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The "Education Through Vision" curriculum has undergone continuous evaluation and modification of the audiovisual instructional materials and classroom activities relevant to its objectives. Seventeen pilot "Education Through Vision" classes were conducted with junior high and high school students to identify variables upon which the curriculum has significant effect and to determine achievement levels in various areas of course content. Random halves of the total sample were measured before and after class participation to determine the effect of the curriculum on such cognitive variables as field dependence and originality. Data were analyzed separately by sex via multivariate and univariate analyses of covariance with verbal and mathematics ability scores as covariates. "Education Through Vision" classes did not exhibit significant gain over comparison classes on the nine cognitive variables studied. A specially constructed end-of-course achievement test was administered and item difficulty data examined for clues to the relative strengths and weaknesses of various curriculum areas. In general, student achievements was high in areas corresponding to stated curriculum objectives such as heightened awareness of light and color. Achievement was lower in unstressed areas such as color terminology and knowledge of the formal principles of design and balance. (LS)

FINAL REPORT

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U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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Donald A. Trismen

Educational Testing Service

Princeton, N. J.

March 1968

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.



U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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Allerdice High School, Pittsburgh, Pa.

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Melbourne High School, Melbourne, Fla.

Memphis Technical High School, Memphis, Tenn.

Milford High School, Milford, New Hampshire

Newton South High School, Newton Centre, Mass.

North High School, Worcester, Mass.

North Reading High School, North Reading, Mass.

South Mountain Junior High School, Allentown, Pa.

Winchester High School, Winchester, Mass.

## SUMMARY

This study was primarily an empirical search for criteria (and instruments which measure these criteria) corresponding to the stated aims of the Education Through Vision curriculum. It was carried out in eleven public schools which conducted pilot Education Through Vision classes during the 1966-1967 school year. Tests of field independence, expressional fluency, length estimation, originality, semantic redefinition, visualization, figural adaptive flexibility, semantic spontaneous flexibility, and ability to interpret metaphor were administered to experimental and comparison classes. On none of these variables did the Education Through Vision classes exhibit gain significantly greater than that of the comparison classes.

A second objective of the study was the identification of curricular strengths and weaknesses as an aid to further curriculum refinement. A specially constructed achievement test, presented by means of tape recording and slide projection, was administered. Item analysis data are presented and discussed with reference to particular curriculum units or exercises. In general, student achievement was found to be relatively high in areas corresponding closely to stated curriculum objectives.

# INTRODUCTION

The Education Through Vision curriculum, under the direction of Bartlett H. Hayes, Jr., has undergone a continuous process of development, tryout, and modification of its instructional materials and methods during the past several years. As a result of this evolutionary process, there existed at the start of the 1966-1967 school year a common core of audio-visual instructional materials and classroom activities. These materials and activities are described in detail in the Education Through Vision Syllabus.[1] In addition, there existed a group of public school teachers who had acquired experience in the use of these techniques and materials at one or more summer workshops conducted by Mr. Hayes. These teachers, representing eleven junior high and high schools in several eastern and southern states, conducted seventeen pilot Education Through Vision classes during the 1966-1967 school year. Although the content of these courses was shaped by the summer workshop experiences of the teachers and the body of methods and materials available in the Education Through Vision Syllabus, the individual versions of the course remained flexible with respect to selection of the material to be studied and order of presentation of this material.

Although the major activities of the curriculum are visually and tactually oriented, many of the intended outcomes are cognitive. These outcomes were hypothesized by the investigator to fall within, or possibly to cut across, the domains typically labeled as "creativity," "verbal ability," "originality," "analytic functioning," and "spatial ability." The following tentative hypotheses, listed in the Syllabus,[2] give the flavor of the curriculum objectives as expressed by its developers and participants:

1. The experience should develop in teachers, as well as in their students, visual acuity, greater awareness of and openness to the world simply because the studio problems cannot be attempted without each student making use of vision and all that it implies: observing, distinguishing, relating, selecting, judging, interpreting, analyzing, synthesizing.

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[1] Young, Laura N., and Hayes, Bartlett H. Jr. (Eds.), A Syllabus for the Research Program in Education Through Vision. Andover, Massachusetts: Phillips Academy, 1967.

[2] Ibid., p. 3

2. The experience can hold important implications for the educative process itself because the studio problems are focused on principles involved in the learning process rather than on the "products" resulting from that process.

3. The experience has potential for stimulating the imagination and areas of creativity of both students and teachers because the core of the course is the correlation of studio work with intellectual and emotional activities which motivate the normal human being.

This evaluation study, then, had as its primary purpose the identification of variables upon which the Education Through Vision curriculum had a significant effect. It was essentially an empirical search for criteria (and instruments which measure these criteria) corresponding to the stated aims of the curriculum. A secondary purpose of the study was the determination of achievement levels in various areas of course content. If it seems strange that this objective is relegated to secondary status, it should be emphasized that the classroom activities only superficially resemble those pursued in typical public school art courses. The heart of the curriculum lies in its intended cognitive outcomes.

It is important to realize that this evaluation study is essentially exploratory. It is intended to provide information regarding criteria appropriate for inclusion in subsequent research efforts. It is also intended to provide information to curriculum developers regarding relative strengths and weaknesses of the curriculum as it now exists. It is <u>not</u> intended as a final demonstration of the worth or value of the curriculum. There are several reasons for this. First, it has already been mentioned that the curriculum is still in the developmental stage, and that it is not offered in a single invariant form to all classes. Second, it was feasible to investigate only a limited set of possible criterion measures. Third, until appropriate criteria have been identified, it is difficult to define logical comparison groups. A true comparative evaluation is recommended only when the curriculum is stabilized, the appropriate criterion domains are agreed upon, and educational treatments purporting to have similar objectives are identified.

# METHODS

## I. TEST BATTERY

Two considerations were paramount in the selection of instruments administered in this study. First, and obviously, instruments were selected which measured abilities judged to be congruent with the stated objectives of the curriculum. Second, wherever possible, instruments were selected which had previously been described in the published psychological literature. Thus, the identification of any of the selected measures as promising avenues of further research would lead immediately to published reports of research in that area. Following is a brief description of each of the tests administered, and the variables they are intended to measure.[3]

Hidden Figures.

> The task is to decide which of five geometrical figures is embedded in a complex pattern. This test is a measure of the "flexibility of closure" factor, which is defined as the ability to keep one or more definite configurations in mind so as to make identification in spite of perceptual distractions. It is also a measure of "field-independence," described by Witkin in the following manner:
>
> > This ability /field-independence/, when developed, makes possible an analytical way of experiencing; inability to overcome a context results in a global way of experiencing. The dimension of individual differences with which we are dealing thus represents, at its extremes, contrasting ways of approaching a field, whether the field is immediately present or represented symbolically. It may therefore best be described as an analytical vs. global field approach.[4]
>
> Tests of this factor require the subject to search in a perceptual field containing irrelevant or distracting material in order to find one or more given configurations.

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[3] For a more complete description, see: French, John W., Ekstrom, Ruth B., and Price, Leighton A. Manual for Kit of Reference Tests for Cognitive Factors. Princeton: Educational Testing Service, 1963.

[4] Witkin, H. A., Dyk, R. B., Faterson, H. F., Goodenough, D. R., and Karp, S. A. Psychological Differentiation. New York: John Wiley and Sons, Inc., 1962, pp. 69-70.

Simile Interpretations.

Incomplete sentences of the form "A woman's beauty is like the autumn because ..." are presented. The task is to complete the sentences in as many ways as possible by giving different explanations for the simile.

This test is a measure of the "expressional fluency" factor, which is defined as the ability to think rapidly of appropriate wording for ideas. It concerns fluency in composing connected discourse as contrasted with fluency in producing single words. It also contrasts with Ideational Fluency in that the ideas are already given or are not central to the task.

Estimation of Length.

Each item consists of lines ½ to 1½ inches in length oriented in different directions. This is to be compared with a set of five pairs of companion lines at the center of the page. The test lines may be as long as or twice as long as the companion lines. This test is a measure of the "length estimation" factor, which is defined as the ability to judge and compare visually perceived distances on paper. Research has not progressed far enough to have explored the importance or generalizability of this factor; for example, the judgment of areas and volumes may not be factorially discriminable from the perception of distance. For the time being, Length Estimation should be considered to involve distance perception in two dimensions. Tests of this factor are likely to involve variance in proneness to optical illusions, but this may be a separate ability and will therefore be regarded as error in measuring Length Estimation.

Symbol Production.

The task is to produce symbols to represent given activities and objects. This test is a measure of the "originality" factor, which is defined as the ability to produce remotely associated, clever, or uncommon responses.

Object Synthesis.

The task is to name an object that could be made by combining two specified objects. This test is a measure of the "semantic redefinition" factor, which is defined as the ability to shift the function of an object or part of an object and use it in a new way. There is some evidence that there are "redefinition" factors in the figural and, perhaps, the symbolic areas as well as this one. "Hidden Figures" and "Camouflage" tests represent figural redefinition. This factor, on the other hand, offers unambiguous pictures or descriptions of

objects. The task is to break conventional sets about the objects and visualize new functions for them, an ability opposite to what has been called "functional fixedness."

Surface Development.

In this test, drawings are presented of solid forms that could be made with paper or sheet metal. With each drawing there is a diagram showing how a piece of paper might be cut and folded so as to make the solid form. Dotted lines show where the paper is folded. One part of the diagram is marked to correspond to a marked surface in the drawing. The subject is to indicate which lettered edges in the drawing correspond to numbered edges or dotted lines in the diagram.

The test is a measure of the "visualization" factor, which is defined as the ability to manipulate or transform the image of spatial patterns into other visual arrangements. Tests of this factor require the examinee to rotate, turn, fold, or invert the images of objects or parts of objects according to explicit directions and to make comparisons of the resulting manipulated images with drawings.

Match Problems II.

The task is to indicate up to four different sets of a specified number of lines, representing matches, which may be taken away from a pattern of such lines in order to leave a certain number of squares or triangles.

This test is a measure of the "figural adaptive flexibility" factor, which is defined as the ability to change set in order to meet new requirements imposed by figural problems.

Utility.

The score in this test is the number of times the class of uses is changed as the subject lists different uses for a given object.

This test is a measure of the "semantic spontaneous flexibility" factor, which is defined as the ability to produce a diversity of verbally expressed ideas in a situation that is relatively unrestricted. In tests of Adaptive Flexibility the subject changes set in order to arrive at a particular answer, while, in tests of this factor, it pays him to change set in as many different ways as possible, although this is not essential so far as he knows.

Note: The eight tests described above are distributed by Educational Testing Service to qualified users for research use only.

In addition to the above tests from the Kit of Reference Tests for Cognitive Factors,[5] the following two tests were administered:

School and College Ability Test (Form 2B).[6]

This test measures the two kinds of school-related abilities which are most important in the greatest number of school and college endeavors: verbal and quantitative. In order to shorten testing time, an abbreviated "Survey" version was administered, which consists of Parts I and II of the complete test (Sentence Understanding and Numerical Computation, respectively). The chief purposes of administering the SCAT Survey were to obtain an estimate of the ability level of the sample with respect to a national norms group, and to enable a covariance adjustment for differing verbal and quantitative ability levels between groups.

Understanding Metaphor.

This is a test developed specially for this project. It consists of a series of metaphoric passages, both prose and poetry. The task is to choose the best answer to each of two items for each passage, as in the following example:

When I have fears that I may cease to be
Before my pen has gleaned my teeming brain

The speaker's brain is compared to
(A) a factory
(B) a sheet of paper
(C) a wheat field
(D) a slum

The test was administered in experimental form and revised on the basis of item analysis data collected during the course of this study. See Appendix A for the revised form test booklet.

End-of-Course Achievement Test.

This test was developed specially for this project, and is a measure of achievement with respect to specific course content. It is presented via 35 mm. colored slides synchronized to a tape recording. Items cover such topics as color, light and shadow, figure-ground relationships, and texture. The test was administered in experimental form, and revised on the basis of item analysis data collected during the course of this study. See Appendix B for the scripts of the original and revised forms.

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[5] French, John W., Ekstrom, Ruth B., and Price, Leighton A., op. cit.

[6] Princeton: Cooperative Test Division, Educational Testing Service.

## II. SAMPLE SELECTION

It is the belief of its developers that, in order to be effective, the Education Through Vision curriculum must be taught by an instructor who has been thoroughly oriented with respect to its purposes, methods, and materials. This has been accomplished in the past by the attendance of prospective teachers at summer workshops conducted by Bartlett Hayes and his staff. The entire population of teachers thus prepared, and the Education Through Vision classes they taught during the 1966-1967 school year, constituted the experimental group in this evaluation study. The requirement that teachers attend at least one orientation workshop precluded the random selection of teachers from some larger population. Respect for the educational needs of students precluded the random selection of students for assignment to Education Through Vision classes. Each participating school was asked to select one comparison or control class for each of its experimental (Education Through Vision) classes. The only restrictions placed on this selection were that:

(a) the control and experimental classes be at the same grade level;

(b) the control class not be a "special" class such as home economics, physical education, etc., which would have students all of one sex;

(c) the control class not be one in which an atypical group of students might be expected (e.g., remedial reading).

As was stated in the Introduction, this study is not in any sense a comparison of the Education Through Vision curriculum with some competing educational treatment. The reason for the inclusion of control classes was to eliminate certain alternative explanations for any observed change on the criterion variables, as will be explained in the following section on Experimental Design. The subject area of the control classes was not important, since the only relevant characteristic of these students was that they <u>not</u> be exposed to the experimental curriculum.

It can be seen that the sample of teacher-class units selected for this study was representative of no clearly definable population. The limited, although still useful, generalization of the obtained results must be to a population of teacher-class units "like these."

As originally constituted, the sample consisted of 27 classes (14 experimental, 13 control) in 11 schools. Of this original sample, nine classes in three schools were omitted from the analysis because of irregularities of test administration, lack of control groups, or because the Education Through Vision classes had students of only one sex. The sample on which the analysis of females was based consisted of 195 students in 18 classes in eight schools. One of these schools was omitted from the sample on which the analysis of males was based, because of irregularities of test administration. Thus the male sample consisted of 161 students in 16 classes in seven schools. Of the nine Education Through

Vision classes, seven met five times per week, and the remaining two met four and three times per week, respectively. There were one eighth, one ninth, and four tenth grade classes. The remaining three classes were composed of students in grades ten through twelve. Table 1 gives total scholastic ability test scores (School and College Ability Test, Survey Form 2B) for the experimental and control classes. All classes, regardless of grade, are related to tenth grade individual national norms for comparability.

Table 1 - General Scholastic Ability of Classes in the Sample

| School | Raw Score Mean | | %-ile Rank of Mean | | Raw Score S.D. | |
|---|---|---|---|---|---|---|
| | ETV | non-ETV | ETV | non-ETV | ETV | non-ETV |
| | 28.5 | 24.1 | 48 | 37 | 6.0 | 9.3 |
| 1 | 19.8 | 15.1 | 22 | 8 | 5.8 | 20.1 |
| 2 | 32.8 | 27.8 | 71 | 48 | 7.8 | 10.3 |
| 3 | 35.0 | 20.4 | 76 | 22 | 6.1 | 10.6 |
| 4 | 36.7 | 30.9 | 81 | 60 | 5.9 | 9.0 |
| 5 | 32.7 | 35.7 | 71 | 76 | 11.3 | 7.7 |
| 6 | 31.8 | 23.9 | 66 | 37 | 9.3 | 9.2 |
| 7 | 32.4 | 38.3 | 66 | 85 | 9.4 | 6.6 |
| 8 | 33.8 | 31.8 | 71 | 66 | 7.2 | 9.6 |
| Grand Mean | 31.5 | 27.6 | 60 | 48 | -- | -- |

## III. EXPERIMENTAL DESIGN

It is not possible, under the restrictive conditions imposed by the realities of the educational world, to attribute observed effects solely to the influence of the curriculum under study. The objective of the experimental design is to eliminate as many as possible of the plausible rival hypotheses, thus leaving the influence of the curriculum itself as the only credible explanation of observed effects. Perhaps the hypothesis which in this study posed the most serious threat to an apparent curriculum effect is that of maturation. Thus it could be argued that an observed change over the period from September 1966 to May 1967 was caused by the natural growth within each individual of the abilities measured. A closely related rival hypothesis is that an observed change is caused by uncontrolled events external to the Education Through Vision classroom.

The procedure most appropriate to the elimination of these rival hypotheses would be the creation, by random assignment of students and teachers, of equivalent experimental and control classes. The preceding

discussion has indicated that this was impossible. Therefore, experimental and control groups were selected as described in the preceding section on sampling. Comparisons of the groups in terms of general scholastic ability are given in Table 1.

Several of the instruments included in the cognitive test battery were of a unique nature, and as such might easily be remembered by the students. Perhaps even more serious was the fact that items in several of the tests were of the open-ended variety, and thus an examinee could, by simply remembering a few item stems, create large numbers of additional responses during the period between pretest and posttest. It is further reasonable to suppose that students in Education Through Vision classes would be more highly motivated to do this than would students in the comparison group. Equivalent forms of most of the instruments were not available. Therefore, in order to eliminate the rival hypothesis of practice effect, different random halves of each class were tested in September 1966 and May 1967. The basic design can be diagrammed as follows, where "O" is an observation or measure, "X" is the introduction of an experimental treatment (in this case the Education Through Vision curriculum), "R" indicates random selection of students to be tested, and the dashed line indicates non-random assignment of classes to treatment and control groups.

$$\begin{array}{ccccc} R & O & X & & \\ R & - & X & O & - \\ R & O & & & \\ R & & & O & \end{array}$$

## IV. DATA COLLECTION

Test administrations were conducted by local test coordinators, selected from the faculty or administration staff of each school. Standardized test administration procedures provided by the investigator were followed. Tests were administered in the same order in all schools during the week preceding the beginning of the Education Through Vision classes in September and a week near the end of the school year in May. Testing of both experimental and control classes was carried out in group administrations, arranged by each test coordinator to fit the class schedule of his school. The one exception to these procedures occurred in the case of the End-of-Course Achievement Test, which was administered to Education Through Vision classes only. Each entire class was tested during a regularly scheduled class period in May.

In addition to the test battery, each Education Through Vision class teacher was requested to maintain a Class Activity Log (see Appendix C). Entries were made for each class session, indicating the activity or exercise pursued and the materials used. This information was gathered as an aid to interpretation of item responses on the End-of-Course Achievement Test.

The scoring of the Simile Interpretations, Symbol Production, Object Synthesis, and Utility tests required subjective scorer judgment. In order to guard against scorer bias and systematic shifts in scoring standards, tests from both September and May administrations were scored by the same scorers during the same period of time (Summer 1967). Test booklets from each administration were scored by each scorer in each scoring session. The test administration from which any booklet came could not be identified by the scorer. In order to obtain estimates of scorer reliability, a random sample of approximately 100 booklets for each of these four tests was selected and rescored in the same manner. These scorer reliabilities are presented and discussed in the Analysis and Results section of this report.

# ANALYSIS AND RESULTS

## I. TEST CHARACTERISTICS

Of the eleven instruments administered (see Appendix D for information regarding scores obtained, numbers of items, and time limits) only the School and College Ability Test (Survey Form 2B) can be considered a fully standardized test in final form. The reliability shown for it in Table 2 is that given in the published Examiner's Manual for the corresponding parallel form.[1] The Hidden Figures, Simile Interpretations, Estimation of Length, Symbol Production, Object Synthesis, Surface Development, Match Problems, and Utility tests are in experimental form and are recommended for research use only. The correlation between separately timed parts, stepped up for a test of total length by the Spearman-Brown formula, is given in Table 2 for each of these eight tests.

The Simile Interpretations, Symbol Production, Object Synthesis, and Utility tests all required considerable judgment on the part of the scorer. Therefore, in addition to the correlation between separately timed parts, Table 2 gives the reliability of a single rating for these tests, expressed as an intraclass correlation coefficient.[2]

The Understanding Metaphor and End-of-Course Achievement Tests were administered in experimental form in September and May. Each has been revised on the basis of item analysis data gathered in this study. However, the revised versions have not been administered to new samples, and the reliabilities given in Table 2 are those of the experimental forms. It should be noted that neither test in its experimental form had a reliability sufficiently high for adequate measurement of individuals. It is recommended that users compute reliabilities for the revised forms and interpret the scores in light of these reliabilities.

The Understanding Metaphor test was essentially unspeeded; 98.3% of the subjects completed the test and 99.1% completed 75% of the test. The End-of-Course Achievement Test was paced by the slide-tape mode of presentation, and therefore was completely unspeeded.

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[1] Cooperative School and College Ability Tests, Examiner's Manual (First Manual/1955). Princeton: Cooperative Test Division, Educational Testing Service, 1955, p. 10.

[2] Winer, B. J. Statistical Principles in Experimental Design. New York: McGraw-Hill Book Company, 1962, p. 126.

Table 2 - Test Reliabilities

| Test | r | N | Type | Sample |
|---|---|---|---|---|
| SCAT Survey (2B) | .91 | 370 | $KR_{20}$ | Norms (High School Seniors) |
| Hidden Figures | .56 | 242 | r between parts | Total group - May admin. |
| Simile Interpretation | .74 | 250 | r between parts | Total group - May admin. |
| Estimation of Length | .68 | 249 | r between parts | Total group - May admin. |
| Symbol Production | .68 | 241 | r between parts | Total group - May admin. |
| Object Synthesis | .77 | 246 | r between parts | Total group - May admin. |
| Surface Development | .75 | 246 | r between parts | Total group - May admin. |
| Match Problems | .77 | 243 | r between parts | Total group - May admin. |
| Utility | .87 | 243 | r between parts | Total group - May admin. |
| Simile Interpretation | .57 | 97 | Intraclass | Random sample from Total group - Sept. + May admin. |
| Symbol Production | .88 | 97 | Intraclass | Random sample from Total group - Sept. + May admin. |
| Object Synthesis | .68 | 94 | Intraclass | Random sample from Total group - Sept. + May admin. |
| Utility | .85 | 92 | Intraclass | Random sample from Total group - Sept. + May admin. |
| Understanding Metaphor | .61 | 115 | $KR_{20}$ | Educ. Through Vision classes - May admin. |
| End-of-Course Achievement | .51 | 260 | $KR_{20}$ | Educ. Through Vision classes - May admin. |

## II. COGNITIVE CRITERION VARIABLES

It will be recalled that the design of this study called for pretest and posttest measures on nine cognitive variables for experimental and control groups. As described in the Experimental Design section of this report, these pretest and posttest measures were obtained on random halves of each class. The data were analyzed separately by sex, by means of the multivariate analysis of covariance. Verbal and mathematical ability measures were administered to all students in order to describe the sample and to serve as covariates. The sample for females consisted of nine experimental and nine control classes in eight schools; the sample for males consisted of eight experimental and eight control classes in seven schools. The following test variables were included in the multivariate analysis:

1. Hidden Figures
2. Simile Interpretation
3. Estimation of Length

4. Symbol Production
5. Object Synthesis
6. Surface Development
7. Match Problems
8. Utility
9. Understanding Metaphor
10. SCAT Verbal
11. SCAT Mathematical

Inasmuch as intact classes were exposed to the experimental treatment, consideration was given to the use of class means as the appropriate experimental unit.[3] However, it was possible to evaluate the necessity of performing such a means analysis by testing the School x Treatment interaction effect against the Within Cells error term. Table 3 shows the results of these multivariate and univariate tests of significance for males and females, using SCAT Verbal and Mathematical scores as covariates:

Table 3 - School x Treatment Interaction Significance Tests

| Variables | Females | | Males | |
|---|---|---|---|---|
| | F* | Probability | F* | Probability |
| 1 - 9 | 1.27 | .08 | 1.35 | .05 |
| 1. Hidden Figures | 1.26 | .27 | 2.47 | .03 |
| 2. Simile Interpretation | 1.21 | .30 | 0.38 | .89 |
| 3. Estimation of Length | 1.56 | .15 | 1.11 | .36 |
| 4. Symbol Production | 0.62 | .74 | 1.06 | .39 |
| 5. Object Synthesis | 0.44 | .88 | 1.13 | .35 |
| 6. Surface Development | 1.19 | .31 | 4.38 | .001 |
| 7. Match Problems | 1.23 | .29 | 0.70 | .65 |
| 8. Utility | 2.54 | .02 | 2.37 | .03 |
| 9. Understanding Metaphor | 1.18 | .32 | 1.07 | .38 |

*Degrees of freedom for the multivariate tests are (63,845) and (54,611) for females and males, respectively. Degrees of freedom for the univariate tests are (7,157) and (6,127) for females and males, respectively.

Examination of Table 3 shows that the multivariate test of significance for females has a probability of .08, which suggests a borderline

[3] For further discussion of this rationale, see: Campbell, Donald T. and Stanley, Julian C., "Experimental and Quasi-Experimental Designs for Research on Teaching," in Gage, N. L. (Ed.), Handbook of Research on Teaching. Chicago: Rand McNally and Co., 1963, p. 193.

case. The multivariate test of significance for males has a probability of .05. Examination of the univariate results for each sex was therefore appropriate. It can be seen from Table 3 that Utility (for females) and Surface Development (for males) were the variables contributing most heavily to the obtained multivariate F ratios. This was interpreted to mean that, with the possible exception of these two variables, there were no significant differences among classes. The implication of this result for the remainder of the analysis was that the Within Cells mean square constituted an appropriate error term.

There remained, however, the problem of a possible Schools x Treatment interaction for females on the Utility variable, and for males on the Surface Development variable. It was decided, therefore, to perform the multivariate analyses of covariance for the treatment effect using SCAT Verbal, SCAT Mathematical, and Utility as covariates for females, and SCAT Verbal, SCAT Mathematical, and Surface Development as covariates for males. Inasmuch as pretest and posttest measures were obtained for non-overlapping random halves of classes, it was not possible to perform the usual covariance analysis test of treatment, using pretest score as a covariate. Instead, pretest/posttest was included as a factor of the design, and the experimental/control x pretest/posttest interaction was evaluated as the test of treatment. Table 4 shows the results of these multivariate and univariate tests of significance for males and females.

Table 4 - Treatment x Pretest/Posttest Interaction Significance Tests

| | Females | | Males | |
|---|---|---|---|---|
| Variables | F* | Probability | F* | Probability |
| 1-7, 9 | 0.90 | .52 | -- | -- |
| 1-5, 7-9 | -- | -- | 1.67 | .11 |
| 1. Hidden Figures | 2.53 | .11 | 2.77 | .10 |
| 2. Simile Interpretations | 1.92 | .17 | 0.04 | .84 |
| 3. Estimation of Length | 0.53 | .47 | 5.26 | .02 |
| 4. Symbol Production | 0.19 | .66 | 0.65 | .42 |
| 5. Object Synthesis | 1.08 | .30 | 0.10 | .75 |
| 6. Surface Development | 0.15 | .70 | -- | -- |
| 7. Match Problems | 1.47 | .23 | 0.21 | .65 |
| 8. Utility | -- | -- | 1.22 | .27 |
| 9. Understanding Metaphor | 0.12 | .73 | 0.01 | .93 |

*Degrees of freedom for the multivariate tests are (8, 149) and (8,119) for females and males respectively. Degrees of freedom for the univariate tests are (1, 156) and (1, 126) for females and males, respectively.

Examination of Table 4 shows that the multivariate tests of significance for both females and males have probabilities of .52 and .11, respectively. For the females, there is clearly no significant difference between treatment and control groups. For males, inspection of the univariate tests shows only one, Estimation of Length, with a probability less than .05. This is most appropriately interpreted as a randomly large F.

Similar univariate tests were performed for the Utility and Surface Development variables, in the case of females and males, respectively, and produced negative results. These analyses were performed using class means as the experimental unit, because of the possible significant School x Treatment interaction referred to previously.

In summary, it was not shown that, in terms of the variables investigated, the Education Through Vision program produced results different from those of the control group.

Intercorrelations of cognitive variables for each sex are given in Appendix E. These correlations are computed using deviations from the respective class means. A comparison of the correlations for males and females shows ample justification for separating the sexes in the analysis.

## III. CURRICULUM-RELATED ACHIEVEMENT

As described in the Test Battery section of this report, a fifty-eight item End-of-Course Achievement Test was constructed specially for this project. (See Appendix B for the scripts of the original and revised versions of this test.) In order to relate achievement levels to specific curriculum objectives and experiments, each item of the original version (the one administered in this study) was classified with respect to the objectives, classroom experiments, and slide tapes (audio-visual materials prepared especially for the Education Through Vision curriculum)

to which it was most closely related. Table 5 shows these item classifications, referenced to the Education Through Vision Syllabus.[6]

Table 5 - End-of-Course Achievement Test - Item Classifications

| Item No. (Part I) | Objectives as Stated in Syllabus (pp. 7-12) | Analogous Experiments or Exercises in Syllabus | Slide Tape |
|---|---|---|---|
| 1 | 4, 5 | D.1 p.33; D.1 p.36 | "The Eye" |
| 2 | 2 | D.4 p.24 | "Color" |
| 3 | 12 & 13 | C. pp.55-56; C.2 & 3 p.58; D.1 p.58 | "Introduction to Photography" sections on figure-ground and strong shape |
| 4 | 11 | C.1 & 2, p.53; D.1 p.53 | "Color" |
| 5 | 3 & 21A, 21C | D.6 p.28; D.1 p.85; C.1-7 pp.88-90 | "Predictive Seeing" |
| 6 | 8 | D.2 p.46 | "Color" |
| 7 | 2, 14 | D.4 p.24; C.4 p.62 | "Color" |
| 8 | 2 | D.4 p.24 | "Color" |
| 9 | 3, 5 | D.6 p.28; D.1 p.36 | "The Eye" |
| 10 | 2 | D.4 p.24 | "Color" |
| 11 | 4, 5 | D.1 p.33; D.1 p.36 | "The Eye" |
| 12 | 8 | D.2 p.46 | "Color" |
| 13-19 | 19 | C.1-3 p.80 | "Shake Up: What Do You See?" "Color" |
| 20-24 | 19 | C.1-3 p.80 | "Shake Up: What Do You See?" |
| 25 | 2 | D.1,2 & 4, pp.23-24 | "Color" |
| 26 | 6, 17, 18 | D.2 p.39; D.3(b) p.74; D.1 p.77 | "Introduction to Photography" section on sensuous surface |
| 27 | 11 | C1. & 2, p.53; D.1 p.53 | "Color" |
| 28 | 3 & 21A & C | D.6 p.28; D.1 p.85 C.1-7 pp.88-90 | "Predictive Seeing" |
| 29 | 2, 14 | D.4 p.24; C.4 p.62 | "Color" |
| 30 | 2 | D.1,2 & 4, pp.23-24 | "Color" |

[6]Young, Laura N., and Hayes, Bartlett H., Jr. (Eds.), A Syllabus for the Research Program in Education Through Vision, Andover, Massachusetts: Phillips Academy, 1967.

Table 5 continued

| Item No. (Part II) | Objectives as Stated in Syllabus (pp. 7-12) | Analogous Experiments or Exercises in Syllabus | Slide Tape |
|---|---|---|---|
| 1 | 6 | C.1 & 2 pp.38-39; D.2 p.39 | "Introduction to Photography" |
| 2 | 16, 17, 18 | C.3 p.69; D.2(a) p.73; D.1 & 2 pp.77-78 | "Introduction to Photography" section on sensuous surface |
| 3 | 5, 7, 14 | D.2 p.36; D.2 p.41; D.2 p.62 | "The Eye" "Perceptual Seeing" "Color" |
| 4 | 16, 17, 18, 28A | C.3 p.69; D.2(a) p.73; D.1 & 2 pp.77-78; D.2 p.112 | "Introduction to Photography" section on sensuous surface "Conceptual Seeing" |
| 5 | 8 | D.4 p.47; D.1-3 pp. 87-88; C. p.109; D.1 p.110 | "Color" "Predictive Seeing" "Symbolic Seeing" |
| 6-10 | 19 | C.1-3 p.80 | "Shake Up: What Do You See?" |
| 11 | 6 | C.1 & 2 pp.38-39; D.2 p.39 | "Introduction to Photography" |
| 12 | 30 | C.1 & 3 p.119 | ALL |
| 13 | 27 | C. p.109; D.1 p.110 | "Symbolic Seeing" |
| 14-16 | 17, 29 | D1.(a) p.72; C.2 pp.115-116 | "Introduction to Photography" section on sensuous surface |
| 17-23 | ALL | ALL | ALL |
| 24 | 21B, 27 | D.1-3 pp.87-88; C. p.109; D.1 p.110 | "Predictive Seeing" "Symbolic Seeing" |
| 25 | 6 | C.1 & 2 pp.38-39; D.2 p.39 | "Introduction to Photography" |
| 26 | 16 | C.3 p.3 | "Introduction to Photography" section on sensuous surface |
| 27 | 12 & 13 | C. pp.55-56; C.2 & 3 p.58; D.1 p.58 | "Introduction to Photography" sections on figure-ground and strong shape |
| 28 | 2 | D.1,2 & 4, pp.23-24 | "Color" |

An item analysis of the End-of-Course Achievement Test was performed, based on the entire group of students (N=260) in Education Through Vision classes. Table 6 gives item difficulty levels and discrimination indices obtained from this analysis.

Table 6 - End-of-Course Achievement Test Item Difficulty and Discrimination Indices

| Item No. (Part I) | Percent Correct | Biserial Correlation With Total Score |
|---|---|---|
| 1 | 70 | .37 |
| 2 | 79 | .35 |
| 3 | 52 | .15 |
| 4 | 51 | .25 |
| 5 | 28 | .22 |
| 6 | 30 | .35 |
| 7 | 13 | -.13 |
| 8 | 36 | .39 |
| 9 | 29 | .34 |
| 10 | 50 | .28 |
| 11 | 14 | -.03 |
| 12 | 15 | .12 |
| 13 | 61 | .23 |
| 14 | 43 | .34 |
| 15 | 65 | .26 |
| 16 | 55 | .25 |
| 17 | 47 | .11 |
| 18 | 28 | .21 |
| 19 | 70 | .26 |
| 20 | 98 | * |
| 21 | 98 | * |
| 22 | 97 | * |
| 23 | 91 | .39 |
| 24 | 80 | .35 |
| 25 | 85 | .31 |
| 26 | 38 | .29 |
| 27 | 74 | .36 |
| 28 | 34 | .41 |
| 29 | 50 | .19 |
| 30 | 72 | .25 |

Table 6 continued

| Item No. (Part II) | Percent Correct | Biserial Correlation With Total Score |
|---|---|---|
| 1 | 91 | .48 |
| 2 | 78 | .08 |
| 3 | 65 | .38 |
| 4 | 55 | .31 |
| 5 | 11 | .09 |
| 6 | 82 | .39 |
| 7 | 90 | .25 |
| 8 | 95 | .57 |
| 9 | 63 | .13 |
| 10 | 9 | -.15 |
| 11 | 51 | .39 |
| 12 | 27 | .31 |
| 13 | 78 | .13 |
| 14 | 45 | .20 |
| 15 | 76 | .24 |
| 16 | 40 | .40 |
| 17 | 32 | .27 |
| 18 | 16 | .14 |
| 19 | 20 | .16 |
| 20 | 26 | .12 |
| 21 | 21 | .04 |
| 22 | 13 | .07 |
| 23 | 24 | .37 |
| 24 | 66 | .25 |
| 25 | 44 | .25 |
| 26 | 70 | .17 |
| 27 | 31 | .13 |
| 28 | 82 | .23 |

*r biserial not computed because of extremely high percent pass

The mean total test score was 30.5, with a standard deviation of 4.5 and a standard error of measurement of 3.2.

Classroom activity logs were examined to determine which classes had been exposed to material appropriate for each item. This analysis was carried out on a group of 12 Education Through Vision classes, since classes excluded from the statistical analysis because of single sex enrollment or lack of a control group could be included here. The following results were obtained:

(1) No items were appropriate for all classes.

(2) Forty items were appropriate for ten classes.

(3) Six items were appropriate for nine classes.

(4) Four items were appropriate for eight classes.

(5) One item was appropriate for seven classes.

(6) Seven items were appropriate for six classes.

Examination of individual item difficulties did not reveal the anticipated tendency for subgroups to achieve higher item scores. This may have been due to differential ability levels of the subgroups, carry-over effects from curriculum materials which were studied, or faulty recording of classroom activities by teachers.

The assessment of curricular strengths and weaknesses by means of item difficulty indices is not as straightforward as it might seem. The basic problem is whether to conclude, for example, that a low item percent correct indicates a curriculum weakness or a difficult item. Since it is well known that a seemingly small change in item wording can significantly alter the difficulty of that item, the problem is an important one. The approach adopted in the analysis to follow was to examine all item data for evidence of item ambiguity or other defect. Conclusions with respect to the curriculum were then drawn based on items judged to have the proper characteristics. Nevertheless, it is probably true that different persons are apt to reach different conclusions from the same set of item data. Readers are therefore urged to make their own judgments after examining the item difficulties in Table 6 and the test script in Appendix B.

Individual items in the End-of-Course Achievement Test (Unrevised Form) related to the experiments on light and photography ranged in difficulty from relatively simple to among the most difficult. The students as a group performed relatively well on most items concerned with (a) the various angles from which a photograph is lighted, (b) the point of view from which an object is photographed, (c) the distance from which a photograph is taken, (d) the qualities of natural lighting at different times of day, and (e) the methods by which textural effects may be achieved through lighting.

Achievement on items designed to measure visual awareness and power of observation was relatively high. It is recommended, however, that readers examine these items (see especially Part I, items 20-24) and make their own judgment of difficulty.

Performance was relatively high on items concerned with the ability to perceive color and the relationships among colors. Performance was relatively low on items requiring a knowledge of specific color terminology and the results of mixing colors. This was not unexpected, since the stated curriculum objectives are clearly related to heightened perception of color rather than to the mechanics of producing it.

Finally, performance was relatively high on items related to identification of the individual parts of a total composition when similarities in colors, textures, and shapes were involved. Performance was relatively low on items concerned with the balance of a work and its distortion through the addition or subtraction of individual parts. This again was in line with the objectives of the curriculum, which stress visual awareness over knowledge about art.

The End-of-Course Achievement Test was revised on the basis of these item data (see Appendix B for the script of the Revised Form). It should be noted that the Revised Form has not been administered, and therefore its characteristics are still unknown.

It will be recalled that Education Through Vision teachers had complete freedom to choose among the various classroom exercises described in the Education Through Vision Syllabus[6] or the Tentative Syllabus 1965-1966.[7] Table 7 shows information regarding class coverage of various exercises.

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[6] Ibid.

[7] Young, Laura N. (Ed.), Research Program in Education Through Vision Tentative Syllabus 1965-1966.

Table 7 - Class Coverage of Exercises

| Exercise or Slide Tape | No. of Classes* | Average No. of Periods Per Class |
|---|---|---|
| Introduction I | 6 | 1 |
| Introduction II | 6 | 1 |
| Shake-Up (Slide Tape) | 6 | 1 |
| Signature | 7 | 1 |
| Color Change | 6 | 2 |
| Curved Straight | 6 | 1.5 |
| Contour Drawing | 4 | 1.5 |
| Photo Still Life (Slide Tape) | 5 | 1 |
| Photo Still Life - camera | 5 | 1.5 |
| Surface Modulation | 6 | 2 |
| Grays That Curve | 6 | 2 |
| Photograms | 5 | 1.5 |
| Color (Slide Tape) | 7 | 1.5 |
| Colors in Conflict | 7 | 4 |
| Acetates and Polarized Light | 4 | 3 |
| Twentieth Century Landscape (Slide Tape) | 7 | 1 |
| Twentieth Century Landscape | 4 | 1 |
| The Eye (Slide Tape) | 6 | 1 |
| Twig and Bannister | 5 | 2 |
| Figure Ground (Slide Tape) | 5 | 1 |
| Figure Ground | 6 | 3 |
| Strong Shape (Slide Tape) | 5 | 1 |
| Strong Shape | 3 | 3 |
| Syncopated Series (Slide Tape) | 6 | 1 |
| Syncopated Series - Vegetable Print | 7 | 3 |
| Rubbings | 5 | 1.5 |
| Sensuous Surface (Slide Tape) | 5 | 1 |
| Exploded Texture | 4 | 3.5 |
| Mosaic | 4 | 2 |

Table 7 (Continued)

| Exercise or Slide Tape | No. of Classes* | Average No. of Periods Per Class |
|---|---|---|
| Visual Analogy | 5 | 4 |
| Conceptual Seeing | 3 | 3 |
| Postcard Landscape | 3 | 1 |
| Line and Flat Tone Landscape | 4 | 3 |
| Impressionist Landscape | 3 | 1 |
| Cubist Landscape | 3 | 1 |
| Repeat Postcard | 3 | 1 |
| Symbolic Seeing (Slide Tape) | 5 | 1 |
| Needed Symbol | 5 | 3 |
| Suggestive Slogan | 4 | 2.75 |
| Action Painting and Rock 'n Roll | 2 | 1 |
| Formal Dance | 1 | 1 |
| The Autonomous Line | 3 | 1 |
| Meander | 4 | 2 |
| House Plan and Building Blocks | 2 | 7 |
| Straw Construction | 1 | 9 |

*A total of seven classes returned useable class logs.

## CONCLUSIONS AND RECOMMENDATIONS

Tests of the following cognitive variables were administered to Education Through Vision classes and comparison classes, with the hope of identifying criteria showing promise and appropriateness for further research on the Education Through Vision curriculum:

Field independence, or flexibility of closure
Expressional fluency
Length estimation
Originality
Semantic redefinition
Visualization
Figural adaptive flexibility
Semantic spontaneous flexibility
Ability to interpret metaphor

Measures of Verbal and Mathematical ability were administered for purposes of sample description and covariance adjustment. Multivariate and univariate analyses of covariance were performed, resulting in the conclusion that Education Through Vision classes did not exhibit gain significantly greater than that of the comparison classes on the above nine cognitive variables.

Item difficulty data were examined for clues to the relative strengths and weaknesses of various curriculum areas. This procedure is recognized as a rather subjective one, since it is to some extent a personal decision whether to interpret item data as descriptive of curriculum achievement or item difficulty. Readers are urged to examine items and item data and to compare their conclusions to those which follow. In general, student achievement was found to be relatively high in areas corresponding closely to stated curriculum objectives such as the heightened awareness of light, color, texture, and shape. Achievement was found to be relatively low in unstressed, peripheral areas such as color terminology, the mechanics of color mixing, and knowledge of formal principles of design and balance.

As pointed out previously, this study was not in any sense a final, comparative evaluation of the Education Through Vision curriculum. Its purpose was rather to provide information to the developers of a still evolving curriculum, and to identify or eliminate variables of potential use in further research. Two levels of data were collected and analyzed. The first, represented by item responses on the End-of-Course Achievement Test, provided evidence regarding the extent to which Education Through Vision students achieved knowledge and skills closely related

to specific curriculum content covered in the classroom. The general conclusion drawn was that achievement was relatively high, especially in areas stressed by the curriculum. A second level of data was represented by the nine cognitive variables listed above. The tasks required by the tests of these variables were less similar to classroom activities than were those required by the End-of-Course Achievement Test. Effects on these variables would have represented <u>transfer</u> from curriculum-specific knowledge and skills to less closely related but more generalized knowledge and skills. At this level, it was not possible to demonstrate a relative advantage of the Education Through Vision group over the comparison group.

Perhaps some speculation over possible reasons for this might have implications for further research. The most obvious explanation is that the wrong variables were selected. A curriculum like Education Through Vision, at the frontier of innovation, is at best imperfectly understood. Its true effects may or may not correspond to its stated objectives, and may or may not bear close resemblance to actual classroom activities. Therefore, one possible strategy for further research is the investigation of other sets of variables, or perhaps other measures of the same variables.

A second explanation is related to the desire of curriculum developers to allow participating teachers the utmost flexibility in the selection of curriculum content, the sequence in which they present this content, and the amount of time spent on various units of content. From a pedagogical standpoint, this philosophy is undoubtedly attractive. From the standpoint of the methodology of evaluation, however, it decreases the probability of demonstrating differences between groups. Statistically speaking, it inflates error variance. Semantically speaking, it means that one is evaluating not one but many curricula, all of which have conveniently (but in a sense imprecisely) been labeled Education Through Vision. It is recommended that the curriculum developers seriously consider the possibility of encouraging participating teachers to present a more uniform version of the curriculum. Another alternative for future research would be the inclusion of enough classes in the sample to allow the formation of subgroups of classes, within which the curriculum would be uniform.

A third possible explanation arises from consideration of the finding that specific curriculum content was learned, but transfer of learning to the cognitive variables investigated did not occur. This suggests that flexibility of cognition necessary for such transfer was not present in these students. The classes participating in this study were predominantly at the high school level. Perhaps some consideration should be given to developing a modification of the curriculum suitable for presentation to students at lower age levels, where possibly greater cognitive flexibility might be found. A related advantage to this

procedure would be the possibility of conducting longitudinal studies, since it seems quite likely that some of the effects of the Education Through Vision curriculum would emerge only after an extended period of time.

A final recommendation for further research focusses on the population to be studied. Although the primary value of the curriculum lies in its effects on students, the effects on teachers should not be overlooked. One reason for this is that effects on teachers will be reflected in all their teaching, and thus will be passed on to students in classes other than Education Through Vision. More important for further research on the curriculum, however, is the possibility that the identification of effects on teachers may lead to more insightful hypotheses regarding student effects.

# APPENDICES

Appendix A

## UNDERSTANDING METAPHOR TEST

Suddenly a shadow fell across the door. It was no more than a darkening of the pale paws of day which were embracing the bar, but the cows stiffened. I turned and looked at the person who made the shadow.

1. The phrase, "paws of day," describes
   - (A) a sudden storm
   - (B) sunlight
   - (C) the farmer's cat
   - (D) the barn

2. The impression we get of the day is that it is
   - (F) sparkling
   - (G) cold
   - (H) dull
   - (J) rainy

As the lily among thorns, so is my love among the daughters. As the apple tree among the trees of the wood, so is my beloved among the sons.

3. The "thorns" are compared to
   - (A) my love
   - (B) the trees
   - (C) the sons
   - (D) the daughters

4. The writer implies that "my love" and "my beloved" are respectively
   - (F) beautiful and fruitful
   - (G) hard and strong
   - (H) lost and lonely
   - (J) white and lovely

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Press me New Grapes, and twine about my brow
The leaves of all the pasts that make the now.

5. "The leaves of all the pasts" are
   (A) previous incidents
   (B) forgotten years
   (C) old grape leaves
   (D) lost cities

6. What is the speaker's attitude towards his experiences?
   (F) Boredom
   (G) Ecstasy
   (H) Bewilderment
   (J) Satisfaction

When I have fears that I may cease to be
Before my pen has gleaned my teeming brain

7. The speaker's brain is compared to
   (A) a factory
   (B) a sheet of paper
   (C) a wheat field
   (D) a slum

8. Which of the following is the best paraphrase of the second line?
   (F) Before I run out of ideas
   (G) Before I die
   (H) Before I have written all my ideas
   (J) Before I have gathered all my thoughts

In me thou see'st the twilight of such day
As after sunset fadeth in the west.

9. The "twilight" is described as
   (A) cloudy
   (B) stormy
   (C) colorful
   (D) darkening

10. The speaker is most probably describing himself as
   (F) dying of old age
   (G) sick and going blind
   (H) tired of living
   (J) dark skinned

To me the Universe was all void of Life, of Purpose, of Volition, even of Hostility: it was one huge, dead, immeasurable steam-engine, rolling on, in its dead indifference, to grind me limb from limb.

11. The writer is comparing the "steam-engine" to
   (A) the Universe
   (B) Life
   (C) himself
   (D) emptiness

12. The writer's feeling is best described as one of
   (F) sadness
   (G) power
   (H) despair
   (J) detachment

If you travel with companions, you cannot read the book of nature without being perpetually put to the trouble of translating it for the benefit of others.

13. "The book of nature" refers to
    (A) one's surroundings
    (B) natural history
    (C) a foreign language book
    (D) a travel book

14. The writer does not want to
    (F) explain why he travels
    (G) talk about what he sees
    (H) investigate scientific causes
    (J) commune with nature

### To Old Age

I see in you the estuary that enlarges and spreads itself grandly as it pours in the great sea.

(An estuary is the wide mouth of a river)

15. The writer is comparing "the great sea" to
    (A) old age
    (B) an estuary
    (C) life after death
    (D) wisdom about nature

16. The writer thinks of old age as something that is
    (F) natural
    (G) fearsome
    (H) avoidable
    (J) pitiful

And for the ear, under the wail and snarl
Of groping foghorns and the winds grown old.

17. The foghorns are groping for
    (A) winds
    (B) fog
    (C) rocks
    (D) ears

18. The foghorns are compared to
    (F) windless skies
    (G) blind creatures
    (H) listeners to sirens
    (J) wounded animals

Its quick soft silver bell beating, beating,
And down the dark one ruby flare
Pulsing out red light like an artery.
The ambulance at top speed floating down
Past beacons and illuminated clocks
Wings in a heavy curve, dips down
And breaks speed, entering the crowd.

19. The bell and light of the ambulance are
    (A) ringing and flashing on and off
    (B) floating and dipping
    (C) ringing and shining steadily
    (D) turned off until it leaves the crowd

20. The lines indicate that the ambulance is
    (F) on a main highway
    (G) carrying corpses
    (H) bringing life
    (J) spattered with blood

When my eyes close. I can see another summer:
A bark of rust grows on the trees of the gas pumps
And the eat signs gather like leaves in the shallow
cellars of diners.

21. Which of the following best describes the "bark of rust?"
(A) The rust is like bark.
(B) The tree's bark is decaying.
(C) The tree's bark is rust colored.
(D) The rust has destroyed the bark.

22. The author is describing a time when
(F) machines will be everywhere
(G) there were no machines or man-made objects
(H) people will only think in terms of machines
(J) man-made objects will have been overcome by nature

I, like an usurped town, to another due,
Labor to admit you, but oh, to no end.

23. Based on the information in these lines, which of the following describes the town?
(A) Sprawling and ugly
(B) Walled and captured
(C) Flaming and in ruins
(D) Crowded and diseased

24. The speaker of these lines is describing himself as
(F) waiting for someone to pay his debts
(G) trying unsuccessfully to let his lawful master rule him
(H) trying to betray his home town to a villain
(J) wanting to destroy his town by selling it to a money-lender

All the unhurried day
Your mind lay open like a drawer of knives.

25. The speaker is comparing knives to
    (A) thoughts
    (B) drawers
    (C) hours
    (D) words

26. The person's mind is described as
    (F) calm
    (G) receptive
    (H) threatening
    (J) hesitant

And in intellectual chains
I lost both love and loathing,
Mured up in the wall of wisdom.
(Mured means walled)

27. The intellectual chains are restraining
    (A) love and loathing
    (B) the speaker
    (C) the intellect
    (D) the speaker's friends

28. The speaker indicates which of the following about "love and loathing"?
    (F) They are unnecessary now that he is wise.
    (G) They are incompatible with each other.
    (H) They are chained by the intellect.
    (J) They are forbidden by the intellect.

Upon the bank, she stood
In the cool
Of spent emotions.

29. The speaker is comparing emotions to
    (A) a bank
    (B) weather
    (C) a woman
    (D) money

30. The woman is best described as
    (F) pensive about her future
    (G) no longer disturbed
    (H) passive and lazy
    (J) saddened by death

KEY - OUM METAPHOR

1. B
2. C
3. D
4. A
5. A
6. D
7. C
8. C
9. D
10. A
11. A
12. C
13. A
14. B
15. C
16. A
17. D
18. B
19. A
20. C
21. A
22. D
23. B
24. B
25. A
26. C
27. B
28. D
29. B
30. B

# EDUCATION THROUGH VISION

NAME: _____
Last First Middle

STUDENT IDENTIFICATION NUMBER: _____

| 1 | 2 |
|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 |



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## Appendix B

The End-of-Course Achievement Test consists of a tape recorded at $7\frac{1}{2}$ inches per second, synchronized to a carousel slide projector by means of a high frequency inaudible signal recorded on the tape. This signal is of the appropriate frequency to activate a Phillips Synchronizer, which in turn relays a slide change signal to the projector.

The unrevised and revised forms of the test require 93 and 49 35mm. colored slides, respectively, for their presentation.

Appendix B

End-of-Course Achievement Test Script (Unrevised Form)

Part I

Slide #

1 This is the first test in the Education Through Vision Program. You should already have filled out the following information * at the top

2 of your answer sheet: your last name, first name and middle initial and your student identification number. You should also have checked the box numbered "one" on the right side of your answer sheet. The remainder * of your answer sheet

3 consists of thirty squares, each divided into four equal sections which are labeled A, B, C, and D. The number of the test question to which each square corresponds appears at the upper left hand corner of each square. For each of the questions on this test, mark an "X" in the section of the appropriate square which corresponds to the best answer. * For example

4 if you were asked which of the four panels contains the color yellow, you * should respond by marking

5 the letter B. Each of the next twelve questions will be read to you once; then there will be a brief pause, followed by another reading of the question and another pause. It is important that you listen carefully and that you record your answer during either the first or the second pause. The question will not be read to you * a third time.

6 Question Number 1. In which of these drawings is the cast shadow illogical? (Pause 5 seconds) Question Number 1. In which of these drawings is the cast shadow illogical? (Pause 5 seconds) *

7 Question Number 2. Which of these panels shows the three primary colors of pigment? (Pause 5 seconds) Question Number 2. Which of these panels shows the three primary colors of pigment? (Pause 5 seconds) *

8 Question Number 3. In which of these four designs is the figure-ground relationship <u>least</u> clearly seen? (Pause 5 seconds) Question Number 3. In which of these four designs is the figure-ground relationship <u>least</u> clearly seen? (Pause 5 seconds) *

9 Question Number 4. In which panel is there a clearly inconsistent color in the shadow field? (Pause 5 seconds) Question Number 4. In which panel is there a clearly inconsistent color in the shadow field? (Pause 5 seconds) *

10 Question Number 5. In which drawing is the observer on approximately the same level as the figures? (Pause 5 seconds) Question Number 5. In which drawing is the observer on approximately the same level as the figures? (Pause 5 seconds) *

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*Indicates position of inaudible slide change signal on Tape.

The work presented or reported herein was performed pursuant to a grant from the U.S. Office of Education, Department of Health, Education, and Welfare.

Slide #

11 Question Number 6. Each of these four panels represents a statement about mixing equal proportions of two pigments. Which of these panels is an incorrect statement? (Pause 5 seconds) Question Number 6. Each of these four panels represents a statement about mixing equal porportions of two pigments. Which of these panels is an incorrect statement? (Pause 5 seconds) *

12 Question Number 7. Which of these panels best illustrates a progression in chroma? (Pause 5 seconds) Question Number 7. Which of these panels best illustrates a progression in chroma? (Pause 5 seconds) *

13 Question Number 8. Which of these panels shows three pairs of complementary colors? (Pause 5 seconds) Question Number 8. Which of these panels shows three pairs of complementary colors? (Pause 5 seconds) *

14 Question Number 9. If you wanted to explain the form of a cube to a man who had never seen one, which of these drawings would best illustrate your explanation? (Pause 5 seconds) Question Number 9. If you wanted to explain the form of a cube to a man who had never seen one, which of these drawings would best illustrate your explanation? (Pause 5 seconds) *

15 Question Number 10. Which of these panels shows the three secondary colors? (Pause 5 seconds) Question Number 10. Which of these panels shows the three secondary colors? (Pause 5 seconds) *

16 Question Number 11. In these four drawings the shape and arrangement of the blocks does not change but the shadow pattern does. In three of the drawings the shadow pattern is impossible, containing contradictions. In which drawing is the shadow pattern logical and consistent? (Pause 5 seconds) Question Number 11. In these four drawings the shape and arrangement of the blocks does not change but the shadow pattern does. In three of the drawings the shadow pattern is impossible, containing contradictions. In which drawing is the shadow pattern logical and consistent? (Pause 5 minutes) *

17 Question Number 12. Each of these four panels represents a statement about mixing equal proportions of three pigments. Note that black is one of the three pigments mixed in Panel A. Which of these panels is an incorrect statement? (Pause 5 seconds) Question Number 12. Each of these four panels represents a statement about mixing equal proportions of three pigments. Note that black is one of the three pigments mixed in Panel A. Which of these panels is an incorrect statement? (Pause 5 seconds) *

18 In the next seven questions you will first be shown a painting and then be shown a slide with four color designs. One of the color designs will use the same combination of colors as the painting you have just seen. You will be asked to identify which of the color designs uses colors identical to those in the painting. Pay careful attention to the colors in each painting and to the color designs. You will see each slide * only once.

Slide #

19 Look carefully at the colors in this painting. (Pause 8 seconds) *
(PMA Manet,
Dead Toreador)

20 Question Number 13. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) *

21 Look carefully at the colors in this painting. (Pause 8 seconds) *
(PMA Picasso,
Dream, 1932)

22 Question Number 14. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) *

23 Look carefully at the colors in this painting. (Pause 8 seconds) *
(PMA Cezanne,
Card Players)

24 Question Number 15. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) *

25 Look carefully at the colors in this painting. (Pause 8 seconds) *
(PMA Braque,
Etude)

26 Question Number 16. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) *

27 Look carefully at the colors in this painting. (Pause 8 seconds) *
(PMA Braque,
La Valse)

28 Question Number 17. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) *

29 Look carefully at the colors in this painting. (Pause 8 seconds) *
(PMA Utrillo,
Paris Barracks)

30 Question Number 18. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) *

31 Look carefully at the colors in this painting. (Pause 8 seconds) *
(PMA Picasso,
The Dream)

32 Question Number 19. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) *

33 In the next five questions you will first be shown a photograph and then be shown a slide with four photographs. One of the four photographs will be identical to the photograph you have just seen. You will be asked to identify this photograph. Pay careful attention since you will see each slide * only once.

34 & 35 (blank) Look at this photograph carefully. (Pause 2 seconds) * (Pause 3 seconds) *

36 Question Number 20. Which of these photographs is identical to the one you have just seen? (Pause 5 seconds) *

| Slide # | |
|---|---|
| 37 & 38 (blank) | Look at this photograph carefully. (Pause 2 seconds) * (Pause 3 seconds) * |
| 39 | Question Number 21. Which of these photographs is identical to the one you have just seen? (Pause 5 seconds) * |
| 40 & 41 (blank) | Look at this photograph carefully. (Pause 2 seconds) * (Pause 3 seconds) * |
| 42 | Question Number 22. Which of these photographs is identical to the one you have just seen? (Pause 5 seconds) * |
| 43 & 44 (blank) | Look at this photograph carefully. (Pause 2 seconds) * (Pause 3 seconds) * |
| 45 | Question Number 23. Which of these photographs is identical to the one you have just seen? (Pause 5 seconds) * |
| 46 & 47 (blank) | Look at this photograph carefully. (Pause 2 seconds) * (Pause 3 seconds) * |
| 48 | Question Number 24. Which of these photographs is identical to the one you have just seen? (Pause 5 seconds) * |
| 49 | Question Number 25. In each of these panels, a different hue is superimposed on the same blue background. In which panel does the blue background seem most intense? (Pause 5 seconds) Question Number 25. In each of these panels, a different hue is superimposed on the same blue background. In which panel does the blue background seem most intense? (Pause 5 seconds) * |
| 50 | Question Number 26. To take a clear photograph of the texture of the moon's surface from a satellite, which of these targets would you select? (Pause 5 seconds) Question Number 26. To take a clear photograph of the texture of the moon's surface from a satellite, which of these targets would you select? (Pause 5 seconds) * |
| 51 | Question Number 27. Which of these blocks seems to be illuminated by the light of the setting sun? (Pause 5 seconds) Question Number 27. Which of these blocks seems to be illuminated by the light of the setting sun? (Pause 5 seconds) * |
| 52 | Question Number 28. The figure to the right of each building represents an adult of average height. In which of these views is the observer about 45 feet above the ground? (Pause 5 seconds) Question Number 28. The figure to the right of each building represents an adult of average height. In which of these views is the observer about 45 feet above the ground? (Pause 5 seconds) * |
| 53 | Question Number 29. Which of these panels best illustrates a progression in value? (Pause 5 seconds) Question Number 29. Which of these panels best illustrates a progression in value? (Pause 5 seconds) * |
| 54 | Question Number 30. In each of these panels, a different hue is superimposed on the same purple background. In which panel does the purple background seem most intense? (Pause 5 seconds) Question Number 30. In each of these panels, a different hue is superimposed on the same purple background. In which panel does the purple background seem most intense? (Pause 5 seconds) |

End-of-Course Achievement Test Script (Unrevised Form)

Part II

Slide #

1 This is the second test in the Education Through Vision Program. You should already have filled out the following information * at the top

2 of your answer sheet: your last name, first name and middle initial and your student identification number. You should also have checked the box numbered "two" on the right side of * your answer sheet.

3 Question Number 1. Which of these photographs is an example of frontlighting? (Pause 5 seconds) Question Number 1. Which of these photographs is an example of frontlighting? (Pause 5 seconds) *

4 Question Number 2. Which of these textures is most like the texture of paper? (Pause 5 seconds) Question Number 2. Which of these textures is most like the texture of paper? (Pause 5 seconds) *

5 Question Number 3. In each of these panels is a detail of a photograph. Which of the photographs was taken at a distance farthest from the subject being photographed? (Pause 5 seconds) Question Number 3. In each of these panels is a detail of a photograph. Which of the photographs was taken at a distance farthest from the subject being photographed? (Pause 5 seconds) *

6 Question Number 4. Which of these details is NOT an example of paint applied to a surface to achieve a textural effect? (Pause 5 seconds) Question Number 4. Which of these details is NOT an example of paint applied to a surface to achieve a textural effect? (Pause 5 seconds) *

7 Question Number 5. Which of these groups of trademarks most effectively conveys a feeling of relaxation, warmth, and friendliness? (Pause 5 seconds) Question Number 5. Which of these groups of trademarks most effectively conveys a feeling of relaxation, warmth, and friendliness? (Pause 5 seconds) *

8 In the next five questions you will first be shown a color arrangement and then be shown a slide with four color arrangements. One of the four arrangements will be identical to the one you have just seen; you will be asked to identify * this arrangement.

9 Look carefully at this color arrangement. (Pause 2 seconds) *

10 Question Number 6. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) *

11 Look carefully at this color arrangement. (Pause 2 seconds) *

12 Question Number 7. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) *

13 Look carefully at this color arrangement. (Pause 2 seconds) *

14 Question Number 8. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) *

15 Look carefully at this color arrangement. (Pause 2 seconds) *

Slide #

16 Question Number 9. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) *

17 Look carefully at this color arrangement. (Pause 2 seconds) *

18 Question Number 10. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) *

19 Question Number 11. Which of these photographs is an example of 45-degree sidelighting? (Pause 5 seconds) Question Number 11. Which of these photographs is an example of 45-degree sidelighting? (Pause 5 seconds) *

20 Question Number 12. In which of these photographs does the presence of people most detract from the mood the picture is meant to convey? (Pause 5 seconds) Question Number 12. In which of these photographs does the presence of people most detract from the mood the picture is meant to convey? (Pause 5 seconds) *

21 Question Number 13. Which of these groups of trademarks contains the most traditional symbols? (Pause 5 seconds) Question Number 13. Which of these groups of trademarks contains the most traditional symbols? (Pause 5 seconds) *

22 In each of the next three questions you will be shown a slide in which three panels contain details from the same painting. One of the panels contains a detail from a different painting; you will be asked to identify * this panel.

23 Question Number 14. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) Question Number 14. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) *

24 Question Number 15. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) Question Number 15. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) *

25 Question Number 16. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) Question Number 16. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) *

26 In each of the next seven questions you will be shown a slide in which three panels contain exact reproductions of original paintings. A fourth panel on each slide will contain a painting in which some prominent part of the original painting has been distorted or changed, resulting in faulty picture composition. You will be asked to identify which panel contains the painting * which has been altered.

27 Question Number 17. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 17. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

28 Question Number 18. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 18. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

Slide #

29 Question Number 19. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 19. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

30 Question Number 20. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 20. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

31 Question Number 21. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 21. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

32 Question Number 22. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 22. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

33 Question Number 23. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 23. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

34 Question Number 24. Which of these groups of trademarks most effectively conveys a feeling of strength and dependability? (Pause 5 seconds) Question Number 24. Which of these groups of trademarks most effectively conveys a feeling of strength and dependability? (Pause 5 seconds) *

35 Question Number 25. Which of these photographs is an example of 90-degree sidelighting? (Pause 5 seconds) Question Number 25. Which of these photographs is an example of 90-degree sidelighting? (Pause 5 seconds) *

36 Look carefully at the texture of this material. (Pause 2 seconds) *

37 Question Number 26. Which of these panels DOES NOT contain the texture you have just seen? (Pause 3 seconds) Question Number 26. Which of these panels DOES NOT contain the texture you have just seen? (Pause 3 seconds) *

38 Question Number 27. Which of these panels contains the best solution to the figure-ground relationship as you have studied it? (Pause 3 seconds) Question Number 27. Which of these panels contains the best solution to the figure-ground relationship as you have studied it? (Pause 3 seconds) *

39 Question Number 28. In which of these panels is the blue chroma the strongest? (Pause 3 seconds) Question Number 28. In which of these panels is the blue chroma the strongest? (Pause 3 seconds)

End-of-Course Achievement Test (Unrevised Form)

Key - Part I

| | | | |
|---|---|---|---|
| 1. | B | 16. | D |
| 2. | C | 17. | C |
| 3. | A | 18. | D |
| 4. | D | 19. | C |
| 5. | C | 20. | A |
| 6. | D | 21. | B |
| 7. | B | 22. | C |
| 8. | B | 23. | A |
| 9. | D | 24. | A |
| 10. | B | 25. | D |
| 11. | A | 26. | B |
| 12. | B | 27. | C |
| 13. | B | 28. | B |
| 14. | D | 29. | C |
| 15. | A | 30. | B |

Key - Part II

| | | | |
|---|---|---|---|
| 1. | B | 15. | D |
| 2. | C | 16. | A |
| 3. | B | 17. | B |
| 4. | A | 18. | A |
| 5. | C | 19. | D |
| 6. | B | 20. | A |
| 7. | C | 21. | B |
| 8. | A | 22. | C |
| 9. | C | 23. | D |
| 10. | C | 24. | B |
| 11. | A | 25. | C |
| 12. | D | 26. | D |
| 13. | D | 27. | C |
| 14. | B | 28. | D |

Appendix B

End-of-Course Achievement Test (Revised Form)

| Slide # | |
|---|---|
| 1 | (Focus) |
| 2 | This is the final examination in the Education Through Vision Program. You should already have filled out the following information * at the top |
| 3 | of your answer sheet: your last name, first name and middle initial and your student identification number. The remainder * of your answer sheet |
| 4 | consists of thirty squares, each divided into four equal sections which are labeled A, B, C, and D. The number of the test question to which each square corresponds appears at the upper left hand corner of each square. For each of the questions on this test, mark an "X" in the section of the appropriate square which corresponds to the best answer. * For example |
| 5 | if you were asked which of the four panels contains the color yellow, you * should respond by marking |
| 6 | the letter B. Each of the following questions will be read to you once; then there will be a brief pause, followed by another reading of the question and another pause. It is important that you listen carefully and that you record your answer during either the first or the second pause. The question will not be read to you * a third time. |
| 7 | Question Number 1. Which of these photographs is an example of frontlighting? (Pause 5 seconds) Question Number 1. Which of these photographs is an example of frontlighting? (Pause 5 seconds) * |
| 8 | Question Number 2. In each of these panels, a different hue is superimposed on the same blue background. In which panel does the blue background seem most intense? (Pause 5 seconds) Question Number 2. In each of these panels, a different hue is superimposed on the same blue background. In which panel does the blue background seem most intense? (Pause 5 seconds) * |
| 9 | In the next three questions you will first be shown a color arrangement and then be shown a slide with four color arrangements. One of the four arrangements will be identical to the one you have just seen; you will be asked to identify * this arrangement. |
| 10 | Look carefully at this color arrangement. (Pause 2 seconds) * |
| 11 | Question Number 3. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) * |
| 12 | Look carefully at this color arrangement. (Pause 2 seconds) * |
| 13 | Question Number 4. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) * |
| 14 | Look carefully at this color arrangement. (Pause 2 seconds) * |

*Indicates position of inaudible slide change signal on tape.

The work presented or reported herein was performed pursuant to a grant from the U.S. Office of Education, Department of Health, Education, and Welfare.

Slide #

15 Question Number 5. Which of these color arrangements is identical to the one you have just seen? (Pause 5 seconds) *

16 In the next two questions you will first be shown a photograph and then be shown a slide with four photographs. One of the four photographs will be identical to the photograph you have just seen. You will be asked to identify this photograph. Pay careful attention since you will see each slide * only once.

17 Look at this photograph carefully. (Pause 2 seconds) *

18 Question Number 6. Which of these photographs is identical to the one you have just seen? (Pause 5 seconds) *

19 Look at this photograph carefully. (Pause 2 seconds) *

20 Question Number 7. Which of these photographs is identical to the one you have just seen? (Pause 5 seconds) *

21 Question Number 8. Which of these panels shows the three primary colors of pigment? (Pause 5 seconds) Question Number 8. Which of these panels shows the three primary colors of pigment? (Pause 5 seconds) *

22 Question Number 9. Which of these blocks seems to be illuminated by the light of the setting sun? (Pause 5 seconds) Question Number 9. Which of these blocks seems to be illuminated by the light of the setting sun? (Pause 5 seconds) *

23 Question Number 10. In each of these panels, a different hue is superimposed on the same purple background. In which panel does the purple background seem most intense? (Pause 5 seconds) Question Number 10. In each of these panels, a different hue is superimposed on the same purple background. In which panel does the purple background seem most intense? (Pause 5 seconds) *

24 Question Number 11. In which of these drawings is the cast shadow illogical? (Pause 5 seconds) Question Number 11. In which of these drawings is the cast shadow illogical? (Pause 5 seconds) *

25 Question Number 12. Which of these groups of trademarks most effectively conveys a feeling of strength and dependability? (Pause 5 seconds) Question Number 12. Which of these groups of trademarks most effectively conveys a feeling of strength and dependability? (Pause 5 seconds) *

26 Question Number 13. In each of these panels is a detail of a photograph. Which of the photographs was taken at a distance farthest from the subject being photographed? (Pause 5 seconds) Question Number 13. In each of these panels is a detail of a photograph. Which of the photographs was taken at a distance farthest from the subject being photographed? (Pause 5 seconds) *

27 Question Number 14. Which of these details is NOT an example of paint applied to a surface to achieve a textural effect? (Pause 5 seconds) Question Number 14. Which of these details is NOT an example of paint applied to a surface to achieve a textural effect? (Pause 5 seconds) *

28 Question Number 15. Which of these photographs is an example of 45-degree sidelighting? (Pause 5 seconds) Question Number 15. Which of these photographs is an example of 45-degree sidelighting? (Pause 5 seconds) *

| Slide # | |
|---|---|
| 29 | Question Number 16. In which panel is there a clearly inconsistent color in the shadow field? (Pause 5 seconds) Question Number 16. In which panel is there a clearly inconsistent color in the shadow field? (Pause 5 seconds) * |
| 30 | Question Number 17. Which of these panels shows the three secondary colors? (Pause 5 seconds) Question Number 17. Which of these panels shows the three secondary colors? (Pause 5 seconds) * |
| 31 | Question Number 18. Which of these photographs is an example of 90-degree sidelighting? (Pause 5 seconds) Question Number 18. Which of these photographs is an example of 90-degree sidelighting? (Pause 5 seconds) * |
| 32 | In the next four questions you will first be shown a painting and then be shown a slide with four color designs. One of the color designs will use the same combination of colors as the painting you have just seen. You will be asked to identify which of the color designs uses colors identical to those in the painting. Pay careful attention to the colors in each painting and to the color designs. You will see each slide * only once. |
| 33 | Look carefully at the colors in this painting. (Pause 8 seconds) * |
| 34 | Question Number 19. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) * |
| 35 | Look carefully at the colors in this painting. (Pause 8 seconds) * |
| 36 | Question Number 20. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) * |
| 37 | Look carefully at the colors in this painting. (Pause 8 seconds) * |
| 38 | Question Number 21. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) * |
| 39 | Look carefully at the colors in this painting. (Pause 8 seconds) * |
| 40 | Question Number 22. Which of these designs uses the same combination of colors as the painting you have just seen? (Pause 5 seconds) * |
| 41 | Question Number 23. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) Question Number 23. Which of these details is NOT from the same painting as the other three? (Pause 5 seconds) * |
| 42 | Each of these panels shows a possible "target area," indicated by crossed lines, at which the lens of a camera mounted in a satellite could be directed. Question Number 24. To take a clear photograph of the texture of the moon's surface, which of these target areas would you select? (Pause 5 seconds) Question Number 24. To take a clear photograph of the texture of the moon's surface, which of these target areas would you select? (Pause 5 seconds) * |
| 43 | Question Number 25. Which of these panels shows three pairs of complementary colors? (Pause 5 seconds) Question Number 25. Which of these panels shows three pairs of complementary colors? (Pause 5 seconds) * |

Slide #

44 Question Number 26. The figure to the right of each building represents an adult of average height. In which of these views is the observer about 45 feet above the ground? (Pause 5 seconds) Question Number 26. The figure to the right of each building represents an adult of average height. In which of these views is the observer about 45 feet above the ground? (Pause 5 seconds) *

45 Question Number 27. Each of these four panels represents a statement about mixing equal proportions of two pigments. Which of these panels is an incorrect statement? (Pause 5 seconds) Question Number 27. Each of these four panels represents a statement about mixing equal proportions of two pigments. Which of these panels is an incorrect statement? (Pause 5 seconds) *

46 Question Number 28. If you wanted to explain the form of a cube to a man who had never seen one, which of these drawings would best illustrate your explanation? (Pause 5 seconds) Question Number 28. If you wanted to explain the form of a cube to a man who had never seen one, which of these drawings would best illustrate your explanation? (Pause 5 seconds) *

47 Question Number 29. In which of these photographs does the presence of people most detract from the mood the picture is meant to convey? (Pause 5 seconds) Question Number 29. In which of these photographs does the presence of people most detract from the mood the picture is meant to convey? (Pause 5 seconds) *

48 Three of these panels contain exact reproductions of original paintings. One panel contains a painting in which some prominent part of the original painting has been distorted or changed, resulting in faulty picture composition. Question Number 30. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) Question Number 30. Which of these panels contains a painting in which the composition has been altered? (Pause 8 seconds) *

49 (End)

End-of-Course Achievement Test (Revised Form)

Key

| | | | |
|---|---|---|---|
| 1. | B | 16. | D |
| 2. | D | 17. | B |
| 3. | B | 18. | C |
| 4. | C | 19. | C |
| 5. | A | 20. | A |
| 6. | A | 21. | D |
| 7. | A | 22. | D |
| 8. | C | 23. | A |
| 9. | C | 24. | B |
| 10. | B | 25. | B |
| 11. | B | 26. | B |
| 12. | B | 27. | A |
| 13. | B | 28. | D |
| 14. | A | 29. | D |
| 15. | A | 30. | A |

Notice for non-ETV teachers only.
In the space provided below write the subject matter area of your class (i.e.; Art, History, etc.)

_____

CLASS ACTIVITY LOG

School _____

Teacher _____

Class Identification No. _____
(Obtain from Test Coordinator)

| Class Meeting No. | Date | Activity (Refer to Syllabus page number if appropriate) | Materials Used |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

## Appendix D

### Test Characteristics

| Test | Administration Time | No. of Items | Type of Score Obtained |
|---|---|---|---|
| SCAT Survey (Form 2B) | | | |
| Part I (Verbal) | 15' | 30 | Rights |
| Part II (Math.) | 20' | 25 | Rights |
| Hidden Figures | 20' | 32 | R - W/4 |
| Simile Interpretations | 4' | 4 | Rights |
| Estimation of Length | 6' | 80 | R - W/4 |
| Symbol Production | 10' | 61 | Rights |
| Object Synthesis | 10' | 24 | Rights |
| Surface Development | 12' | 60 | R - .17 W* |
| Match Problems II | 14' | 38 | Rights |
| Utility | 10' | 2 | Shift** |
| Understanding Metaphor | 30' | 30 | Rights |
| End-of-Course Achievement | | | |
| Unrevised | 28' | 58 | Rights |
| Revised | 15' | 30 | Rights |

*Items had from five to eight response options. The correction factor was computed from the formula

$$C = n_1/N(k_1-1) + n_2/N(k_2-1) + \ldots$$

where N = total number of items

$n_1$ = number of items having $k_1$ response options

**Responses are scored, not for fluency or the total number of categories used, but for the number of shifts in thinking demonstrated throughout the test. Therefore, every response is scored in relation to the responses before it. If a response shows an approach to the use of an object which differs from that of the preceding answer, it is given a score of one, as evidence of the shift.

## Appendix E

### Intercorrelations*

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. SCAT Verbal | | 38 | 19 | 29 | 02 | 18 | 12 | 35 | 38 | 29 | 62 |
| 2. SCAT Math | 32 | | 17 | 00 | 02 | 09 | 03 | 36 | 35 | 08 | 23 |
| 3. Hidden Figures | 21 | 20 | | -04 | 24 | 22 | 01 | 39 | 30 | 03 | 16 |
| 4. Simile Interpretation | 28 | 19 | -02 | | 09 | 26 | 22 | -14 | 05 | 24 | 22 |
| 5. Estimation of Length | 07 | 10 | 23 | 02 | | 22 | 10 | 21 | 21 | 08 | 02 |
| 6. Symbol Production | 20 | 10 | 10 | 15 | 04 | | 21 | 14 | 18 | 26 | 12 |
| 7. Object Synthesis | 19 | 06 | 15 | 06 | 13 | 13 | | 13 | 12 | 37 | 02 |
| 8. Surface Development | 18 | 23 | 51 | -01 | 30 | 01 | 19 | | 48 | 11 | 25 |
| 9. Match Problems | 17 | 22 | 31 | -05 | 30 | 08 | 09 | 47 | | 17 | 27 |
| 10. Utility | 22 | 13 | 07 | 25 | 18 | 24 | 21 | 11 | 20 | | 15 |
| 11. Understanding Metaphor | 42 | 19 | 31 | 19 | 10 | 01 | 10 | 32 | 08 | 20 | |

*Intercorrelations for females (N = 195) appear above the diagonal; those for males (N = 161) appear below the diagonal. Decimal points are omitted.

OE 6000 (9-66) DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
WASHINGTON 25, D.C.

**ERIC DOCUMENT RESUME**

DATE OF RESUME: 3/8/68

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| | 11. CONTRACT NO.: OEC-1-7-070049-0161 | |

12. PUBLICATION TITLE: N.A.

13. EDITOR(S): N.A.

14. PUBLISHER: N.A.

15. ABSTRACT (250 words max.)

This evaluation study was primarily an empirical search for criteria corresponding to the stated aims of the Education Through Vision curriculum. This innovative curriculum, developed under the direction of Bartlett H. Hayes, Jr., was presented to pilot classes in eleven junior and senior high schools in several eastern and southern states during the 1966-1967 school year. Tests of nine cognitive variables were administered to Education Through Vision and comparison classes, and the relative effects assessed. A special achievement test of curriculum content, administered by means of tape recordings and colored 35 mm. slides, was developed. Item data are reported indicating relative strengths and weaknesses of specific curriculum units.

16. RETRIEVAL TERMS (Continue on reverse)

art
curriculum
evaluation
experimental
innovation
perception
test
audio-visual
visual

17. IDENTIFIERS: N.A.

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16. RETRIEVAL TERMS (Continued)

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