to mention individually but they know who they are.

To Vic and Annie, my calabash relatives, for making me part of their family and letting me involve them in all my nutty schemes.

To Robert Schlater, my friend and advisor, whose open door and open mind made this thesis possible.

To Aunt Bunnie, who started it all on those Saturday afternoons long, long ago.

To my mother and dad for their love and generosity.

And

To my wife Virginia--the most wonderful part of this adventure was finding you--you've made the whole thing worthwhile.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Mediated technology is rapidly becoming a vital force in the improvement of all levels and forms of education. The traditional teaching tools of teacher, textbook and blackboard have been joined by "hardware" and "software", such as television, film, projectors of all kinds, programed instruction, and computers. Yet, more study and testing is needed before all the tools, both hardware and software, can be effectively combined to bring about the improvements in education that their potentials predict.

To establish such appropriate and effective use of media in the classroom, sophisticated research and high-level conferences are taking place throughout the country. "Instructional technology" is gaining prominence as a systematic approach to the total process of teaching and learning. Unfortunately, much of the research being done on the newer media and their applications in the classroom relies upon the same kinds of tests that have always been used to determine the amount learned from a given situation. Information is being presented one way and the testing procedure for

evaluating the success of the teaching/learning situation is being done in another way. In other words, new methods of instruction are being researched with old forms of testing. This situation is becoming more critical as the amount of visual presentation, compared to verbal, increases.

The cliche, "I can't remember names but I never forget a face," implies that many people retain visual impressions longer than verbal ones. This concept was tested by Ralph Haber and Lionel Standing at the University of Rochester. The test subjects looked at 280 pairs of photographic slides. One slide in each pair had been previously shown to the group in a series of 2,560 slides viewed at the rate of one every ten seconds. The other slide of the pair was similar but had not been previously viewed by the subjects. When asked to indicate which slide in each pair they had seen before, the subjects identified 85-95% correctly. However, when asked to verbalize details of certain pictures, the subjects did not do nearly as well.[1]

It is this kind of testing that will lead the way to increased understanding of the role and function of visual learning. Such knowledge will be particularly vital as visual presentation of material increases. While television is the major source of visual presentation of material, very little research has been done to determine what kinds of testing

---

[1]Ralph Norman Haber, "How We Remember What We See," Scientific American, CCXXII (May, 1970), p. 104.

should follow instruction via this medium. As Hartman found, "Most experimenters have used the print channel alone for testing, regardless of the channels utilized in the original presentation."[2] There are studies being done in related fields, audio channel/print channel comparisons for example, that give us some insight into this area. There are definite indicators emphasizing the need to have presentation of materials and subsequent testing or evaluation methods closely related in terms of form as well as content.

An illustration of this concept of related presentation and testing forms can often be found in art appreciation or art history courses. The usual manner of presentation is that of 2x2 color slides of artists' works with accompanying lectures by the instructor. Books with a generous supply of illustrations and museum field trips quite often supplement the classroom experience. These courses generally use slides for a major part of the test program as well. The students are asked to identify an artist, period, or particular design element from the art pieces shown on the slides.

It would not be as effective, in such a test situation, to give students a verbal description of an impressionistic painting and then ask them to identify the artist or the techniques employed. The results in such a case would depend on how well the instructor could verbalize impressionistic

---

[2]Frank R. Hartman, "Single and Multiple Channel Communication: A Review of Research and a Proposed Model," AV Communication Review, IX (November - December, 1961), p. 242.

art and how well the student had memorized descriptions of paintings and characteristics of painters. In turn, successful completion of such a test would also depend on the students' skill in verbalizing the information requested. The test, in this example, would have little to do with whether a student could recognize a Reubens from a Degas on sight. How much faster and more to the point it is to show a slide of the painting and then ask the students to identify the artist.

More and more learning is dependent upon the visual presentation of material. Through films, slides, illustrations and other forms of graphic portrayal, the learning situation has moved away from the strict verbal interpretation of knowledge. However, the tests used to determine the amount learned by a student who has received a majority of his information visually still depend on the written forms of the past.

Despite behavioral objectives which call for recognition or identification of the painting style of Degas, for example, a student must demonstrate his knowledge in word descriptions. An exam question may be valid and reliable and yet the form of the question may be contradictory to the way in which the student learned the information.

Although a test may seem to measure what it is intended to measure and appear to yield a dependable score in most situations, it can fall far short in both these critical

criteria if the students' verbal/written skills are weak or if non-standard English is the accepted spoken dialect. All students do not arrive at a lesson with the same level of verbal, writing and/or reading skills. This does not mean, however, that learning cannot take place. Poor test results, too often accepted as lack of learning, may be due to the students' inability to express what they have learned when given the structure of a written/verbal test. The students with the poorest test grades may be the ones who need a visual kind of learning the most. Since they do not have all the communication skills of some of their classmates, visual learning and testing may be the key for them. Valid and reliable tests must be developed through research which will accurately measure learning which takes a place through visual presentation of information.

Purpose of the Study

The primary purpose of the research reported in this paper was to investigate the relative effectiveness of conventional written/verbal tests and visual or picture type tests in determining the amount of information gained from a televised message. The question studied was:

> "After visual information has been presented via television, does a visual testing technique measure learning more effectively than the conventional written/verbal technique?"

The use of television for instruction is growing rapidly, but research on the effectiveness of conventional testing of

televised instruction is scarce. Research in this area should be undertaken for the following reasons:

First, testing should be part of the learning process and as such be as effective as possible. Frank Hartman states, ". . . learning demonstrated in the . . . testing situation may be expected to increase as the testing situation becomes more like the original situation in which the information was learned."[3]

The second reason is that tests must measure what has been learned. Presley Holmes says there is evidence that this does not happen if testing is not utilizing the same channel as the presentation.[4]

The proper perspective for this study has been summarized by Charles Hoban. Hoban concluded that ". . . it is necessary to recognize that educational research and educational change are structurally related. It is inconceivable that education research should have any major function other than to provide data upon which decisions on educational change, or no change, are made and implemented."[5]

---

[3]Ibid., p. 246.

[4]Presley D. Holmes, Jr., "Television Research in the Teaching-Learning Process," (unpublished Doctoral dissertation, Wayne State University, 1959), p. 76.

[5]Charles F. Hoban," Critique on the Methodology of Research," (Paper presented at the U. S. Office of Education Conference on Research in New Media, Washington, D. C., Oct. 21-27, 1958), p. 5.

Research Review

Instructional television is a fairly late arrival as far as media in instruction is concerned. Its grandparents are radio and film. In the 1920's almost 200 radio stations had been constructed by schools. The University of Wisconsin claims to have been the first on the air with regular voice programming in 1917. "The year 1929 was not kind to these educational radio stations, but 35 of them still stood even after that storm."[6] Educational radio started to grow slowly again throughout the '30's and '40's. However, radio, or film for that matter, has never reached the potential that most observers predicted in those early days. Commercial television boomed after World War II, but it was not until 1953 that the first non-commercial educational station went on the air. ETV has had a steady growth since that time, despite the poor financial situation that most ETV stations continually find themselves in.[7]

Holmes feels that the advent of television has given impetus to all visual media in instruction. He says, however, ". . . the introduction of television into the teaching-learning process has also served to bring to light the problem of measuring learning from verbal symbol and visual material."[8]

---

[6]Wilbur Schramm, Jack Lyle, and Ithiel de Sola Pool, The People Look at Educational Television (Stanford: Stanford University Press, 1963), p. 3.

[7]Ibid., pp. 1-11.

[8]Holmes, op. cit., pp. 82-83.

Students may be learning far more from the televised lesson than verbal/written testing techniques seem to indicate. Most present testing of televised lessons, however, depends on the student's ability to verbally describe or list information that he has been presented pictorially.

There is evidence from educational film research that learning from a multiple channel communication message increases as the similarity between the message and the testing situation increases. In his review of multiple channel research literature, Hartman notes that in almost every instance the testing of visual information has used the conventional channel of print with verbal type questions. Hartman states:

> The weight of the experimental evidence indicates that this form of testing does not measure an adequate amount of multiple channel learning and may lead to erroneous results--particularly when the learning of pictorial information is tested by means of verbal descriptions approximate to it.[9]

For example, early studies in England show attempts have been made to determine what is being retained by students after televised instruction. M. D. Vernon reported on pilot studies on the reaction to certain representative ITV programs. These studies were done to discover what actual impressions were obtained by the viewer. Small groups of not

---

[9]Frank R. Hartman, "A Review of Research on Learning from Single and Multiple Channel Communications and a Proposed Model with Generalizations and Implications for Television Communication," Research on the Communication Process (University Park, Pennsylvania: Pennsylvania State University, 1960), VI-29.

more than eleven subjects were invited to view television programs. They were told that immediately following the program they would be asked to write a brief account of what they remembered. They were told in their instructions: "Imagine that someone asked you what the programme was about, and this is what you told them." After these reports were written, the subjects were asked questions about what parts of the program stimulated them, what parts bored them and what parts confused them. This type of study was certainly a step in the right direction, but there was no visual stimulus to prompt their answers.[10]

Another example is a study conducted by Deutschmann, Barrow, and McMillan who compared the effect of different modes of communication upon relative learning of relevant and irrelevant information. The study concluded that the television film instructional situations are more efficient than the ordinary classroom instruction because more irrelevant material is screened out.[11] In other words, there is more control over the message and what communicators refer to as noise (anything that detracts from the message) when using

---

[10]M. D. Vernon, "Perception and Understanding of Instructional Television Programmes," British Journal of Psychology, XLIV (1953), 116-126.

[11]Paul J. Deutschmann, Lionel C. Barrow, Jr., and Anita McMillan, "The Efficiency of Different Modes of Communication," AV Communication Review, IX (November-December, 1961), 263-270.

film or television rather than conventional classroom instruction.[12] This study is important in showing another advantage of using visual media instruction. However, again in this experiment, the conventional verbal technique was employed to obtain the results.

Frank R. Hartman puts the learning-testing situation this way: "If the two situations in which information is (a) presented for learning and (b) then presented again for testing are looked upon as two complex but similar sets of stimuli, the learning demonstrated in the second or testing situation may be expected to increase as the testing situation becomes more like the original situation in which the information was learned. This leads to the expectation that single channel testing such as the usual printed questions will not elicit fully the learning from a multiple channel medium."[13]

Despite the need for a change in the form of testing, this is not to say that the criteria for a good test are outdated. The basis for accurate testing must remain; it is the form that must change.

There have probably been tests as long as one man has attempted to pass his knowledge on to another. It is a means

---

[12]Paul J. Deutschmann, Lionel C. Barrow, Jr., and Anita McMillan, "The Efficiency of Different Modes of Communication," AV Communication Review, X (May-June, 1962), pp. 176-178.

[13]Hartman, "Single and Multiple Channel Communication . . . ," AV Communication Review, p. 246.

of determining immediately whether given information has been understood and can be demonstrated. It is hoped, of course, that such data and concepts will be retained and added to in the future.

But, what is a good test? Henry Chauncey and John Dobbin, in their book, Testing: Its Place in Education Today, state that there are two main criteria. The first is whether the test measures what it is intended to measure; that is, is it valid. The second criterion is if the test yields a dependable score; in other words, is it reliable.[14]

Clearly stated educational objectives are essential before beginning any educational experience. This is no less true when using media such as television. Further, there should be valid reasons for using television, for example, as opposed to another means of presenting the material. After these are determined and the course material presented, the student must be tested or evaluated to see if those objectives have been met. J. Stanley Ahman, et al., in their book, Evaluating Elementary School Pupils, say, "For every educational objective he [the teacher] should have an evaluation method, preferably direct observation of pupil behavior. Since he has limited opportunity to observe pupil behavior under natural conditions, he must contrive classroom situations

---

[14]Henry Chauncey and John E. Dobbin, Testing: Its Place in Education Today (New York: Harper and Row, 1963), p. 54.

that give the pupil an opportunity to demonstrate his behavior."[15] They also report that although there is a large variety of tests available, the supply is still inadequate, as well as a decided lack of quality.[16]

It is usually impossible to wait to evaluate a student's behavior as it naturally occurs. The problems of trying to evaluate an entire classroom as each individual exhibits certain behavior is a larger task than any teacher could manage. Tests then are merely a substitute for waiting to observe behavior as it naturally occurs, says Georgia Adams. "The test is designed to elicit from examinees the behavior the test user wishes to evaluate."[17] But, even if we develop valid and accurate tests, will they actually reveal what the student is about?

E. F. Lindquist questions this and feels that things like how a student votes in a school election may be a better guide to the student's future behavior than any test he can take. The books actually read by a student in his spare time, Lindquist feels, may give better insight into the student's literary tastes than the score he receives on a literary

---

[15]J. Stanley Ahman, Marvin D. Glock, and Helen Wardeber, Evaluating Elementary School Pupils (Boston: Allyn and Bacon, Inc., 1960), p. 52.

[16]Ibid., p. 53.

[17]Georgia Sachs Adams, Measure and Evaluation in Education, Psychology, and Guidance (New York: Holt, Rinehart, and Winston, 1964), p. 149.

appreciation test. The problems of deriving any meaningful type of measure from such observations of students is recognized by Lindquist. However, he feels the difficulties are perhaps "no worse than have been resolved before through determined and persistent effort."[18]

Part of the reason educators may be reluctant to change testing methods or even experiment with new ways of testing may be due to factors other than the students' education. According to Chauncey and Dobbin, tests are used by schools for things other than assessing the development of the individual learner and aiding the academic guidance of studies. Tests are also useful to schools in helping plan curriculum, in making decisions on promotion and admission, and assisting in school assessment.[19]

While education may be tradition-bound and slow to change, especially in an area that is part of the over-all administration of a school, testing must be judged on its own merits and how valid it is for each course--not how well it fits into the existing way of doing things. We must make sure tests are doing what they are supposed to do rather than how easy they are to administer or how well they fit into the system.

---

[18]E. F. Lindquist, Preliminary Considerations in Objective Test Construction ("Educational Measurement"; Washington, D. C.: American Council on Education, 1951), p. 157.

[19]Chauncey and Dobbins, op. cit., pp. 66-68.

Over the years more and more visual content has been added to courses with little change in the testing program. In 1960 Hartman could find only fourteen studies comparing the pictorial channel with the audio and print channels. But, these few did point toward the importance of visual presentation in education. Five of the fourteen studies found advantage for the pictorial channel over print, six found superiority for pictorial over audio, and three of the studies found no consistent differences. However, Hartman also found ". . . the testing always involved verbal items, a fact which surely worked to the disadvantage of the pictorial channel."[20]

But, does this matter? If the course content is basically the same, except for a more visual presentation, shouldn't last year's test still be valid? Probably not. After an investigation into the teaching-learning process where television is present, Presley Holmes concludes, "There is strong evidence that tests measure principally verbal content and that tests are needed to measure visual content."[21]

Testing should be part of the overall learning experience of the course. In order for this to happen, there must be a direct relationship between the presentation and the test. After doing a study with instructional film, S. M. Roshal deduced that increased learning resulted from "increased

---

[20]Hartman, "A Review of Research . . . ," pp. VI-5-6.

[21]Holmes, op. cit., p. 76.

correspondence between the presentation and the testing situation."[22]

There has been work done in the comparison of audio and print channels that can be applied to television and verbal tests. The point to these tests is to determine what happens when one channel--audio--is used for the presentation, and another channel--print--is used for the test. It takes a particular kind of skill to take a written test, which may not give a true indication of how much the student actually learned while listening to the lesson. As far back as the '30's, F. R. Elliott noted that any comparison between audio and print channels was invalid unless both channels were also used to test the learning.[23] Despite this pioneering, research continues to determine if and when television is as effective or more effective than conventional teaching with little regard to the effectiveness of the tests being used in the research. The research has shown that there is no significant difference in the learning that takes place whether using television or conventional teaching. Again using the comparison of print and audio channels, H. J. Reed, writing in the Journal of Experimental Psychology, reported that the

---

[22]S. M. Roshal, Effects of Learner Representation in Film-Mediated Perceptual-Learning, Technical Report SDC 269-7-5, Instructional Film Research Program (University Park: Pennsylvania State University, 1949), p. 7.

[23]F. R. Elliott, "Memory for Visual, Auditory and Visual-Auditory Material," Archives of Psychology, 29:199 (1936), p. 245.

aural and print presentations were both most effective when the testing for either was done using the same channel as the original presentation.[24]

These film-verbal and audio-verbal comparisons cannot be used to deduce that exactly the same thing holds true for a television-verbal comparison. However, available information does show a need for more research to determine if visual testing is called for after many types of televised instruction. This does not mean that just because a lesson is televised, all testing must be visual. But, it does indicate that visual tests are necessary when recognition is being tested.

---

[24]H. J. Reed, "The Influence of a Change of Conditions Upon the Amount Recalled," Journal of Experimental Psychology, XIV (1931), pp. 632-49.

CHAPTER II

METHODOLOGY

Television Message Design

It was necessary to develop a television message upon which three different types of tests could be constructed. This was necessary in order to judge which of the tests was most effective in measuring learning of information presented visually via television.

The requirements for the experimental television message were:

1. The content of the message should contain information which would be unfamiliar to the experimental population.
2. The content of the message should lend itself to a highly visualized television presentation. Much of the message should not need audio explanation.
3. Relevant pictorial materials must be available and be adaptable for a televised presentation.
4. The pictorial materials available must adapt themselves to objective testing, both written/verbal and visual.

The topic selected was Greek Temple Architecture. It was assumed that experimental subjects would have had little exposure to a detailed presentation of this subject. Robert Schlater had used this subject matter satisfactorily in an

experiment conducted in 1966.[25] Dr. Schlater made both his television script and slides on Greek Architecture available for this experiment. The script was then adapted to suit the dictates of this study. (See Appendix A).

The television script included the following ten sub-topics:

1. The basic intention of the temples
2. The location of temples
3. The floor plans of temples
4. Type of construction used in temples
5. Capitals of Doric order columns
6. Capitals of Corinthian order columns
7. Capitals of Ionic order columns
8. Bases of Doric order columns
9. Bases of Ionic order columns
10. Bases of Corinthian order columns.

The television message then prepared had a total length of five minutes, thirty seconds.

The visual content consisted of twenty-nine slides with no live performer on camera. The narration was pre-recorded on audio tape by Arthur Weld, a professor in the Television and Radio Department of Michigan State University. The message was produced at Michigan State's Closed Circuit

---

[25]Robert W. Schlater, "Effect of Speed of Presentation and Irrelevant Cues on Recall of Television Messages," (unpublished Doctoral dissertation, Michigan State University, 1966).

Television studio. The slide chain in the control room was employed for the visuals with two studio cameras used to "shoot" the titles to be superimposed over some of the visuals. The message was recorded on two-inch video tape.

Sample of Subjects

A total of 124 high school students served as subjects for the experiment. One hundred twenty-four usable test questionnaires were completed. The subjects were attending a 4-H conference and were in residence at Michigan State University from June 10 to June 13, 1970. Total enrollment for the conference was 721 representing 63 of Michigan's 83 counties.

Selection criteria to attend the conference were made at the county level. Conference leaders assumed that long-time membership and interest in the 4-H programs were two primary considerations used for selection. Each county was given a quota based on population.

The 124 test subjects also answered demographic questions eliciting educational level, sex, and any previous study in Greek architecture. (Tables 1, 2 and 3.)

The Conference participants were randomly assigned to classrooms upon their arrival at MSU. Pre-numbered Conference badges were randomly distributed to the 4-H leaders. One leader was assigned to each classroom which had an average of thirty students. The 4-H leader randomly passed the badges to his group, and each participant wrote his name on it.

Table 1. Response to question "Have you ever studied Greek architecture in a course in High School or College?"

GROUP	OMIT		YES		NO		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
E-1	0	0	6	23.1	20	76.9	26	100
E-2	1	3.7	7	25.9	19	70.4	27	100
E-3	1	3.7	6	22.2	20	74.1	27	100
C-1	1	6.7	4	26.7	10	66.7	15	100
C-2	1	6.7	2	13.3	12	80.0	15	100
C-3	1	7.1	1	7.1	12	85.7	14	100
Total experimental group	2	2.5	19	23.75	59	73.75	80	100
Total control group	3	6.9	7	15.9	34	77.2	44	100
Grand Total	5	4.1	26	20.9	93	75.0	124	100

Table 2. Sex of subjects.

GROUP	OMIT		Sex of Subjects MALE		FEMALE		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
E-1	0	0	5	19.2	21	80.8	26	100
E-2	1	3.7	10	37.0	16	59.3	27	100
E-3	1	3.7	6	22.2	20	74.1	27	100
C-1	1	6.7	4	26.7	10	66.7	15	100
C-2	0	0	2	13.3	13	86.7	15	100
C-3	0	0	5	35.7	9	64.3	14	100
Total experimental group	2	2.5	21	26.25	57	71.25	80	100
Total control group	1	2.27	11	25.00	32	72.73	44	100
Grand Total	3	2.42	32	25.81	89	71.77	124	100

Table 3. Grade level of subjects.

GROUP	FRESHMAN		SOPHOMORE		JUNIOR		SENIOR		BELOW FRESHMAN		OMITS		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
E-1	10	38.5	8	30.8	5	19.2	1	3.8	2	7.7	0	0.0	26	100
E-2	6	22.2	9	33.3	7	25.9	3	11.1	1	3.7	1	3.7	27	100
E-3	10	37.0	4	14.8	7	25.9	2	7.4	3	11.1	1	3.7	27	100
C-1	1	6.7	3	20.0	5	33.3	5	33.3	0	0.0	1	6.7	15	100
C-2	2	13.3	4	26.7	4	26.7	5	33.3	0	0.0	0	0.0	15	100
C-3	4	28.6	2	14.3	3	21.4	4	28.6	0	0.0	1	7.1	14	100
Total experimental group	26	32.50	21	26.25	19	23.75	6	7.50	6	7.50	2	2.50	80	100
Total control group	7	15.91	9	20.45	12	27.27	14	31.82	0	0.0	2	4.55	44	100
Grand Total	33	26.61	30	24.19	31	25.00	20	16.13	6	4.84	4	3.23	124	100

Rationale for the random assignment to classrooms was that conference program leaders wanted to insure that geographical and personal ties would not hinder participation in the conference program. William Tedrick, program leader of the 4-H youth program who made it possible to use these test subjects, was asked to select five specific classrooms for use in the experiment. After the selection, a table of random numbers was used to designate two of the classrooms as the control group and three as the experimental group. The two classrooms designated control group were sub-divided into three treatment groups referred to as C-1, C-2, and C-3. The remaining three classrooms, or the experimental group, were designated as treatment groups E-1, E-2, and E-3.

The video tape was "fed" to only E-1, E-2, and E-3 at 11:35 A.M., June 18, 1970, and the tests were administered to all the groups immediately following the televised presentation.

Test Instrument Construction

The tests used in this experiment were designed and pretested by Dr. Robert Schlater, Chairman of the Television and Radio Department of Michigan State University.

Three different multiple choice tests were used to test the subjects' recall of video and audio information presented in the experimental television message. All three tests contained fifteen questions relating to the television message and three demographic questions.

Electronic data processing score sheets were used with machine scoring pencils. The tests were designated A, B, and C.

Test A (Appendix II)

All fifteen questions eliciting recall of video and audio information contained in the television message were written/verbal descriptions of the information. This method is a traditional one for testing both visual and audio information in multiple channel messages. An example of a question from Test A was:

A Doric order base is distinguished by:

1. its having no base as such.
2. its simple, circular base.
3. its ornately sculptured base.
4. its simple, rectangular base.

Test A was administered to groups E-1 and C-1.

Test B (Appendix III)

Nine of the fifteen questions in Test B were designed to elicit visual recall from the video portion of the televised message. These questions required the correct identification of pictures or drawings which were used in the television lesson. For example:

Which of the following pictures is a Doric order base?

(Immediately below this question were four photographs of different bases including one used in the television message of a Doric order base.)

Six of the questions were designed to elicit recall of verbal information presented in the audio channel of the television message. These questions were written/verbal descriptions of the information.

An example of a written/verbal question in Test B is:

The Greeks sometimes derived the design for the top elements of their columns . . .

1. from nature.
2. from mythology.
3. from earlier cultures.
4. from religious symbols.

Test B was administered to groups E-2 and C-2.

Test C (Appendix IV)

This test was exactly the same as Test B except that the pictures and drawings in the questions were one-quarter the size of those in Test B. Groups E-3 and C-3 were administered this test.

A table of random numbers was used to determine the order in which the questions appeared on the tests. This mixed the visual and written/verbal questions together in no particular order. To assign an order to the correct answer and the foils of the multiple choice, a table of random numbers was again employed.

The cover on the test booklet gave instructions for the use of the test booklet, the answer sheet, and the machine scoring pencil.

Message Presentation

Five classrooms in Bessey Hall (Michigan State University) were used for the experiment. The video taped message was "fed" from Closed Circuit Television's master control room to three of the rooms. It was received on television sets located in the three rooms containing the experimental group. The three experiment administrators gave groups E-1, E-2, and E-3 brief instructions before the tape was played. The subjects were asked to view the tape as though they were seeing it in their own school as part of their curriculum. The subjects were told by the administrators that there would be a test following the televised message and the test would pertain to facts covered in the television lesson they were about to see. The televised message started promptly at 11:35 A.M. and concluded at 11:40:30 A.M. There were no technical problems during the play back.

Test Administration

The testing started immediately following the televised lesson. Even though only three groups (E-1, E-2, and E-3) viewed the televised presentation, all groups took their tests at the same time.

Test administrators passed the test booklets, answer sheets, and scoring pencils and then read aloud the instructions from the test booklet. After this was completed, the test administrators asked for questions and when they were

answered the groups were told to proceed with the test. There was no time limit stated for finishing the tests and all groups had handed in their completed answer sheets by 11:50 A.M.

CHAPTER III

FINDINGS

The experiment reported here compared the relative effectiveness of traditional written/verbal tests with visual (picture) tests as a way of measuring learning after a visual message was presented via television.

A total of 124 subjects participated in the experiment. In order to demonstrate that the televised lesson had an effect, the subjects were separated into a control group--44 subjects who were not exposed to the televised lesson--and an experimental group--80 subjects who did view the televised lesson. However, all 124 subjects were tested immediately following the televised lesson.

The control group and experimental group were each further divided into three treatment groups. The three experimental tests were designated Tests A, B, and C.

The experimental treatment groups were each assigned one of the three tests. The experimental treatment groups, the number of subjects in each treatment group, and the test administered to each group is as follows:

E-1	26 subjects	Test A
E-2	27 subjects	Test B
E-3	27 subjects	Test C

The three control treatment groups were also each assigned one of the three experimental tests. The following is the list of these treatment groups, the number of subjects in each group, and the test administered to each group:

C-1	15 subjects	Test A
C-2	15 subjects	Test B
C-3	14 subjects	Test C

Test A had a total of fifteen questions relating to the televised lesson. All of the questions were written/verbal and covered the entire content of the lesson, whether the information had been presented via the audio channel or the video channel. There were six questions covering material presented via the audio channel and nine questions covering material presented via the video channel.

Test B contained fifteen questions pertaining to the televised lesson. This test used a combination of written/verbal questions and picture questions to cover the content of the televised lesson. Six of the questions were written/verbal and covered the material presented via the audio channel in the televised lesson. The remaining nine questions were picture questions. That is, they used photographs and drawings as the major part of each question. The nine picture questions covered the information that had been presented via the video channel in the televised lesson.

Test C was exactly the same as Test B except for the size of the photographs and drawings in the picture questions. These pictures in Test C were one-quarter the size of those used in Test B.

Two scores were obtained from each test and thus two mean scores from each group. The score of the entire fifteen questions for each of the three tests was designated "test total." The score of the nine picture questions in Test B and in Test C covering video information and also the nine written/verbal questions in Test A covering video information, were each designated "visual total."

The "test total" means of the control and experimental groups were compared using analysis of variance. The difference between the two group means was significant at the .0001 level. These means are shown in Table 4.

The "visual total" means of the control and experimental groups were also compared using analysis of variance. The difference between the means of these two groups was significant at the .0001 level of confidence. The means of these groups are shown in Table 4.

Table 4. Group Means .

	Test Total	Visual Total
Experimental Group	9.88	6.14
Control Group	5.07	2.96

It can be concluded from these findings, then, that the televised lesson increased the subjects knowledge of Greek

temple architecture. However, the question this paper explores is whether a visual testing technique measures learning more effectively than a written/verbal technique.

Test Total

The data here were obtained using the "test total" means for all treatment groups. The group means are shown in Table 5. The test of these means by analysis of variance was not significant at a level of .05. The interaction between the three test treatments for the experimental and control groups was also tested, again using analysis of variance. The result of this was not significant at a level of .05. It can be concluded, then, that neither of the combination written/verbal and picture tests (B and C) measured learning more effectively than the written/verbal test (A). It can also be concluded that neither Test B nor Test C measured learning more effectively than the other.

Table 5. Treatment group means for "Test Total."

Treatment Group	Mean Score
E-1	9.54
E-2	10.56
E-3	9.52
C-1	5.13
C-2	5.00
C-3	5.07

Visual Total

These data were obtained using the "visual total" means of all of the treatment groups. The group means are shown in Table 6. These means were tested by analysis of variance and this test showed no significant difference at a level of .05. The interaction between the three test treatments for the experimental and the control groups was also tested by analysis of variance. The result of this test was not significant at a level of .05. The conclusion can be made that neither of the visual tests (picture questions on Tests B and C) measured learning more effectively than the written/verbal test (i.e., questions on Test A covering information contained in the video channel). It can also be concluded that neither of the visual tests measured learning more effectively than the other.

Table 6. Treatment group means for "Visual Total."

Treatment Group	Mean Score
E-1	5.46
E-2	6.89
E-3	6.04
C-1	3.27
C-2	3.73
C-3	2.86

Test Reliability

In order to test the reliability of the three tests, an item analysis was done.

The means used in this analysis were the "test total" means of the three experimental groups. Along with the item analysis, a number of item statistics were also reported. (Table 7.)

Table 7. Item statistics used to determine test reliability.

Test	A	B	C
Standard Deviation	3.44	3.33	3.57
Variance	11.86	11.10	12.72
Mean Item Difficulty	37	30	37
Mean Item Discrimination	56	52	59
Mean Point Biserial Correlation	47	50	49
Test Reliability, estimated by the Kuder-Richardson Formula Number 20	.7747	.7961	.7957
Standard Error of Measurement	1.6326	1.5035	1.6136

It can be concluded from these data that all three tests were reliable instruments since each of the item statistics fell in the area normally considered acceptable.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

This study was designed to investigate the relative effectiveness of written/verbal and visual (or picture) tests in measuring learning obtained from a visual presentation via television. The televised lesson for this study was recorded on two inch video tape and transmitted to television sets which were viewed by subjects in three classrooms. The subjects in these three classrooms, plus the subjects in two other classrooms who did not see the televised lesson, were each given one of three experimental tests. The subjects were randomly assigned to classrooms, groups, and treatment groups.

Summary

One hundred twenty-four subjects took part in this experiment. By random selection these subjects were assigned to five classrooms. Using a table of random numbers, three of the five classrooms were designated the experimental group and two classrooms the control group. Again using a table of random numbers, each of the three classrooms making up the experimental group was assigned one of the three tests.

By random selection the students in the remaining two classrooms, i.e., the control group, were divided as equally as possible and each subject assigned one of the three tests.

A five minute-thirty second television lesson was recorded using a script about Greek temple architecture.

The video channel for this presentation was entirely still pictures and drawings of Greek temple architecture. The audio channel was an off-camera voice and coincided with the visuals in the video channel. Information in the lesson dealing with the architectural styles of the columns was not presented in the audio channel. Two pictures of the capital and base of the columns for each of the three styles were shown and the name of each style was superimposed over the picture. This televised lesson was transmitted via closed circuit lines to television sets in the three classrooms designated as the experimental group. At the conclusion of the televised lesson, the appropriate tests were distributed to all 124 subjects. The instructions on the tests were read aloud by the test administrators and after asking for questions the subjects were told to begin the tests. The three multiple choice tests were designated Tests A, B, and C.

Test A had a total of fifteen questions relating to the televised lesson. All of the questions were the written/verbal type and covered the entire content of the televised lesson whether the information had been presented via the audio channel or the video channel.

There were six questions covering material presented via the audio channel and nine questions covering material presented via the video channel.

Test B contained fifteen questions pertaining to the televised lesson. This test used a combination of written/verbal questions and picture questions to cover the content of the televised lesson. Six of the questions were the written/verbal type and covered the material presented via the audio channel. The remaining nine questions were picture questions. That is, they employed photographs and drawings as the major part of the question. The nine picture questions covered the information that had been presented via the video channel in the televised lesson.

Test C was exactly the same as Test B except for the size of the photographs and drawings in the picture questions. These visuals in Test C were one-quarter the size of those used in Test B.

Electronic data processing answer sheets were used with the subjects indicating the correct answers with machine scoring pencils. Two scores were obtained from each test. The first, labeled "total test," was the total correct answers from all fifteen questions. The second score obtained was labeled "visual total." This was the total correct answers from the nine written/verbal questions in Test A covering information contained in the video channel of the televised lesson and from the nine picture questions in both Test B

and Test C. Having two scores for each test also produced two mean scores for the control group and the experimental group as well as two mean scores for each of the six treatment groups.

The "test total" means of the control group and the experimental group were compared by analysis of variance and were shown to be significantly different.

The "visual total" means of the control group and the experimental group were also compared by analysis of variance. The difference between these two means were again shown to be significantly different. This meant, then, the televised lesson had increased the subjects knowledge of Greek temple architecture.

The "test total" means for all of the treatment groups were compared using analysis of variance as was the interaction between the control group, the experimental group, and the three treatments or tests. The direction of the means pointed favorably toward Test B (the large picture test) but statistically there was no significant difference.

Analysis of variance was again employed to compare the "visual total" means of the six treatment groups and to look at the interaction between the control group, the experimental group, and the three treatments. The direction of the means went favorably toward Tests B and C (the picture tests) but statistically showed no significant difference.

An item analysis was done on each of the treatment groups and none of the data obtained indicated any lack of reliability for any of the three tests.

Conclusions

The following conclusions can be drawn from the data reported:

1. The televised lesson significantly increased the subjects knowledge of Greek temple architecture.

2. The picture questions in the two visual tests did not significantly measure learning more effectively than the corresponding written/verbal questions in the written/verbal test. However, although not statistically significant, the means showed a definite direction favoring both of the picture tests.

The individual scores for all the experimental treatment groups tended to bunch at the top, i.e., the scores were high. This could have been caused primarily by three things:

First, the tests may have been too easy. However, the item statistics, obtained with the item analysis to judge the reliability of the tests, do not indicate this. (Table 7.)

The second reason could be what is known as a "ceiling effect." That is, the number of questions stopped too soon. There weren't enough of them. Had there been more questions the scores might have spread out more and perhaps the differences between the means would have been more significant.

The third factor that might have influenced the high scores was the time factor. The tests were administered immediately following the televised lesson. In the normal classroom, visual information is usually presented to the student and then a written/verbal test is given later. This can be a day, a week, a month or a term later. It may be that a greater length of time might lower test scores when a student is tested in a written/verbal manner on information he has been presented earlier in a visual manner.

Another importance of visual testing, indicated by the research review, may be to reinforce learning. In other words, the presentation of material is the first step in the teaching/learning process and testing is the second step. The data in this study, however, are not sufficient to indicate the validity of that thesis.

3. The three experimental tests used in this study were reliable instruments. The tests, then, could be used with confidence in further studies. However, some of the questions might be replaced with more difficult ones. A further study might involve a longer presentation as well as a longer test.

The mean score for the large picture test was 9.45 per cent higher than the small picture test mean and 15.89 per cent higher than the written/verbal test mean. The mean score for the small picture test was only 6.44 per cent higher than that of the written/verbal test. These differences are

interesting but are not statistically significant and do not lend themselves to any meaningful interpretation.

Implications For Further Research

This study attempted to show a significant difference in the relative effectiveness of visual testing and written/verbal testing, after visual information had been presented via television.

Further research is needed in the area of visual testing. Of particular interest would be the study of the time variable. Research is needed to determine if the differences found in this study would increase, decrease, or stay the same as the interval between presentation and testing lengthened. Visual testing may be most effective as a reinforcement to learning as the length of time between presentation and testing grows.

The subject matter for the televised lesson was chosen with the probability that subjects were unfamiliar with it. Experimentation with different topics needs to be done in order to determine what content areas adapt themselves best to visual testing.

The subjects used in this study were white high school students affiliated with 4-H. Other racial groups from an urban setting are natural subjects for future research. Visual instruction has proved to be an effective tool in culturally deprived areas. Perhaps this is also where visual

testing can be most effective. Other age groups, both younger and older, should also be used as subjects.

Longer tests, longer presentations, more difficult tests, more subjects per experiment, and the addition of color should all be studied.

The amount of visual content in instruction continues to grow. People are bombarded with visual imagery everywhere: in the school, on the highway, and at home. They are "tuned in" on a visual world. It seems natural, then, that exploration into the effectiveness of visual testing should become an important and permanent part of educational research.

LIST OF REFERENCES

Adams, Georgia Sachs. Measure and Evaluation in Education, Psychology, and Guidance. New York: Holt, Rinehart, and Winston, 1964.

Ahmann, J. Stanley, Glock, Marvin D., and Wardeber, Helen. Evaluating Elementary School Pupils. Boston: Allyn and Bacon Inc., 1960.

Carpenter, C. R. and Greenhill, L. P. An Investigation of Closed Circuit Television for Teaching University Courses. Instructional Television Project Report Number 2. University Park, Pennsylvania: Pennsylvania State University, 1959.

Chauncey, Henry and Dobbin, John E. Testing: Its Place in Education Today. New York: Harper and Row, 1965.

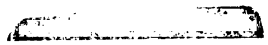
Deutschmann, Paul J., Barrow, Lionel C., Jr., and McMillan, Anita. "The Efficiency of Different Modes of Communication," AV Communication Review, IX (November-December, 1961), 262-270.

_____. "The Efficiency of Different Modes of Communication," AV Communication Review, X (May-June, 1962), 176-178.

Elliott, F. R. "Memory for Visual, Auditory and Visual-Auditory Material," Archives of Psychology, 29:199, 1936.

Haber, Ralph Norman. "How We Remember What We See," Scientific American, CCXXII (May, 1970), 104-112.

Hartman, Frank R. "Investigations of Recognition Learning Under Multiple Channel Presentations and Testing Conditions," Research on the Communication Process. University Park, Pennsylvania: Pennsylvania State University, 1960.



Hartman, Frank R. "A Review of Research on Learning from Single and Multiple Channel Communications and a Proposed Model with Generalizations and Implications for Television Communications," Research on the Communication Process. University Park, Pennsylvania: Pennsylvania State University, 1960.

_____. "Single and Multiple Channel Communication: A Review of Research and a Proposed Model," AV Communication Review, IX (November-December, 1961), 235-261.

Hoban, Charles F. "Critique on the Methodology of Research." Paper presented at the U. S. Office of Education Conference on Research in New Media, Washington, D. C., October 21-27, 1958.

Holmes, Presley D., Jr. "Television Research in the Teaching-Learning Process." Unpublished Doctoral dissertation, Wayne State University, 1959.

Jaspen, Nathan. Effects on Training of Experimental Film Variables: Study I, Verbalization, Rate of Development, Nomenclature, Errors, "How it Works," Repetition. Technical Report SDC 269-7-17, Special Devices Center, Office of Naval Research, Port Washington, New York, 1950.

Kerlinger, Fred N. Foundations of Behavioral Research. New York: Holt, Rinehart, and Winston, Inc., 1964.

Klapper, Hope L. Closed-Circuit Television as a Medium of Instruction at New York University. New York: New York University, 1958.

Lindquist, E. F. Preliminary Considerations in Objective Test Construction. "Educational Measurement"; Washington, D. C.: American Council on Education, 1951.

Reed, H. J. "The Influence of a Change of Conditions Upon the Amount Recalled," Journal of Experimental Psychology, XIV (1931), 632-649.

Rock, R. T., Jr., Duva, J. S., and Murray, J. E. Training by Television: The Comparative Effectiveness of Instruction by Television, Television Recordings, and Conventional Classroom Procedures. Technical Report 476-02-2, Special Devices Center, Office of Naval Research, Port Washington, N. Y., 1951.

Roshal, S. M. Effects of Learner Representation in Film-Mediated Perceptual-Learning. Technical Report SDC 269-7-5, Instructional Film Research Program. University Park, Pennsylvania: Pennsylvania State University, 1949.

Schlater, Robert W. "Effect of Speed of Presentation and Irrelevant Cues on Recall of Television Messages." Unpublished Doctoral dissertation, Michigan State University, 1966.

Schramm, Wilbur, Lyle, Jack, and Pool, Ithiel de Sola. The People Look at Educational Television. Stanford: Stanford University Press, 1963.

Travers, Robert M. W. (ed.). Research and Theory Related to Audiovisual Information Transmission. Salt Lake City, Utah: University of Utah Bureau of Educational Research, 1964.

Vernon, M. D. "Perception and Understanding of Instructional Television Programmes," British Journal of Psychology, XLIV (1953), 116-126.

APPENDIX I

NUMBER OF SLIDE	VIDEO (ALL SLIDES)	AUDIO	TIME
		NO AUDIO FOR 5 SECONDS	
1.	"SET A TRAP TO CATCH A GOD"	NARRATOR: Set a trap to catch and keep a god. That was the basic intention of the early Greek temple.	0.05
2.	"GREEK TEMPLE ARCHITECTURE"	Greek gods and goddesses who roamed and ruled the universe had virtues and they had faults.	
3.	L. S. TEMPLE	One of the greatest faults was that they were not always attentive to their worshippers. It was therefore necessary to attract the gods to places of beauty if one were to get their attention.	
		Such was the reasoning of the ancient Greeks whose temples provide a visual history of another age.	0:30
4.	M. S. TEMPLE ON HILL	Surviving Greek temples, many of them built between 500 B. C. and 300 B. C. are	

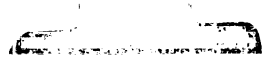
NUMBER OF SLIDE	VIDEO (ALL SLIDES)	AUDIO	TIME
		monuments to one of the great periods of architecture.	0:39
		Wars and other disasters took their toll over the centuries so that today only portions of these classical buildings remain.	0:48
5.	C. U. TEMPLE	In the bright, Grecian sunlight, the remnants of the temples remind tourists and scholars of a highly sophisticated civilization.	0:57
		The ancient Greeks developed different styles or "orders" of architecture for their temples but the basic plan was similar for all.	1:00
6.	FLOOR PLAN	In the typical floor plans, shown here, thick lines are walls, the circles are columns, and the fine lines indicate steps.	1:09
7.	FLOOR PLAN	The principal room contained a statue of the god or goddess for whom the temple was	1:18

NUMBER OF SLIDE	VIDEO (ALL SLIDES)	AUDIO	TIME
		built; other rooms provided accessory space for treasure.	1:27
8.	TEMPLE SHOWING ROOF AND COLUMNS	All of the temples were designed to employ what is called post-lintel construction.	1:30 1:39
		In other words, uprights or columns were placed on a base and beams were placed horizontally across the uprights.	1:48
9.	DRAWING SHOWING ROOF AND COLUMNS	Over the beams, a low-pitched roof was constructed similar to those found in many houses today.	1:57
10.	L. S. DORIC COLUMN	The ancient Greeks developed three differ-	
11.	L. S. IONIC COLUMN	ent styles or "orders" of architecture which	
12.	L. S. CORINTHIAN COLUMN	differed primarily in the appearance of the columns.	2:10
13.	C. U. DORIC CAPITAL W/SUPER	The top element of the column is called the capital	2:19

NUMBER OF SLIDE	VIDEO (ALL SLIDES)	AUDIO	TIME
14.	C. U. DORIC CAPITAL W/SUPER	One of the main differences among the three orders was in the design of the capitals;	
15.	C. U. IONIC CAPITAL W/SUPER		2:28
16.	C. U. IONIC CAPITAL W/SUPER		
17.	C. U. CORINTHIAN CAPITAL W/SUPER		2:57
18.	C. U. CORINTHIAN CAPITAL W/SUPER		3:18
		The Greeks probably used designs from nature in developing the patterns for the capitals of the different orders.	3:27
		In addition to the capital, the	3:30
19.	C. U. DORIC BASE W/SUPER	the three orders also differed in the design of the base of the column.	3:39
20.	C. U. DORIC BASE W/SUPER		
21.	C. U. IONIC BASE W/SUPER		4:00

NUMBER OF SLIDE	VIDEO (ALL SLIDES)	AUDIO	TIME
22.	C. U. IONIC BASE W/SUPER		
23.	C. U. CORINTHIAN BASE W/SUPER		4:27
24.	C. U. CORINTHIAN BASE W/SUPER	This order was not as widely used by the Greeks for their temples as were the other two orders.	4:48 4:57
25.	C. U. ROW OF COLUMNS	In this brief examination	5:00
26.	C. U. TEMPLE	that a talented group of architects lived in Greece many centuries ago. The massive	
27.	M. L. S. TEMPLE	columns of the temples, contrasted with the intricate, fine sculpturing, attest to their	
28.	L. S. TEMPLE	skill and artistry.	
29.	X. L. S. TEMPLE	It is a fitting tribute that many buildings are constructed today which use architectural features copied from classical Greek temples.	5:30
	FADE TO BLACK		

APPENDIX II



TEST A

PLEASE READ THE FOLLOWING INSTRUCTIONS

1. You should have on your desk a test booklet, an answer sheet, and a special pencil. Record all your answers on the answer sheet with the special pencil. Do not write in the test booklet.

2. Item No. 1 on the answer sheet is followed by 5 spaces from 1 through 5. Carefully blacken with your pencil one of the spaces as your answer. Do not mark more than one response to each question. Be certain to erase completely if you change an answer.

3. There are 18 items to answer.

1. Greek temples were designed to employ what is called

   1. hammer-beam roof construction
   2. tie-beam roof construction
   3. stone and vault construction
   4. post and lintel construction

2. The basic intention of the Greek temple was

   1. to attract a god to a place of beauty in order to get his attention
   2. to serve as centers for classical Greek religious services
   3. to stimulate artistic and cultural talents of Greek architects
   4. to provide places of beauty where Greek scholars could contemplate

3. A Corinthian order capital is distinguished by

   1. its ornate sculpture of acanthus leaves
   2. its simple and solid appearing sculpture
   3. its spiral or scroll-like formation
   4. its ornate sculpture of gods

4. The most common plan for Greek temples was

   1. a square room surrounded by vertical columns on four sides
   2. a circular room with columns on all sides
   3. a triangular room with columns on all sides
   4. a rectangular room surrounded by vertical columns on four sides

5. Greek temples were usually built

   1. at the base of a hill
   2. in the center of town
   3. on top of a hill
   4. in a protected valley

6. A Doric order base is distinguished by

   1. its having no base as such
   2. its simple, circular base
   3. its ornately sculptured base
   4. its simple, rectangular base

7. An Ionic order base is distinguished by

   1. its having no base as such
   2. its simple, circular base
   3. its ornately sculptured base
   4. its simple, rectangular base

8. The Greeks sometimes derived the design for the top elements of their columns

1. from nature
2. from mythology
3. from earlier cultures
4. from religious symbols

9. An Ionic order capital is distinguished by

1. its ornate sculpture of acanthus leaves
2. its simple and solid sculpture
3. its spiral or scroll-like formation
4. its ornate sculpture of gods

10. Corinthian order columns were

1. used in about half the surviving Greek temples
2. used in a great many Greek temples
3. used less by the Greeks than the other orders
4. not used by the Greeks

11. Greek temples were built with

1. flat roofs
2. dome roofs
3. no roofs
4. triangular roofs

12. The principal room of Greek temples contained

1. treasure collected for a god
2. seating for worshippers
3. a statue of a god or goddess
4. open walkways for worshippers

13. The Corinthian order base is distinguished by

1. its having no base as such
2. its simple, circular base
3. its ornately sculptured base
4. its simple, rectangular base

14. Many of the surviving Greek temples were built between

1. 300 A.D. and 400 A.D.
2. 700 A.D. and 900 A.D.
3. 500 B.C. and 300 B.C.
4. 900 B.C. and 700 B.C.

15. A Doric order capital is distinguished by

    1. its ornate sculpture of acanthus leaves
    2. Its simple and solid sculpture
    3. its spiral or scroll-like formation
    4. its ornate sculpture of gods

---

16. Have you ever studied Greek architecture in a course in high school or college?

    1. Yes
    2. No

17. What is your sex?

    1. Male
    2. Female

18. What is your class?

    1. Freshman
    2. Sophomore
    3. Junior
    4. Senior

APPENDIX III

TEST B

PLEASE READ THE FOLLOWING INSTRUCTIONS

1. You should have on your desk a test booklet, an answer sheet, and a special pencil. Record all your answers on the answer sheet with the special pencil. Do not write in the test booklet.

2. Item No. 1 on the answer sheet is followed by 5 spaces from 1 through 5. Carefully blacken with your pencil one of the spaces as your answer. Do not mark more than one response to each question. Be certain to erase completely if you change an answer.

3. There are 18 items to answer.

1. Greek temples were designed to employ what is called

    1. hammer-beam roof construction
    2. tie-beam roof construction
    3. stone and vault construction
    4. post and lintel construction

2. The basic intention of the Greek temple was

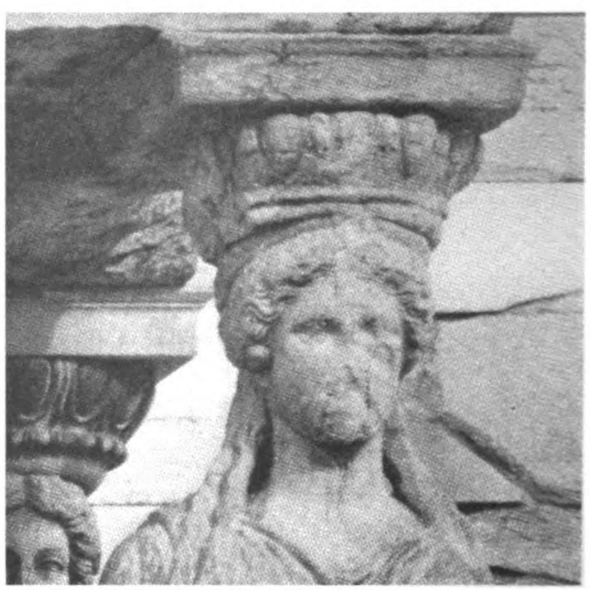
    1. to attract a god to a place of beauty in order to get his attention
    2. to serve as centers for classical Greek religious services
    3. to stimulate artistic and cultural talents of Greek architects
    4. to provide places of beauty where Greek scholars could contemplate

3. Which of the following pictures is a Corinthian order capital?

1

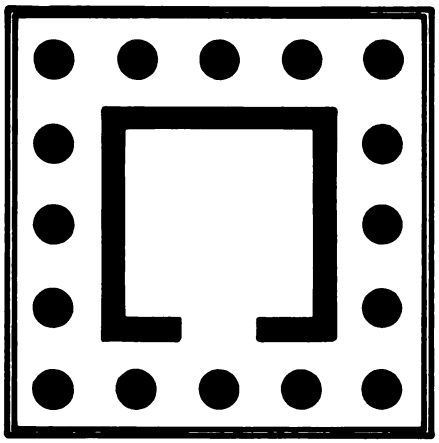
2

3

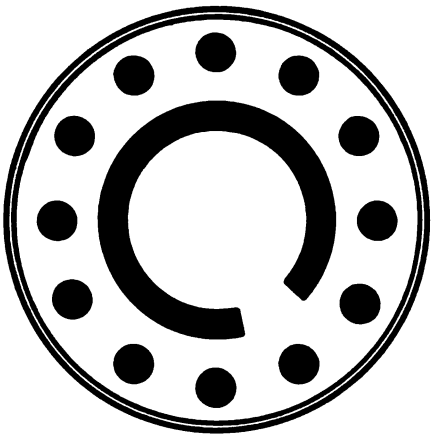


4

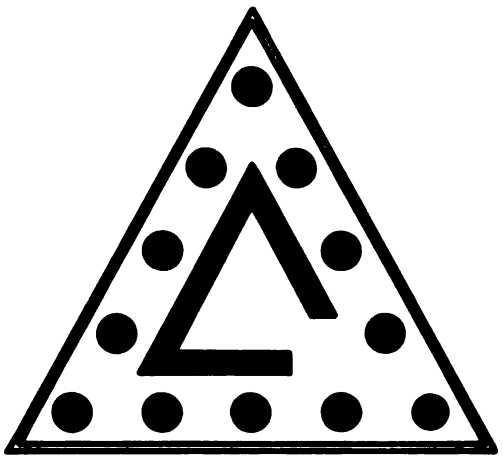
4. Which of the following pictures illustrates the most common plan of Greek temples?



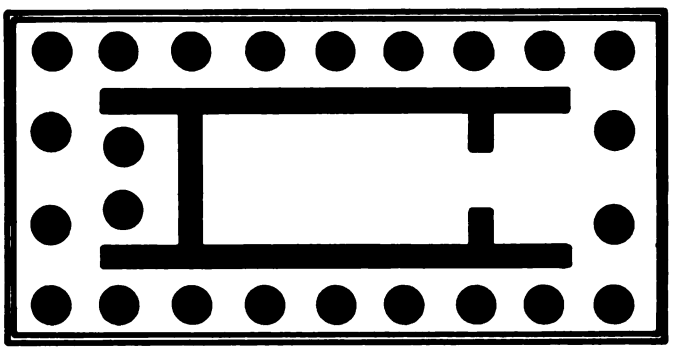
1



2



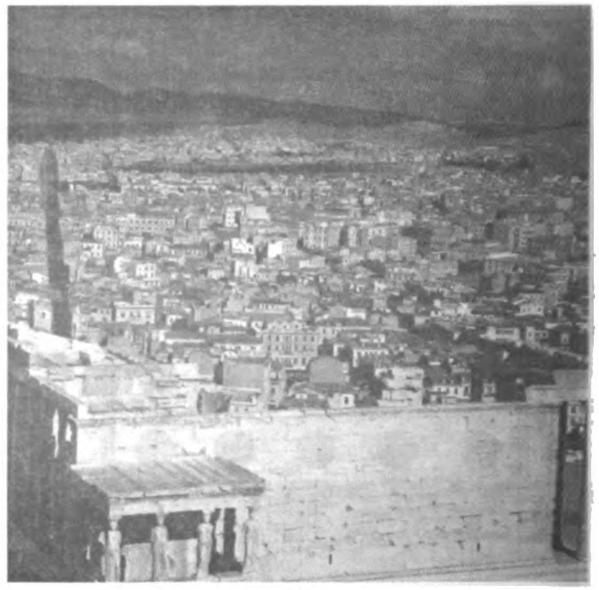
3



4

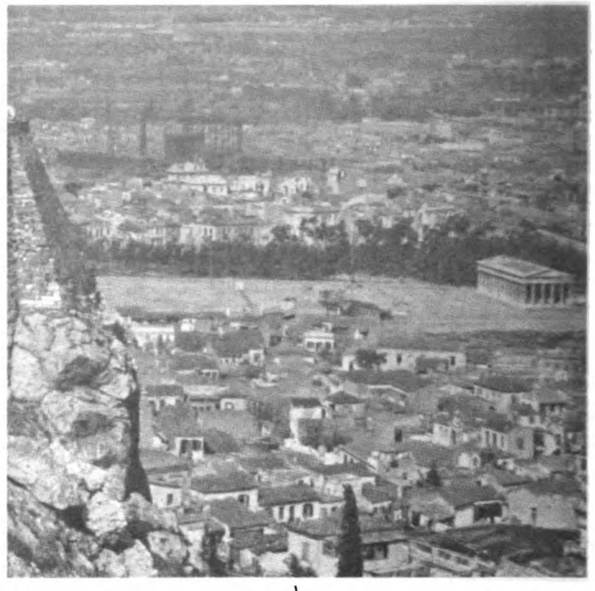
5. Which of the following pictures best illustrates where Greek temples were usually built?

1



2

3

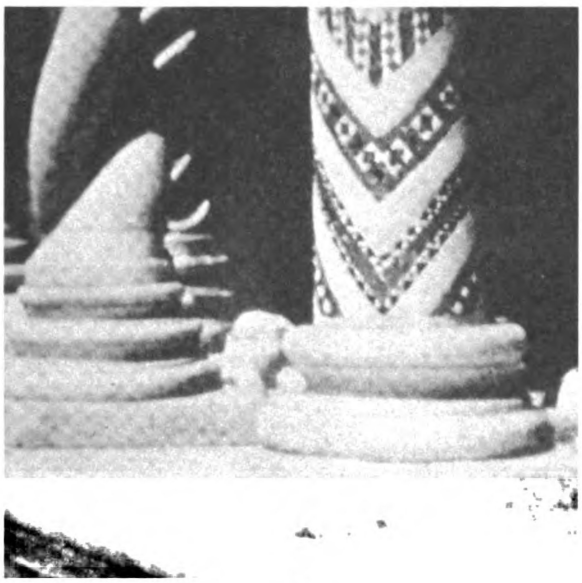


4

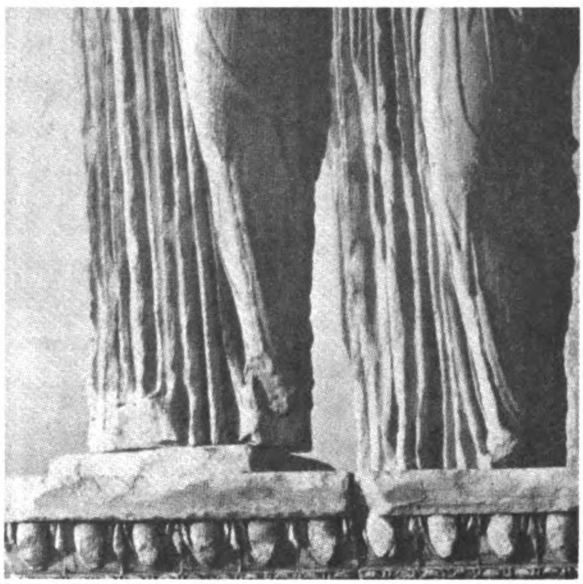
6. Which of the following pictures is a Doric order base?

1

2



3

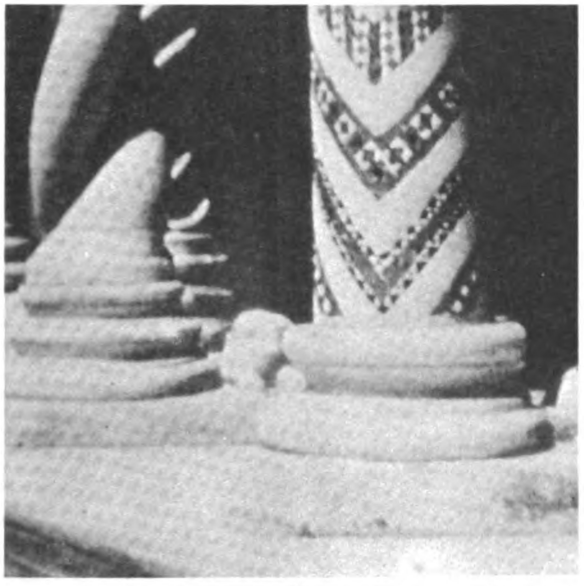


4

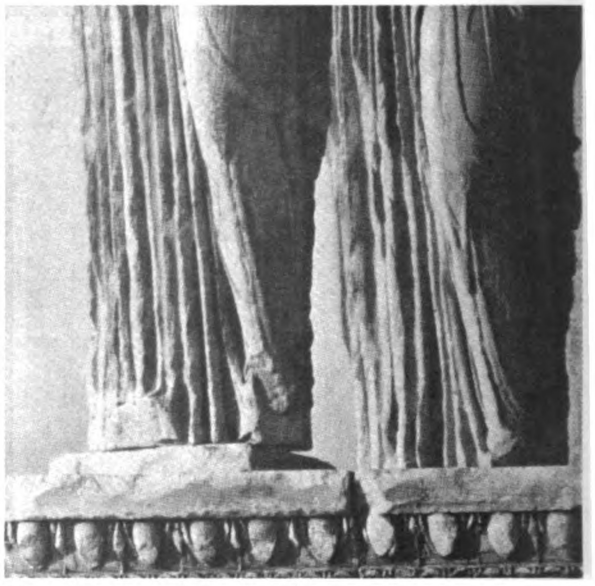
7. Which of the following pictures is an Ionic order base?

1

2



3



4

8. The Greeks sometimes derived the design for the top elements of their columns

   1. from nature
   2. from mythology
   3. from earlier cultures
   4. from religious symbols

9. Which of the following pictures is an Ionic order capital?

1

2

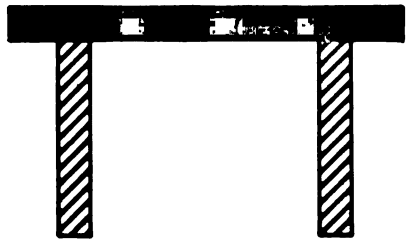
3

4

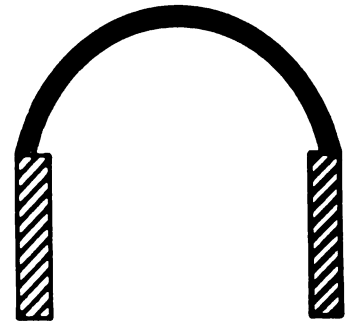
10. Corinthian order columns were

1. used in about half the surviving Greek temples
2. used in a great many Greek temples
3. used less by the Greeks than the other orders
4. not used by the Greeks

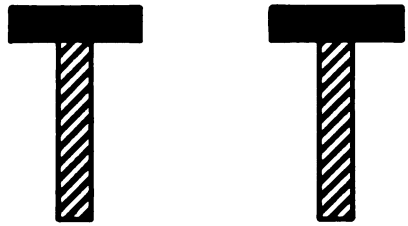
11. Which of the following pictures illustrates the roofs of Greek temples?



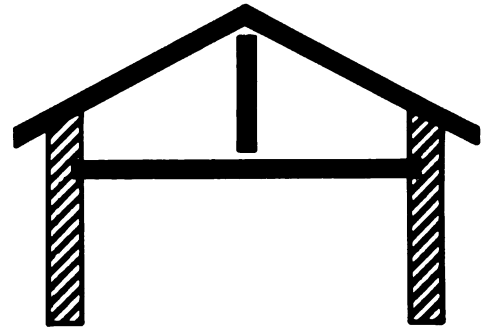
1



2



3



4

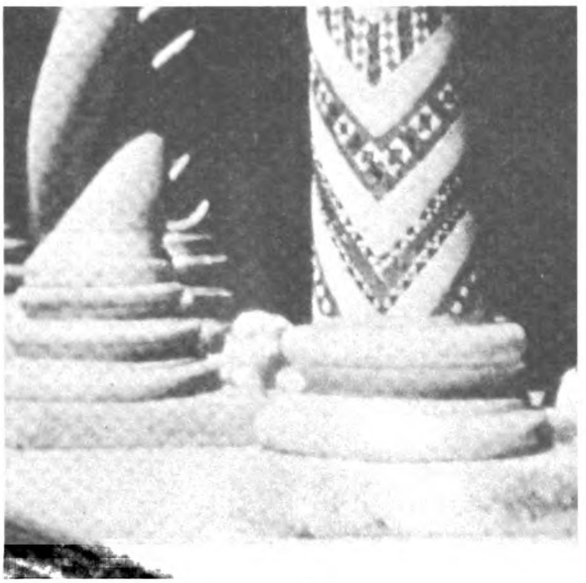
12. The principal room of Greek temples contained

1. treasure collected for a god
2. seating for worshippers
3. a statue of a god or goddess
4. open walkways for worshippers

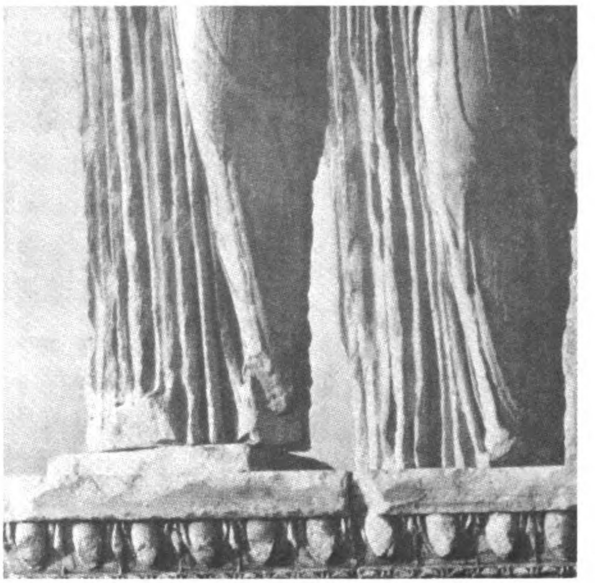
13. Which of the following pictures is a Corinthian order base?

1

2



3



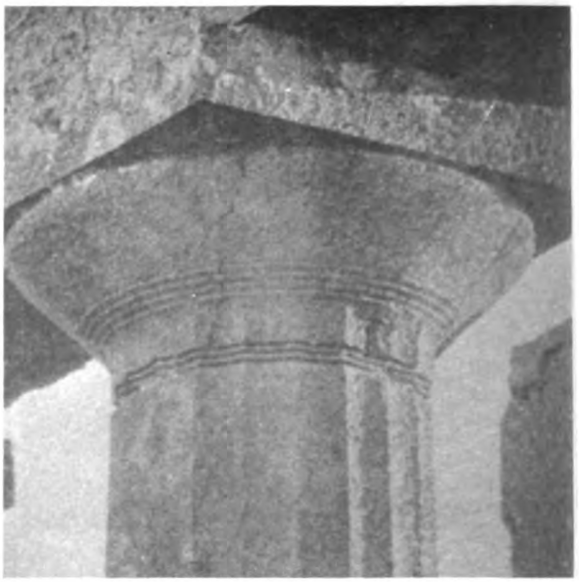
4

14. Many of the surviving Greek temples were built between

1. 300 A.D. and 500 A.D.
2. 700 A.D. and 900 A.D.
3. 500 B.C. and 300 B.C.
4. 900 B.C. and 700 B.C.

15. Which of the following pictures is a Doric order capital?

1



2

3

4

16. Have you ever studied Greek architecture in a course in high school or college?

    1. Yes
    2. No

17. What is your sex?

    1. Male
    2. Female

18. What is your class?

    1. Freshman
    2. Sophomore
    3. Junior
    4. Senior

APPENDIX IV

TEST C

PLEASE READ THE FOLLOWING INSTRUCTIONS

1. You should have on your desk a test booklet, an answer sheet, and a special pencil. Record all your answers on the answer sheet with the special pencil. Do not write in the test booklet.

2. Item No. 1 on the answer sheet is followed by 5 spaces from 1 through 5. Carefully blacken with your pencil one of the spaces as your answer. Do not mark more than one response to each question. Be certain to erase completely if you change an answer.

3. There are 18 items to answer.

1. Greek temples were designed to employ what is called

   1. hammer-beam roof construction
   2. tie-beam roof construction
   3. stone and vault construction
   4. post and lintel construction

2. The basic intention of the Greek temple was

   1. to attract a god to a place of beauty in order to get his attention
   2. to serve as centers for classical Greek religious services
   3. to stimulate artistic and cultural talents of Greek architects
   4. to provide places of beauty where Greek scholars could contemplate

3. Which of the following pictures is a Corinthian order capital?

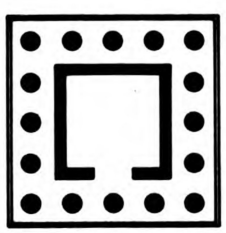
1

2

3

4

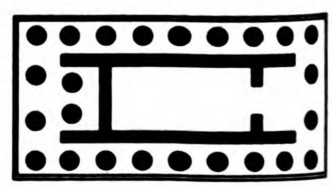
4. Which of the following pictures illustrates the most common plan of Greek temples?



1

2

3



4

5. Which of the following pictures best illustrates where Greek temples were usually built?

1

2

3

4

6. Which of the following pictures is a Doric order base?

1

2

3

4

7. Which of the following pictures is an Ionic order base?

1

2

3

4

8. The Greeks sometimes derived the design for the top elements of their columns

   1. from nature
   2. from mythology
   3. from earlier cultures
   4. from religious symbols

9. Which of the following pictures is an Ionic order capital?

1

2

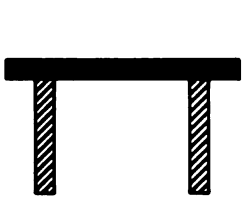
3

4

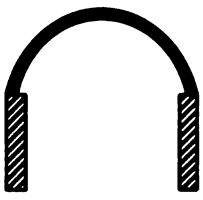
10. Corinthian order columns were

    1. used in about half the surviving Greek temples
    2. used in a great many Greek temples
    3. used less by the Greeks than the other orders
    4. not used by the Greeks

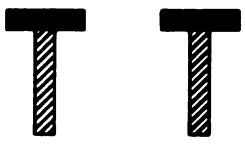
11. Which of the following pictures illustrates the roofs of Greek temples?



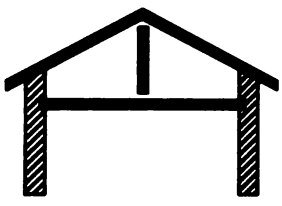
1



2



3



4

12. The principal room of Greek temples contained

    1. treasure collected for a god
    2. seating for worshippers
    3. a statue of a god or goddess
    4. open walkways for worshippers

13. Which of the following pictures is a Corinthian order base?

1

2

3

4

14. Many of the surviving Greek temples were built between

1. 300 A.D. and 500 A.D.
2. 700 A.D. and 900 A.D.
3. 500 B.C. and 300 B.C.
4. 900 B.C. and 700 B.C.

15. Which of the following pictures is a Doric order capital?

1

2

3

4

16. Have you ever studied Greek architecture in a course in high school or college?

    1. Yes
    2. No

17. What is your sex?

    1. Male
    2. Female

18. What is your class?

    1. Freshman
    2. Sophomore
    3. Junior
    4. Senior