

THE UNIVERSITY OF MANITOBA

THE DEVELOPMENT OF A DRAWING TEST
FOR UTILIZATION IN
HIGH SCHOOL ART EDUCATION

by

ARTHUR WAI CHING LO

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ABSTRACT

Although visual perception has been a long standing goal in art education, art educators generally find it hard to be specific about how such a goal can be evaluated objectively because of the scarcity of standardized tests. The purpose of this study was to (1) develop a drawing test, (2) administer it to four groups of twenty students in grade ten and eleven with differing high school art training, (3) analyse and compare the results of the drawing test consisting of eight still life objects drawn under a specific lighting condition, and (4) determine its usefulness to art teachers in practice.

Using a descriptive method, the study analysed and compared the works of four groups of grade ten and eleven students with differing amount of high school art training at Gordon Bell High School in Manitoba. A pilot study whose purpose was to improve and standardize procedures for the main study involved 100 grade ten and eleven students. Hypotheses were developed on the assumption that the drawing test would indicate significant differences in the performances of the various groups:

1. The drawings resulting from the test would indicate that the grade 11 students with two years of high school art training would score higher than the grade 11 students with no previous high school art training.

2. The drawings resulting from the test would indicate that the students with one year of high school art training will score higher than the students with no previous high school art training, and

3. The scores of the drawing test would correlate positively with those obtained in the Torrance's Picture Completion Test for Creative Thinking for the four groups of high school students.

The criterion for the drawing test of still life objects was based on four behavioral traits -- originality, effort performance, work efficiency and differentiation. Each of these traits was derived from major learning theories in art education: (1) originality was defined as the ingenuity in choosing an eye-level in observing things, (2) effort performance was defined as the visual effort in seeing as much detail of an object as possible, (3) work efficiency was defined as the visual-motor skill required to draw as many objects as possible within a given time period, and (4) differentiation was defined as the visual capacity to discriminate size relationship among the different objects.

The instrument used in the drawing test was a 'light-proof' box to which six different controllable light sources were attached. Eight still life objects were put inside the box in a fixed composition so that the light and dark varia-

tions of the objects under a specific lighting condition could be studied clearly through a viewing aperture. The examinee was asked to make a pencil drawing and complete the test in a forty minute period. His drawing was scored by three judges who evaluated each of the four visual traits using a five-point scale to determine excellence in each of the criterion.

The findings from this study, in supporting the two major hypotheses, indicated that grade 11 students with two years of high school art training and grade 10 students with one year of high school art training scored significantly higher than students of the same grade level who had no high school art training. The drawing test developed in this study also appeared to be a useful tool for art teachers seeking to understand the visual capabilities or limitations of students. In this regard, art curricula could fulfill a need for providing remedial or enrichment programs in visual training. Utilization of the drawing tests may assess the various needs of students in drawing courses.

CHAPTER I

INTRODUCTION TO THE STUDY

Since John Dewey's Progressive Education Movement in the 1930's, many art educators have begun to put more emphasis on creative thinking and development of visual perception in the planning and teaching of their programs. In as much as recent research in Education and Psychology has assisted art educators in recognizing the development of visual perception and creative thinking as two worthwhile objectives, these two objectives are not necessarily new in the field of art education. As early as 1899, a Committee of Ten on Drawing organized by the National Education Association (quoted in Klar, Winston and Kirby, 1933) formally stated the importance of developing visual perception and creative thinking as two of four desirable goals in art education:

1. To offer a consistent development in the faculty of sight,
2. To develop an appreciation of the beautiful,
3. To acquire the ability to represent,
4. To develop the creative impulse and thinking. . .

(p. 271)

The first statement in particular relates to the development of visual perception; and for the purpose of this study, implies that visual-perceptual efficiency in drawing is important in expressing graphic ideas adequately. Few studies have

stressed 'visual perception' development as a measurable goal. In contrast, 'creative thinking' has had more emphasis or stress as an obtainable goal in art programs.

Kepes (1965) pointed out that in fact a key task of our times is the education of vision -- the development of visual perception which is essential to a student's awareness of his environment. He claimed that although visual training has been a long standing goal in art education, art educators have not been specific about a sequential program which focuses on visual perception. Since most experiments and findings on visual perception are to be found in the field of psychology rather than in art education, art educators need to examine the relevancy of those findings and implement aspects of the records according to their needs. Studies concerning visual perception are therefore urgently needed for the progressive development of curricula in art education. Specifically, the development of a drawing test may assist art teachers to assess students' drawing abilities more accurately and to develop remedial or enrichment programs in art.

Statement of the Problem

The purpose of this study is to (1) develop a drawing test, (2) administer it to groups of grade ten and eleven students with differing high school art training, and (3) analyse

and compare the results of the test.

The Testing Instrument and Criteria

The testing instrument included a light-proof box on to which six different controllable light sources were attached. Eight, still life objects were put inside the box in a fixed composition so that light and dark variations or shadings of the objects, under a specific lighting condition, could be studied clearly through a viewing aperture by a student. The student was asked to make a pencil drawing for the test within a forty minute period. The criteria for evaluating the instrument consisted of descriptions of four observable traits for visual perception: (1) originality, (2) effort performance, (3) work efficiency, (4) differentiation. Originality was to be scored in terms of the eye-level or angle chosen by a student for his drawing, effort performance in terms of the amount of light and dark value variations or shading details observed in each object, work efficiency in terms of the number of objects finished for the drawing test within a given forty minute period and differentiation in terms of ability to perceive accurately and draw the objects according to scale and in relation to one another. This was presented in a format requiring a rating of each quality respectively on a five-point scale.

The drawing test was conducted in Gordon Bell High School

in Winnipeg, Manitoba over a one-year period. The pilot study, the purpose of which was to improve and standardize procedures for the main study involved 100 grade 10 and 11 students. The main study involved four groups of twenty grade ten and eleven students. Half of the sample or 40 students had taken no high school art course of any kind while the other half of the sample had had one or two years of high school art training. The Torrance Picture Completion Test for Creative Thinking was also administered to the four groups of students and the results were used as an appendage to the overall findings of this study.

Hypotheses

The major hypotheses developed for this study are:

1. The drawings resulting from the test will indicate that the grade 11 students with two years of high school art training will score higher than the grade 11 students who have had no previous high school art training.
2. The drawings resulting from the test will indicate that the students with two years of high school art training will score higher than the students with only one year of high school art training.
3. The drawings resulting from the test will indicate that the students with one year of high school art training

will score higher than the students with no previous high school art training.

4. The scores of the drawing test will correlate positively with those obtained in the Torrance's Picture Completion Test for Creative Thinking for the four groups of high school students.

Statement of Major Assumptions

The study is based on the following major assumptions:

1. The development of visual perception can be advanced in different degrees, depending on the amount of high school art experience a student has had, i.e., it is in direct ratio to the amount of visual art training.

2. Visual perception can be measured by developing a standardized drawing test in which a student may express freely and accurately his visual ideas.

Statement of Limitations

The following limitations should be noted in interpreting the findings of this study:

1. The methodological limitation inherent in the design of the study under which the drawing test was administered to the Gordon Bell High School's sample population; i.e., the physical structure of the testing instrument, the forty minute

time condition allowed for each drawing test, the duration of the testing period (about two months) and the environmental conditions (Gordon Bell School's educational structure and the set-up of the testing room). Changes in any one of these conditions will of course affect the drawing test results;

2. The structure of Gordon Bell High School's regular grade 9 and 10 art programs that constitute the grade 10 and 11 art students' high school art training. The grade 9 or grade 10 regular art program basically contains nine fundamental areas of studies. They are: (1) drawing and painting, (2) lettering, (3) design, (4) ceramics, (5) sculpture, (6) printmaking, (7) mosaics, (8) murals, and (9) textiles. Besides these nine areas of studies that are recommended by the 1961 'High School Program of Studies' of Manitoba Department of Youth and Education, three still life drawing projects specifically designed for developing students' visual perception are also included. They contained a value drawing study, a texture drawing study and a pattern drawing study of various natural objects. As a student who has had a different previous high school art program which may stress different areas of studies in art and visual development was not included as a participant in this study, all these must be taken into consideration as a limitation in interpreting a group of students' drawing test results.

Definition of Terms

Visual Perception

Visual perception in art education generally refers to the refining of the optical senses and the development of the ability to view objects in ways which go beyond mere recognition. Specifically, it involves the using of past art training and knowledge to interpret, evaluate and represent the perceived objects competently through an art medium, e.g., in a drawing or painting. In this sense, visual perception in art is usually related to a student's performance with an art medium as a result of his visual art training.

Visual Perception Traits

In this drawing test, a student's pencil drawing of the still life objects is rated on four traits: (1) originality (O), the unique or novel way in adopting an eye-level in observing objects, (2) Effort Performance (EP), the amount of light and dark value variations or shading details observed in each object, (3) Work Efficiency (WE), the number of objects finished for the drawing test within a given forty minute period and, (4) Differentiation (D), the ability to perceive discriminately and draw the objects according to scale and in relation to one another.

Creative Thinking

The term is used here as it has been specifically defined in 'Torrance's Picture Completion Test for Creative Thinking' (1966) in terms of four overt traits; originality, flexibility, fluency and elaboration.

Value

The term is used to refer to the different degrees of light and dark tone on an object under different lighting conditions. In a pencil drawing such as the one used in the test of this study, it is expressed as different shadings on the drawn object.

CHAPTER II

A SURVEY OF RELATED LITERATURE

The literature related to the topic of this study falls into three categories: (1) theoretical foundations of the study, (2) research to visual preception evaluation in art education and (3) visual perception drawing test methodology.

Theoretical Foundation for the Study

Importance of Visual Perception in Art Education

Interest in the development of a drawing test depends on the realization of how important visual training is as a part of the public school art education program.

Guy Hubbard (1967) advocated visual training as an important aspect of art education:

"The utility of vision in everyday life is undeniable. Vision is also fundamental to the study of the visual arts whether one serves as a critic or as a producer in art. The person whose potential for thinking visually has been well developed is more likely to be prepared both for understanding and creating works of art than a person whose visual abilities are untrained. The truly educated person has many visual resources to turn to help. He has a large repertoire of things he has seen and he can recall many visual ideas and events. He can make fine visual comparisons, perceive in great detail, resolve visual problems. The poorly educated person visually cannot do these things nearly as well. His progress in art studies will be slower than that of the visually more mature student." (p. 28)

Accordingly if visual training underlies a student's overall progress in art, the task for art educators to develop an instrument to evaluate the development of visual perception should not be neglected. Such a test is often as controversial as the planning of visual training itself. McFee (1961), in explaining the visual changes and methods by which the changes can be accomplished, outlined some difficulty with visual training as an item worthy of evaluation:

"The emphasis made on the need for visual training of children and students may cause some cries of 'if you do this you will stifle creativity, for artists today do not copy nature.' This criticism usually comes from people who are not aware of the complexity of the visual process. Visual training increases the wealth of materials the children have to work with. If visual training becomes rigid and authoritarian, it may inhibit creative activity, but if it is used to motivate visual curiosity and exploration it should widen the range of creative students. Much more effect of light and color, of form and line will become available for children to use. They will go beyond the cognitive categorizing and see more details and significant relations as they respond to their environment, both visually and cognitively." (p. 63)

In terms of positive experience gained from visual training in art, McFee (1966) claimed that every future citizen should attain a high degree of visual proficiency in order to sharpen his critical faculties. At the classroom level, a student who has gained a high level of proficiency in visual observation is to have a greater opportunity to use art media more creatively. In this sense, a visual perception drawing test

for utilization in art is important to any art teacher who wants to improve his art program. Moreover, the validity of a drawing test for utilization in art relies on its capacity to detect specific differences in visual development between or among students who have had different amounts of art training and experience. The test should be reliable and yield similar results when utilized by several groups of students who are evaluated by different judges.

Derivation of Visual Perception Traits

There is difficulty in assessing the complex aspects of visual perception and usually, general inferences about the behavioral traits of visual perception characterize art programs. The four overt behavioral traits chosen for the study (i.e., originality, effort performance, work efficiency and differentiation) represent a synthesis of many learning theories in art education.

As early as 1954, Attneave introduced some aspects of visual perception in art as information-handling processes. His Information-Handling Theory claimed that perceiving involves much more visual information than an individual can think about at any given time, and every time we deal with even the simplest visual objects, we use only part of the information that is reflected on the retina. In the process of recognition and

differentiation of the visually perceived objects, an individual has to rely on his past knowledge to classify (1) similar things as units, (2) the random by averages and, (3) according to wholes and completions. According to this theory, a student's drawing should normally have the characteristics of (a) cognitive generalization by things that draw most of his attention, (b) randomization of other objects less important to him and (c) tendency to envisage the rest of the objects that can only be partly perceived. In short, a drawing showing detailed differentiation of subject matter is thought to be an important trait of visual perception, and the ability of a student to show such a trait in his drawing depends somehow on the amount of past training he has had in art.

Differentiation, a behavioral trait of visual capacity to select and discriminate objects is also related to the amount of visual effort put in a drawing study. Visual effort performance, beyond normal visual capacity developed as a result of age and maturity, can be in fact refined through training. Such visual training is needed to avoid what McFee (1961) called 'errors as a result of perceiver's "constancies" ':

There is a tendency for us to identify things by their functions rather than by their visual qualities. For example, a child learns the "thinglike" quality of the ball -- its function such as rolling and bouncing. Adults teach him about balls through manipulation -- learning to roll, catch and bounce a ball. Rarely are the visual qualities of a ball in light and space introduced to him; nor is he encouraged to respond to a ball visually except for simple

recognition of size and color and possible decoration. For this reason, he tends to see the ball same size twenty feet away as it is in his hand, the same color in bright light or in shade These tendencies to depend on what is known are called "constancies". (p. 47)

For an art educator, one of the aims of developing visual perception in art is to go beyond a child's three common perceptual constancies -- the brightness constancy, the size constancy and the shape constancy. For as long as a child keeps seeing objects as the same light and dark value, the same size and shape regardless of the actual comparative size depending on the distance between the objects and the viewer, and regardless of the real shape at the eye-level from which they are observed, the child would seem to be restricted or limited since little differentiative visual capacity is expressed, and little training to concentrate his visual effort is expended, beyond mere recognition of objects and their functional attributes.

This does not mean that a visually sensitive art student would not show any error of perceptual constancies in his drawing works; however, it does point out that with specific visual training in art education, the student would not be dominated by "constancies" or restricted by them. A drawing test developed for assessing visual perception should then be able to measure his differentiative and effort performance in his drawing work.

Arnheim's Perceptual Theory (1954) developed mainly from Gestalt psychology suggested that although one sees in wholes most of the time, he perceives only as much details as is necessary according to his past learning background experience has prepared him to see, e.g., one first sees an object at a distance as a form of shape only, depending on the original angle or eye level of observation. As one puts more and more effort in his visual concentration, he then perceives enough details about form or shape to name the object. Then by sustaining his visual effort, he may even obtain enough visual cues to identify what the object really is according to his past knowledge -- so that, if he chooses, he can draw in detail on a piece of paper a reproduction of the perceived object. According to this theory, the success of his drawing depends not only on the differentiative and effort performances mentioned earlier, but also on his originality in choosing a unique angle or eye level of viewing. In this sense, originality in a drawing may also be defined as a student's ingenuity in adopting an uncommon way of observing and studying things. The most common way of seeing things is the least original in the sense that it will involve less ingenious visual effort on the part of a student in making a drawing study. Such visual effort is of course important in observing objects for a detailed value study. Work efficiency was added to the list of traits as another way of measuring how the student expressed

himself in terms of visual motor efficiency within a given time to complete the drawing — say, over a forty minute period. Visual originality, differentiation, effort performance and work efficiency are therefore traits which were considered important in developing an instrument for assessing drawings of high school students.

In summary, the four visual traits used in the drawing test can be summarized as follows:

- (1) Originality (O): The student's unique or novel way of choosing an eye level in viewing objects for his drawing. A more uncommon eye level indicates more originality in a student's drawing.
- (2) Effort Performance (EP): The student's visual effort as shown by the amount of light and dark variation or shading details representing each object in his drawing.
- (3) Work Efficiency (WE): The student's visual-motor skill in finishing as many objects as possible in his drawing within a forty minute period.
- (4) Differentiation (D): The student's visual ability to compare, discriminate and draw the objects according to scale in a compositional relationship.

Research Relating to Visual Perception Evaluation in Art

Most early tests dealing with visual perception are

based on the premise that the ability of artists to observe phenomena with more adequacy is greater than that of people lacking training in art. In short, a drawing test should be reliable and should detect differences of visual development among people who have different amounts of art training. One of the widely used tests, the Meier Art Test (Meier, 1940, 1963) concluded that people with art training are more sensitive visually and therefore will respond to the aesthetic character of a work of art more readily. Another test, the Education Through Vision, End of Course Achievement Test (Trisman, 1968), which also attempted to measure visual perception achievement among different groups of people with different aesthetic training, arrived at a similar conclusion. However, both of the tests were not developed specifically for testing visual perception in art at the high school level.

Later study by Anderson (1968) on the aesthetic judgment and perceptual sensitivity of high school students established a direct relationship between a student's work efficiency in producing outstanding art work and his previous visual art training. Other recent studies by Breithaupt (1954), Kensler (1964), Lang (1961) and McWhinnie (1965) on various aspects of visual perception in art education have not only indicated visual training to be an important part of modern art programs, but affirmed that there may be a direct relationship between a student's visual aesthetic awareness and his past

learning experience in art. A recommendation for the development of a practical visual perception testing instrument for utilization in art specifically for high school students is commonly cited. Moreover, the structure of a visual perception drawing test for students at that level should be interesting, flexible and manoeuvrable enough within a set framework to be used more than once on the same group of students. The drawing results of such a test may be useful not only to an art teacher who wants to improve the content of an art program, but also to the student who may be made aware of his weaknesses and seek to overcome them. The validity of a drawing test is then related to its capacity to show accurately the differences of achievement between groups of grade 10 and grade 11 students who have different amounts of high school art training. It should also be reliable and yield similar results when administered to several groups of students and also when it is evaluated by different examiners.

Visual Perception Testing Methodology

Since visual perception is complex, most researchers making studies of it have to identify many traits, including some similar to the four used in this study. The major problem of visual perception testing methodology is stated by Barsch (1967) this way:

To classify an individual as perceptually handicapped has little significance unless such a statement is accompanied by a description or types of classes of events and categories which are characteristically misperceived by the individual (p. 170)

Studies by Mitchell (1957) on relationship between attitudes about visual art training and behavior in art activity and by Solome (1964) on the effects of visual learning upon two dimensional drawings by children, and by Van Voorhis (1942) on the space perception ability as a result of art education indicate different attempts to study visual perception. They generally summarized that the methodology of a visual perception drawing test has to involve a tightly-controlled testing instrument and standardized evaluation guidelines.

Because of the common problem in testing methodology, a great deal has been written on the topic of validity of visual perception and creativity tests. The best summary criticisms are based on the grounds that existing visual perception or creativity tests are usually not much more than a slightly different kind of I.Q. test is found in a book by Wallach and Kogan (1965). They pointed out again and again that relationships among visual perception or creativity tests, which are supposed to be measuring something common to them but distant from I.Q. tests, are weaker than relationships between visual and I.Q. tests.

One of the explanations about the weak correlated reliability among various visual perception tests in art lies in the fact that one test tends to include too many traits or items to be each measured clearly. Some visual tests used simply measure a student's creative thinking rather than his visual capacities. Whereas a student's creative and his visual development in art may or may not be inter-related, the investigator feels that they may best be measured separately, if possible. The crucial task in the development of a drawing test for high school students is to determine logically the four major desirable visual traits in art that are manageable in number under a single theme of study through a common art medium; i.e., the testing of visual perception using a still life study done in pencil and evaluated for originality, effort performance, work efficiency and differentiation. Another test dealing with creative thinking; the Torrance Picture Completion Test for Creative Thinking, was administered separately.

Numerous criticisms were mentioned earlier concerning general testing methodology. The researcher feels that in the study reported, an attempt was made to follow sound procedures in the design of the instrument. He feels also that the justification of his study could best be represented by the following statements made by E. Eisner and D. Ecker (1966):

"One of the crucial tasks for art educators (today) is not to find ways to resist changes, but rather, to employ critical procedures by which wise choices may be made along competing proposal for changes In matter of fact the body of conclusions provided by research in the behavioral sciences may be the most appropriate resources to consult. But where critical answers to factual problems relevant to art education are not available, art educators must pursue philosophic research. Art education should consider part of its task the provision of relevant data through empirical research. But however important such data may be, the problem of what ends are worth pursuing is reasonably managed by philosophic inquiry. Indeed, the extent to which the inquiry should or should not, can or cannot employ various scientific procedures is itself a philosophic problem." (p. 12-13)

In summary, a review of related literature in this chapter developed recognition of the importance of visual development as an objective of art education and the need for developing a testing instrument in this regard especially at the high school level. It also revealed some sound principles upon which a visual perception drawing test for high school art students could be developed.

CHAPTER III

INSTRUMENT AND STUDY PROCEDURES

The structure of a drawing test as an assessing instrument is described in detail in the first part of this chapter. In the latter part of the chapter, the study procedure about how the instrument was administered to different groups of high school students of Gordon Bell High School is made explicit.

Instrument

The lightproof viewing box

The lightproof viewing box, developed specifically for the drawing test, was made up of four pieces of wood, 2 feet by 4 feet and two pieces of plywood 2 feet by 2 feet (each being one inch in thickness). They were nailed tightly together to form a rectangular box, 4 feet by 2 feet by 2 feet, which was painted black outside and white inside to ensure maximum interior light reflection. Two holes, (6 inches in diameter) were cut out in the centre of the box and the side panels. These six holes would be named Light Hole No. 1, Light Hole No. 2, . . . etc. for easy references. They were the only inlet channels through which controlled artificial light (six 60 watt light

bulbs to be fitted on to each of the light holes) could be affixed inside the box. Another viewing hole (V.H. 10 inches in diameter) was made in the centre of the front 2 foot by 2 foot panel with ten eye-level markings, each an inch apart, around its circumference. See Figure 1 (a) and (b) as follows:

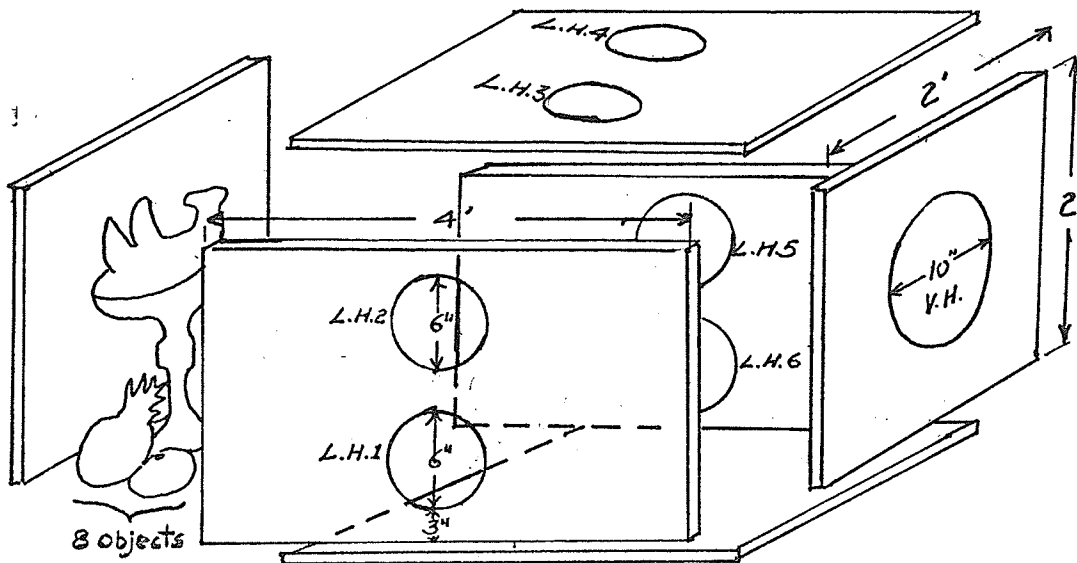


Figure 1(a) The Viewing Box

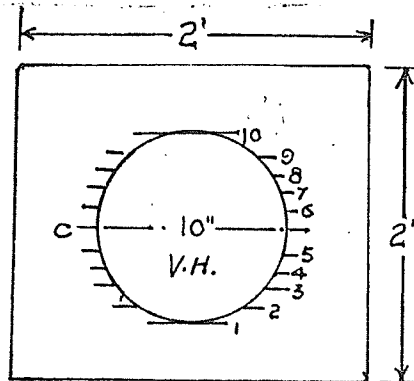


Figure 1(b) The Front Panel

The Still Life Objects

As shown in Figure 1 (a), a number of still life objects were put inside the viewing box and their light and dark value variations could be studied under controlled lighting conditions, (i.e., when one of the six light sources from any of the six light holes was turned on) through the viewing hole by a student taking the test. The still life objects to be studied were seven common artificial fruits; namely, (1) a pineapple, (2) a grapefruit, (3) a coconut, (4) an apple, (5) an orange, (6) a string of two bananas, and (7) a cluster bunch of grapes, together with (8) a grey ceramic vase.

The seven still life objects were chosen for their familiarity as a common visual experience and their variety in shape and texture in making an interesting composition for a value drawing study for the VP test. The fruits were constructed out of plastic. Real fruits could not be used because biochemical processes might affect their natural coloration and shape during the long testing periods; i.e., some of them might dry up or become spoiled so much so that their shapes would change before the study was over.

A grey vase was inserted with the fruit objects to diversify the height of the composition (an otherwise unilevel study of objects). Its grey hue also provided a neutral tone

of reference to assist students to perceive visually the light and dark values around it.

Other common objects could have been used for the study. Lowenfeld (1959) placed strong emphases on careful selection and presentation of natural objects or events as the subject matter of students' art work, particularly when they might have a potential reference to the immediate experience of students -- he surmised that wisely chosen subject matter for visual training in art, either by the teacher or by the students, would produce meaningful art work that promoted creativity. However, the selection of still life objects for this study was carried out by the investigator since a large number of students, 100 in the pilot study, and 80 in the main study were participating. Any attempt to allow a few students or even a larger group of students to select the articles might bias the investigation.

The Controlled Environment

After the viewing box was completed, it was then put in on a sturdy workshop table (8 feet by 12 feet) sitting inside a pottery room adjacent to an art room. The eight still life objects were put inside and set down carefully in each of the fixed positions which were not changed throughout the study. Into each of the light holes, a 60 watt desk light with a cone

shaped lamp-shade having a six inch diameter was fitted tightly. To control the light source further, the researcher wrapped two layers of heavy black canvas around the whole surface of the box except for the viewing hole in the front panel.

The room was chosen on the basis that it would be quiet for the duration of the drawing test. It provided a student with maximum privacy from disturbing elements, such as noises produced by students and movements common in classrooms. During the two months of testing sessions, the 20 by 32 foot room (except the table with the viewing box and a chair on which a student could sit for making the drawing for entrance and exit) was fixed so that it could be opened only from the inside. A student, once inside taking the test, might not come out until he had finished the drawing test or until the forty minutes had elapsed.

The Time Condition

The time allowed for each student to start and complete the drawing test was forty minutes; one normal regular class period. Any high school student involved who wished to take the test during any of his 'independent-study' or free period could do so at the beginning of a class period and hand in his drawing at the end of the same period.

The Lighting Condition

Since there were six light sources and only one was to be turned on for each student's testing, the researcher used a method of randomization to determine which number of the light holes would have its light source turned on for a student to take the test. Before going into the testing room, the student would be asked to shake one of two dice in a box. The dice served the purpose well since they had six possible numbers each of which could be used to correspond to the same number of the light hole or lighting condition chosen by the examinee; i.e., if the dice showed the face value of five then the number five light hole would have its light turned on. The number of the light hole used for each student was put down in a record which might help to evaluate the student's drawing results.

The researcher learned the value of using six light holes instead of one through a pilot test experience. After a great number of students had been subjected to the test where only one light was used, they were able to talk about and compare the light and dark value shadings they all had observed and studied. This affected the other students' responses when their turns came up for taking the drawing test.

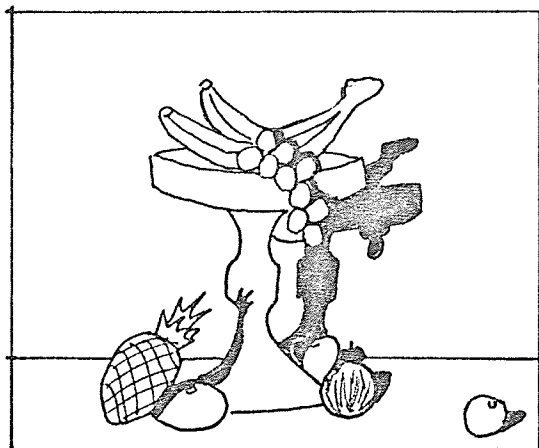
The Objective Photo-Records

The researcher used a highly light sensitive camera to

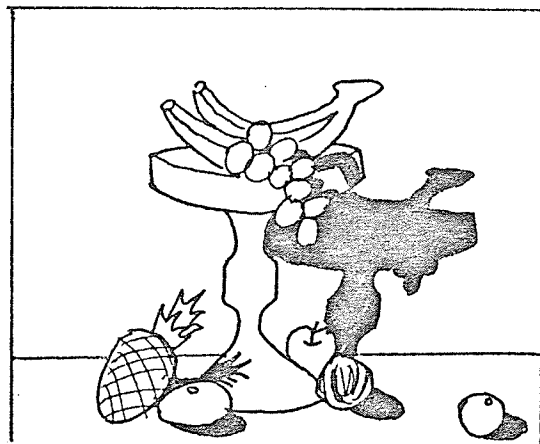
take a black and white value picture of the eight still life objects at each of the eight eye levels, under each of the six possible lighting conditions. Therefore he obtained forty-eight (8 x 6) objective photo-records of variable light and dark value compositions. Six drawings representing the photo samples that showed the shadow-variations of objects under six different lighting conditions at the centre eye-level can be seen in Figure 2 on page 28.

The main use of these photo-records was to help, but not to dictate the way the markers were to make an objective evaluation of a student's drawing results. Whenever necessary, the pictures also helped to solve disagreements among markers and checkers in evaluating some exceptional cases. Each of the photo-records could be mounted on a picture projector. With this machine it could be projected on an 8 inch by 12 inch white cartridge drawing paper for comparative purposes in any magnified or reduced size. The white drawing paper was the same size as the one that was provided to a student for taking the drawing test.

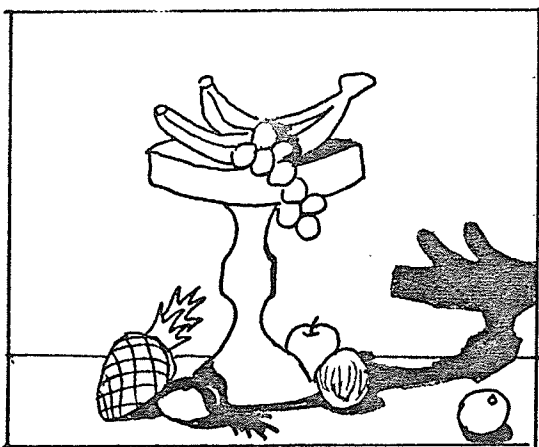
Wald's "Eye and Camera" comparison (1950) pointed out that the mechanism of a human eye and that of a camera in perceiving and recording the image of an object was so similar that they both relied on a given light condition to make out the detailed value variations shown on an object.



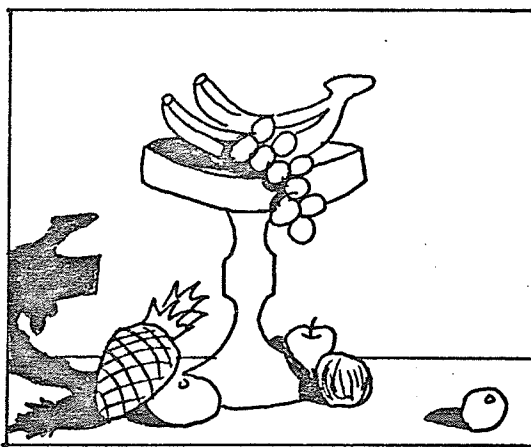
(a) Under Light-Hole No. 1.



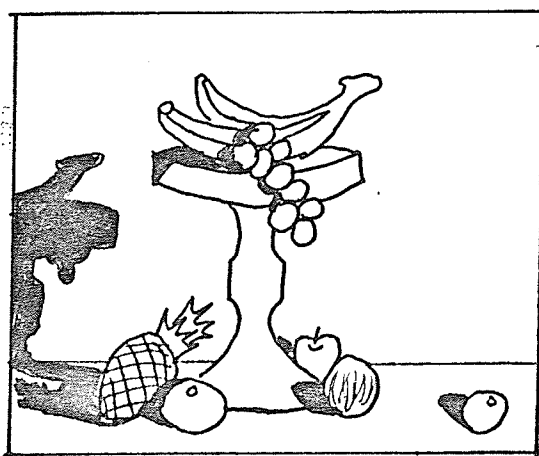
(b) Under Light-Hole No. 2.



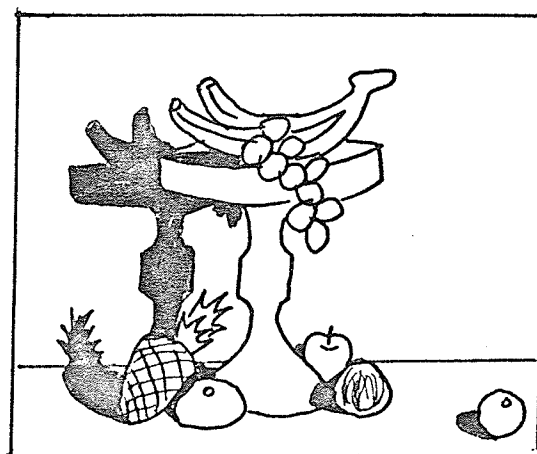
(c) Under Light-Hole No. 3.



(d) Under Light-Hole No. 4.



(e) Under Light-Hole No. 5.



(f) Under Light-Hole No. 6.

Figure 2. — Shadow Variations Of Objects Under Six Lighting Conditions At The Centre Eye Level.

Other Accessories Used in the Test

Other necessary accessories were provided for each examinee taking the drawing test. This was done to avoid differences occurring in students' value drawing results (due strictly to the uses of different kinds of drawing materials, or misunderstanding of the specific purpose of this drawing test). The following items could be brought into the testing room by a student:

- (1) one standard 6-B drawing pencil
- (2) one standard medium soft gum eraser
- (3) one standard size 8 inches by 12 inches white cartridge drawing paper
- (4) one simple instruction sheet with a few questionnaires (see Appendix A)

And for some students taking the test besides the regular school hours:

- (5) An alarm clock set for a forty minute time period at the beginning of the test.

To ensure that a student would understand purposes and conditions of the test fully and not to waste any part of the forty minute drawing period, he was encouraged to ask questions about the instruction sheet before checking out those items to begin the test.

In summary, the drawing test involved many well-controlled

structural details in order to develop a refined instrument.

Study Procedure at Gordon Bell High School

In this section the method, sample population, and the procedure for administering the test to Gordon Bell High School students will reveal procedural details and pertinent information about the scoring guide specially developed for the drawing test.

Sample Population

The main study comprised eighty high school students at Gordon Bell High School in Winnipeg, Manitoba, whose total student population was approximately 1000 junior and senior high school students.

Another 100 high school students (grades 9 - 12) of different art backgrounds were involved in the 'pilot study' of the drawing test. All volunteering participants were randomly chosen, and a descriptive method was used in this study.

Among the eighty students participating in the main study test sessions, forty (twenty grade 10 and twenty grade 11) students had no past high school art training and another forty (twenty grade 10 and twenty grade 11) students had either

one year or two years past high school art training. They could be classified into the following four different groups according to their high school art training backgrounds:

Group A (GA): - Twenty grade 10 students with no past high school art training.

Group B (GB): - Twenty grade 10 students with one year of past high school art training.

Group C (GC): - Twenty grade 11 students with no past high school art training.

Group D (GD): - Twenty grade 11 students with two years of past high school art training.

The Judges and the Markers

Besides the investigator (Teacher No. 1 or T_1), two other high school art teachers (Teacher No. 2 and No. 3 or T_2 , T_3) from different schools acted as the judges and markers for the drawing test and the Torrance Drawing Completion Test of Creative Thinking.

The teaching experience of the three art teachers in art education was approximately seven years. As a team they assisted in developing the scoring guide for the drawing test used in this study.

Testing Strategy

At the beginning of the 1971 School term, the pilot test was administered to one hundred volunteer students in Gordon Bell High School in Winnipeg. They ranged from grade 9 to 12 and had different programs of previous art training. No member of the four groups who was to participate in the main study was allowed to take the pilot test. The first testing sessions ran over a three month period. The main purposes of the 'pilot study' were: (a) to perfect the design of the instrument developed for the drawing test; e.g., from the one hundred results shown, the researcher learned that it was generally beyond the average high school student's ability to complete a drawing of more than eight objects within the forty minutes allowed; (b) to help the three judges to determine a practical scoring guide for the test and (c) to train the panel of judges to mark the one hundred drawings and rate the results to obtain a high interjudge reliability coefficient.

The three judges spent considerable time, during the training sessions, marking and checking the pilot test results to develop a standard guideline and terminology which was used in the scoring guide. They also constructed and adjusted a valid marking scale for evaluating the test results in terms of the four chosen visual traits; i.e. originality according to a student's unique or novel way of choosing an eye-level

for his value studies, effort performance according to the detailed values drawn for each object, work efficiency according to the number of objects completed in his drawing and differentiation according to his ability to perceive and draw objects correctly and according to scale.

In the spring term of 1972, eighty grade 10 and 11 high school art students were chosen for testing. Each student had a personal interview with the researcher to check his school records relating to the amount of course work and method of instruction he received in his formal art education course work in the school. Such information was important in determining whether or not an art student met the selection criteria pertinent to the development of the drawing test.

The testing for the main study ran over a two month period. The eighty students' results were marked separately by the three markers according to the standard scoring guidelines. They were then classified into four groups, (Group A, Group B, Group C, and Group D) according to the amount of previous high school art training they had respectively. This facilitated clarity and convenience in checking, comparing and analysing the data. Torrance's Picture Completion Test for Creative Thinking was administered to all of the four groups of high school art students as soon as the regular testing sessions were over.

Procedure of Administering the Drawing Test

As an examinee taking the drawing test needed no supervision once he was inside the testing room, any teacher could administer the test according to the following standard procedure. At the start of the test the following instructions were observed:

(1) check out the necessary accessory items for the student; i.e., the standard pencil, drawing paper, instruction sheet, etc.;

(2) if necessary, answer and explain questions about the conditions for the test as clearly stated in the guideline notes for the researcher;

(3) unlock the testing room door at the beginning of the forty minute period;

(4) set one light condition for the student and record it; and, at the end of the test,

(5) check that the time used was exactly forty minutes, collect all the items checked out, plus the student's drawing results;

(6) go inside the testing room to ensure the eight still life objects' positions were fixed as originally marked, the lighting mechanism was functioning properly, so that the testing conditions would be the same for the next student coming in for the test, and;

(7) lock up the items and the student's drawing result in the art room's drawers specially designated for them.

A simulated picture showing a student taking the test is shown in Figure 3 on page 36.

Procedure for Developing a Standard Scoring Guide

Each drawing was measured for originality, effort performance, work efficiency and differentiation as defined earlier. The evaluation of each of these four visual traits involved a separate scoring system allotting weights to a student's responses. If a student's drawing showed a response to any of the four visual traits which was extremely unusual in the pilot study results, for instance, he received a high score for that trait according to a five-point scale. On the other hand, a common response to any of the four traits would obtain few or no points.

The following five-point concept used by the researcher was developed by Rouse (1962) and has been widely used by others in setting up testing instruments in art education. With the hundred pilot test results, it could be applied as follows: responses given by more than 90% of the responding group = 0 point, 80 to 90% = 2 points, 60 to 40% = 3 points, 40 to 20% = 4 points and less than 20% = 5 points. The five-point system was based on a twenty per cent range except the

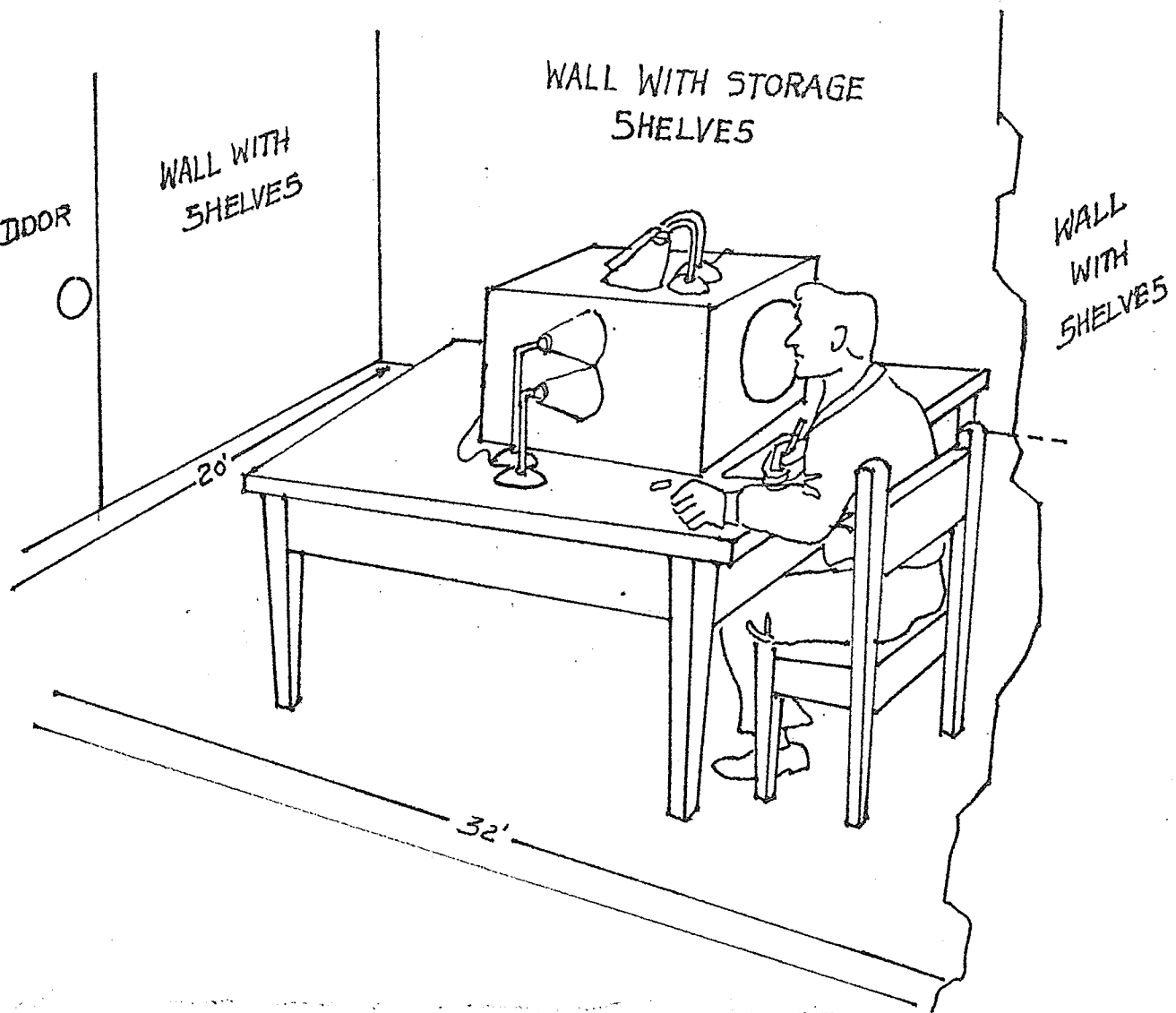


Figure 3 - A Student Taking the Drawing Test

bottom range where two ten per cent divisions were used to differentiate a one point or no point response. As it often happened, the drawing results with responses of the bottom range involved more disagreement in obtaining an objective judgment and therefore required a subdivision in scoring.

The point-range relationship developed from the pilot test results and used for setting up a scoring guide is shown in Figure 4 on page 38. It indicated that a top range five-point response meant a response of an unusual quality which was produced by less than twenty per cent of the hundred tested participants, an upper middle range four point response meant a response of a quality which was produced by no more than forty percent of the tested participants, and so on.

Developing the five-point scale necessitated double checking of all one hundred results, first to compute the frequency with which each response appeared. After weights had been assigned to each response, they were scored according to the four desirable visual traits. The individual five-point scale developed for scoring each response was applied to the other criteria as a way of standardizing the scoring guide.

The Scoring Guide Developed for the Test

The scoring guide developed contained four parts; one devoted for each response on each of the four traits in the criteria of the drawing test. The procedure and concept used for developing this guide were discussed earlier -- and the exact individual credit-point scale used in measuring visual originality, effort performance, work efficiency and differentiation was developed and perfected after 100 pilot tests.

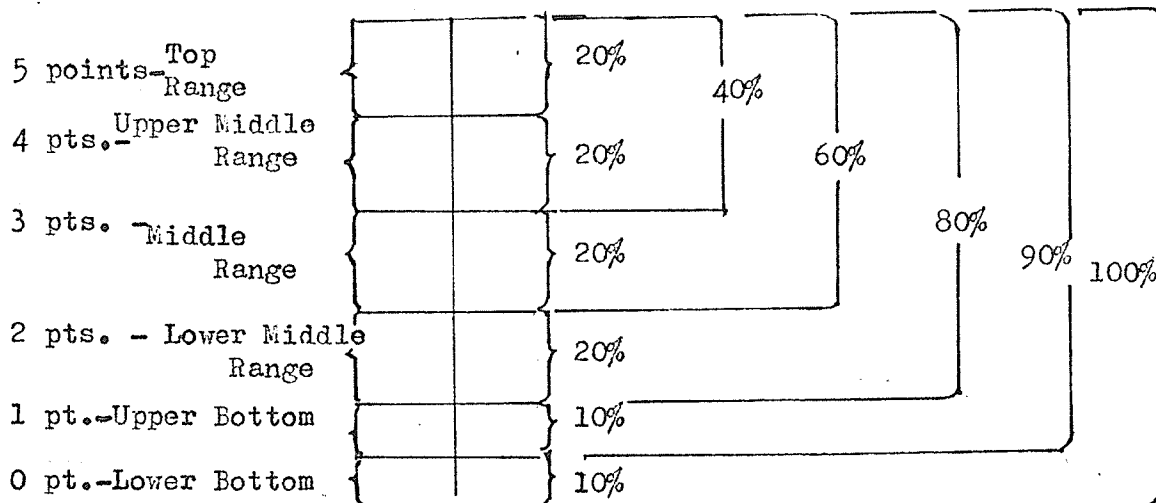


Figure 4. The Point-Range Relationship Used in The Scoring Guide

(I) Scoring for Originality (O):

In the drawing test originality refers to the unique or uncommon way in which a student visually perceives the objects to make the drawing. Over 90% of the pretest responses to originality were scored by referring to the eye-level (see Figure 1 (b) on page 22) a student used to observe and study the objects — an indication of his willingness or unwillingness to adopt a unique or novel angle or position in observing and studying things. In the trial run results, the most common eye-level (over 90%) shown was the centre one which allowed the widest and easiest scope of vision. It was the least original in the sense that such choice involved the most common or convenient way of seeing things for a detailed value

study without going beyond casual recognition.

For maximum objectivity in scoring a drawing for originality, the eye-level or statement indicated on a student's instruction sheet could be checked with that of a photo-record if necessary. The exact credit-point scale developed for scoring originality is represented by Table I below:

TABLE I
EYE LEVEL SCALE AND SCORING SYSTEM FOR ORIGINALITY
CATEGORY FOR THE DRAWING TEST

Categories of responses	Credit point
Eye level - centre	0 point
Eye level - 5 or 6	1 point
Eye level - 4 or 7	2 points
Eye level - 3 or 8	3 points
Eye level - 2 or 9	4 points
* None of the above - e.g. a novel at an angle involving combinations of levels that produced a value composition uncommon to the 48 photo-records	5 points

(II) Scoring for Effort Performance (EP):

In the test, effort performance referred specifically to amount of light and dark value variations or shading differences on each of the drawn objects -- an indication of visual effort put in a drawing. The judge might, of course, use the photo-records to determine, if necessary, the degree of 'pertinency' of the shadings of each object shown as an EP response from a student's drawings.

According to the pilot test results, the credit-point scale developed for scoring effort performance is represented by Table II.

-TABLE II

VALUE VARIATION SCALE AND SCORING SYSTEM FOR EFFORT PERFORMANCE CATEGORY FOR THE DRAWING TEST.

Objects completed with shading	Credit point
Less than 4 objects	0 point
Exactly 4 objects	1 point
5 objects	2 points
6 objects	3 points
7 objects	4 points
8 objects	5 points

(III) Scoring for Work Efficiency:

In the test, work efficiency referred to the number of still life objects completed in a student's drawing within the given forty minutes allowed — a trait of visual-motor efficiency the investigator considered important.

According to the pilot test results, the scale developed for scoring work efficiency is represented by Table III.

TABLE III

OBJECT COMPLETION SCALE AND SCORING SYSTEM FOR
WORK EFFICIENCY CATEGORY FOR THE DRAWING

TEST

Number of objects completed	Credit point
Less than 4 objects	0 point
Exactly 4 objects	1 point
5 objects	2 points
6 objects	3 points
7 objects	4 points
8 objects	5 points

(IV) Scoring for Differentiation:

In the test, differentiation was scored according to the number of still life objects drawn correctly according to their

shape. Thus differentiation referred to visual capacity in discriminating and appropriating the shapes of the objects.

This category does not imply that a realistic reproduction of the objects had to be evident. For instance, as an orange is small and round in comparison to a coconut, it is not necessarily the same in relation to a grape. A student could indicate on his instruction sheet which object he did choose to be used as a standard reference, and as long as he was cognizant of scale, the actual size of the object was not considered to be the sole criteria. The photo-record was used to help to evaluate differentiation of a drawing whenever it was necessary.

According to the pilot test results, the scale developed for scoring differentiation is represented by Table IV.

TABLE IV

SHAPE RELATIONSHIP SCALE AND SCORING SYSTEM FOR
DIFFERENTIATION CATEGORY FOR THE DRAWING
TEST

Number of objects with correct shape relationships	Credit point
2 objects or less	0 point
3 objects	1 point
4 objects	2 points
5 objects	3 points
6 objects	4 points
7 objects	5 points

In summary, this chapter has shown how the structural details of the drawing test were developed and how the pilot test was refined. The categories and scale used for scoring also are explained explicitly in this section.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

In the first part of the chapter, a tabulation of VP drawing test results of the four groups of Gordon Bell High School art students are presented. They are shown first as individual group results (scored by each of the three judges), and then as combined averages. The inter-judge reliability and the method of treatment of data are also explained.

The second part of the chapter deals with the amount of high school art training of each group of students and its influence on their drawing test results. The research hypotheses are tested and the reliability and validity of the test are also explained.

Presentation of Data by Groups

Method of Presentation

The eighty drawing test results are tabulated on the basis of two groupings, each representing high school art students who are at the same grade level but having a different past high school art training. They were: Group A grade 10 students with no past high school art training (GA), Group B grade 10 students with one year of past high school art

training (GB), Group C grade 11 students with no past high school art training (GC), and Group D students with two years of past high school art training (GD).

Method of Treatment of Data

After scoring all the data for the four groups of students in the VP drawing test, the three judges had the frequency distribution and mean scores arranged for the two groups of grade 10 high school students (GA with no past high school art training; GB with one year of past high school art training) and for the two groups of grade 11 high school art students (GC with no past high school art training; GD with two years of past high school art training). The comparisons might be summarized by using a 2 x 2 factorial design (Van Dalen, 1966).

Table V shows the sizes of the groups stratified by the grade level and the amount of past high school art training each had completed.

TABLE V

GROUPINGS OF STUDENTS BASED ON GRADE LEVEL AND PAST HIGH SCHOOL ART TRAINING

		<u>High School Grade Level</u>	
		Gr. 10	Gr. 11
High School Art	No	GA=20	GC=20
	Yes	GB=20	GD=20

The Main Study Drawing Test Results

Tables VI - XI present test results of the four groups of high school students, each arranged in a decreasing order of merit point standing on the five-point scale. Each group's frequency distribution, total overall rating and mean score can be noted easily in a parallel group to group arrangement. (See Table V - 2 x 2 factorial design).

Group A was paired with Group B (both grade 10), and Group C was paired with Group D (both grade 11), as both groupings contained students in the same grade level but with a different high school art training background.

Each group's drawing results scored by Judge T₁, T₂ and T₃ is presented separately in Table VI-XI. The total average result obtained by three judges of each group is shown in Table XII and XIII. These results are used to analyse the significance of differences between the grade ten and eleven drawing results. Whereas the data obtained in Table VI and XI are important in finding out the inter-judge reliability of the drawing test, the data contained in Table XII and XIII are essential in calculating the validity of the test (indicating accurately the mean differences of achievement among the groups of students.)

THE DRAWING TEST RESULTS OF GROUP A AND GROUP B

AS SCORED BY JUDGE T₁

Group A - Grade 10 with no high school art						Group B - Grade 10 with one year of high school art					
MS*	O	EP	WE	D	Overall Rating	MS*	O	EP	WE	D	Overall Rating
1	4	4	5	3	4.00	1	5	5	5	5	5.00
2	4	3	3	4	3.50	2	5	5	4	5	4.75
3	4	3	4	3	3.50	3	5	4	5	5	4.75
4	3	3	4	4	3.50	4	5	5	5	4	4.75
5	3	3	3	2	2.75	5	4	5	5	5	4.75
6	2	2	2	2	2.00	6	5	4	4	5	4.50
7	2	2	2	2	2.00	7	5	4	5	4	4.50
8	2	2	2	2	2.00	8	5	4	5	4	4.50
9	2	2	2	2	2.00	9	5	4	4	4	4.25
10	2	2	2	2	2.00	10	4	4	4	3	3.75
11	2	2	2	1	1.75	11	3	4	3	4	3.50
12	2	1	2	1	1.50	12	3	3	4	4	3.50
13	1	2	1	1	1.25	13	4	4	3	3	3.50
14	1	1	1	1	1.00	14	4	3	4	3	3.50
15	1	1	1	1	1.00	15	3	3	3	3	3.00
16	1	1	1	1	1.00	16	3	4	2	3	3.00
17	1	1	1	1	1.00	17	3	3	4	2	3.00
18	1	1	1	1	1.00	18	3	3	3	3	3.00
19	1	1	1	1	1.00	19	3	3	3	3	3.00
20	1	1	1	1	1.00	20	3	3	3	2	2.75
Total					38.75	Total					78.25

*MS = Merit Standing

THE DRAWING TEST RESULTS OF GROUP A AND GROUP B

AS SCORED BY JUDGE T₂

Group A - Grade 10 with no high school art						Group B - Grade 10 with one year of high school art					
MS*	O	EP	WE	D	Overall Rating	MS*	O	EP	WE	D	Overall Rating
1	4	4	4	3	3.75	1	5	5	5	5	5.00
2	3	4	3	4	3.50	2	5	5	4	5	4.75
3	4	3	4	3	3.50	3	5	4	5	5	4.75
4	3	3	3	4	3.25	4	4	5	5	5	4.75
5	3	3	3	2	2.75	5	5	5	5	4	4.75
6	2	2	2	2	2.00	6	5	4	4	5	4.50
7	2	2	2	2	2.00	7	5	4	5	4	4.50
8	2	2	2	2	2.00	8	4	5	4	5	4.50
9	2	2	2	2	2.00	9	5	4	4	4	4.25
10	2	2	2	1	1.75	10	4	4	4	3	3.75
11	2	1	2	1	1.50	11	3	4	4	4	3.75
12	1	2	2	1	1.50	12	4	3	4	4	3.75
13	1	1	2	1	1.25	13	3	4	3	4	3.50
14	1	1	1	2	1.25	14	4	3	4	3	3.50
15	1	1	1	1	1.00	15	3	3	3	4	3.25
16	1	1	1	1	1.00	16	4	3	3	3	3.25
17	1	1	1	1	1.00	17	3	3	3	3	3.00
18	1	1	1	1	1.00	18	3	3	3	3	3.00
19	1	1	1	1	1.00	19	3	3	3	3	3.00
20	1	1	1	1	1.00	20	2	3	3	3	2.75
Total					37.00	Total					79.25

*MS = Merit Standing

THE DRAWING TEST RESULTS OF GROUP A AND GROUP B
AS SCORED BY JUDGE T₃

Group A - Grade 10 with no high school art						Group B - Grade 10 with one year of high school art					
MS*	O	EP	WE	D	Overall Rating	MS*	O	EP	WE	D	Overall Rating
1	3	4	3	4	3.50	1	5	5	5	5	5.00
2	4	3	4	3	3.50	2	5	5	4	5	4.75
3	4	4	3	3	3.50	3	5	5	4	5	4.75
4	3	3	3	4	3.25	4	5	4	5	5	4.75
5	3	3	3	3	3.00	5	5	5	5	4	4.75
6	3	2	3	2	2.50	6	5	4	4	5	4.50
7	2	2	2	2	2.00	7	5	4	5	4	4.50
8	2	2	2	2	2.00	8	5	4	5	4	4.50
9	2	2	2	2	2.00	9	4	5	4	5	4.50
10	2	2	2	2	2.00	10	5	4	4	4	4.25
11	2	2	2	2	2.00	11	4	4	4	3	3.75
12	1	2	2	2	1.75	12	3	4	3	4	3.50
13	2	2	2	1	1.75	13	3	3	4	4	3.50
14	1	2	1	1	1.25	14	3	3	3	4	3.25
15	1	1	1	1	1.00	15	4	3	3	3	3.25
16	1	1	1	1	1.00	16	3	3	4	3	3.25
17	1	1	1	1	1.00	17	3	3	3	3	3.00
18	1	1	1	1	1.00	18	3	3	3	3	3.00
19	1	1	1	1	1.00	19	3	3	3	3	3.00
20	1	1	1	1	1.00	20	3	3	3	2	2.75
Total					40.00	Total					79.50

*MS = Merit Standing

THE DRAWING TEST RESULTS OF GROUP C AND GROUP D
AS SCORED BY JUDGE T₁

Group C - Grade 11 with no high school art						Group D - Grade 11 with two years of high school art					
MS	O	EP	WE	D	Overall Rating	MS	O	EP	WE	D	Overall Rating
1	4	3	4	3	3.50	1	5	5	5	5	5.00
2	3	4	3	4	3.50	2	5	5	5	5	5.00
3	3	3	3	4	3.25	3	5	5	5	5	5.00
4	4	3	3	3	3.25	4	5	5	5	5	5.00
5	3	3	3	3	3.00	5	5	5	5	5	5.00
6	2	2	2	2	2.00	6	4	5	5	5	4.75
7	2	2	2	2	2.00	7	4	5	4	5	4.50
8	2	2	2	2	2.00	8	5	4	5	4	4.50
9	1	2	2	2	1.75	9	4	4	4	5	4.25
10	2	1	2	2	1.75	10	4	4	4	4	4.00
11	1	1	1	2	1.25	11	4	3	4	4	3.75
12	1	2	1	1	1.25	12	3	4	4	4	3.75
13	1	1	1	1	1.00	13	3	4	3	4	3.50
14	1	1	1	1	1.00	14	4	3	4	3	3.50
15	1	1	1	1	1.00	15	4	3	3	4	3.50
16	1	1	1	1	1.00	16	3	4	3	3	3.25
17	1	1	1	1	1.00	17	3	3	3	3	3.00
18	1	1	1	1	1.00	18	3	3	3	3	3.00
19	1	1	1	1	1.00	19	3	3	3	3	3.00
20	1	1	1	1	1.00	20	3	3	3	3	3.00
Total					36.50	Total					80.25

THE DRAWING TEST RESULTS OF GROUP C AND GROUP D

AS SCORED BY JUDGE T₂

Group C - Grade 11 with no high school art						Group D - Grade 11 with two years of high school art					
MS	O	EP	WE	D	Overall Rating	MS	O	EP	WE	D	Overall Rating
1	4	3	3	4	3.50	1	5	5	5	5	5.00
2	3	4	4	3	3.50	2	5	5	5	5	5.00
3	3	3	3	4	3.25	3	5	5	5	5	5.00
4	4	3	3	3	3.25	4	5	5	5	5	5.00
5	2	3	3	3	2.75	5	5	5	5	5	5.00
6	2	2	2	2	2.00	6	5	4	5	5	4.75
7	2	2	2	2	2.00	7	4	5	4	5	4.50
8	2	2	2	2	2.00	8	5	4	5	4	4.50
9	2	2	2	2	2.00	9	4	4	4	5	4.25
10	2	1	2	2	1.75	10	4	5	4	4	4.25
11	1	2	1	1	1.25	11	3	4	4	4	3.75
12	2	1	1	1	1.25	12	4	3	4	4	3.75
13	1	1	1	1	1.00	13	3	4	3	4	3.50
14	1	1	1	1	1.00	14	4	3	4	3	3.50
15	1	1	1	1	1.00	15	3	3	4	3	3.25
16	1	1	1	1	1.00	16	4	3	3	3	3.25
17	1	1	1	1	1.00	17	3	4	3	3	3.25
18	1	1	1	1	1.00	18	3	3	3	3	3.00
19	1	1	1	1	1.00	19	3	3	3	3	3.00
20	1	1	1	1	1.00	20	3	3	3	3	3.00
Total					36.50	Total					80.50

THE DRAWING TEST RESULTS OF GROUP C AND GROUP D

AS SCORED BY JUDGE T₃

Group C - Grade 11 with no high school art						Group D - Grade 11 with two years of high school art					
MS	O	EP	WE	D	Overall Rating	MS	O	EP	WE	D	Overall Rating
1	3	4	3	4	3.50	1	5	5	5	5	5.00
2	3	3	3	4	3.25	2	5	5	5	5	5.00
3	3	4	3	3	3.25	3	5	5	5	5	5.00
4	4	3	3	3	3.25	4	5	5	5	5	5.00
5	2	3	3	3	2.75	5	5	4	5	5	4.75
6	2	2	2	2	2.00	6	5	4	5	4	4.50
7	2	2	2	2	2.00	7	4	5	4	5	4.50
8	2	2	2	2	2.00	8	4	4	5	4	4.25
9	2	2	2	2	2.00	9	5	4	4	4	4.25
10	2	2	2	1	1.75	10	3	4	4	4	3.75
11	1	1	1	2	1.25	11	4	3	4	4	3.75
12	1	2	1	1	1.25	12	4	4	3	4	3.75
13	1	1	1	1	1.00	13	4	4	4	3	3.75
14	1	1	1	1	1.00	14	3	4	3	4	3.50
15	1	1	1	1	1.00	15	4	3	4	3	3.50
16	1	1	1	1	1.00	16	4	3	3	3	3.25
17	1	1	1	1	1.00	17	3	3	3	3	3.00
18	1	1	1	1	1.00	18	3	3	3	3	3.00
19	1	1	1	1	1.00	19	3	3	3	3	3.00
20	1	1	1	1	1.00	20	3	3	3	3	3.00
Total					36.50	Total					79.50

THE DRAWING TEST TOTAL AVERAGE RESULTS OF GROUP A
AND GROUP B AS SCORED BY JUDGE T₁, T₂, and T₃

Group A - Grade 10 with no high school art					Group B - Grade 10 with one year of high school art				
MS*	T ₁	T ₂	T ₃	Total Average	MS*	T ₁	T ₂	T ₃	Total Average
1	4.00	3.75	3.50	3.750	1	4.75	5.00	5.00	4.917
2	3.50	3.50	3.50	3.500	2	5.00	4.75	5.00	4.917
3	3.50	3.50	3.50	3.500	3	4.75	4.75	4.75	4.750
4	3.50	3.25	3.25	3.333	4	4.75	4.75	4.75	4.750
5	2.75	2.75	3.00	2.833	5	4.50	4.50	4.75	4.583
6	2.00	2.00	2.00	2.000	6	4.50	4.75	4.50	4.583
7	2.00	2.00	2.00	2.000	7	4.75	4.50	4.50	4.583
8	2.00	2.00	2.00	2.000	8	4.50	4.25	4.50	4.401
9	2.00	1.50	2.50	2.000	9	4.25	4.50	4.50	4.401
10	2.00	2.00	2.00	2.000	10	3.75	3.75	4.25	3.917
11	1.75	1.75	2.00	1.833	11	3.50	3.75	3.25	3.500
12	1.25	1.50	1.75	1.500	12	3.50	3.50	3.50	3.500
13	1.50	1.25	1.75	1.250	13	3.50	3.50	3.50	3.500
14	1.25	1.25	1.25	1.250	14	3.00	3.25	3.75	3.333
15	1.00	1.00	1.00	1.000	15	3.00	3.75	3.25	3.333
16	1.00	1.00	1.00	1.000	16	3.50	3.25	3.25	3.333
17	1.00	1.00	1.00	1.000	17	3.00	3.00	3.00	3.000
18	1.00	1.00	1.00	1.000	18	3.00	3.00	3.00	3.000
19	1.00	1.00	1.00	1.000	19	3.00	3.00	3.00	3.000
20	1.00	1.00	1.00	1.000	20	2.75	2.75	2.75	2.750
Total				38.749	Total				78.051

*MS = Merit Standing

GA's mean score = 1.9375

GB's mean score = 3.9026

THE DRAWING TEST TOTAL AVERAGE RESULTS OF GROUP C
AND GROUP D AS SCORED BY JUDGE T₁, T₂, and T₃

Group C - Grade 11 with no high school art					Group D - Grade 11 with two years of high school art				
MS*	T ₁	T ₂	T ₃	Total Average	MS*	T ₁	T ₂	T ₃	Total Average
1	3.50	3.50	3.50	3.500	1	5.00	5.00	5.00	5.000
2	3.25	3.25	3.25	3.250	2	5.00	5.00	5.00	5.000
3	3.50	3.25	3.25	3.333	3	4.75	5.00	5.00	4.917
4	3.25	3.50	3.25	3.333	4	5.00	4.75	5.00	4.917
5	3.00	2.75	2.75	2.833	5	5.00	5.00	4.75	4.917
6	2.00	2.00	2.00	2.000	6	5.00	5.00	4.50	4.833
7	2.00	2.00	2.00	2.000	7	4.50	4.50	4.50	4.500
8	2.00	2.00	2.00	2.000	8	4.50	4.50	4.25	4.401
9	1.75	1.75	2.00	1.833	9	4.00	4.25	4.25	4.166
10	1.75	2.00	1.75	1.833	10	4.25	3.75	3.75	3.917
11	1.25	1.25	1.25	1.250	11	3.75	4.25	3.75	3.917
12	1.25	1.25	1.25	1.250	12	3.75	3.75	3.75	3.750
13	1.00	1.00	1.00	1.000	13	3.50	3.25	3.75	3.500
14	1.00	1.00	1.00	1.000	14	3.50	3.50	3.50	3.500
15	1.00	1.00	1.00	1.000	15	3.50	3.50	3.50	3.500
16	1.00	1.00	1.00	1.000	16	3.00	3.25	3.25	3.333
17	1.00	1.00	1.00	1.000	17	3.25	3.25	3.00	3.333
18	1.00	1.00	1.00	1.000	18	3.00	3.00	3.00	3.000
19	1.00	1.00	1.00	1.000	19	3.00	3.00	3.00	3.000
20	1.00	1.00	1.00	1.000	20	3.00	3.00	3.00	3.000
Total				36.415	Total				80.401

* MS = Merit Standing

GC's mean score = 1.8208

GD's mean score = 4.0201

The t Test of Significance

Table XII shows that the scoring of the same test by three different teachers and indicates that Group B grade ten students who had one year of high school art performed better as a whole than Group A grade ten students with no high school art training. Whereas Group B students achieved a mean score of 3.9026, Group A students achieved a mean score of 1.9375.

Statistically speaking, one can prove that the mean difference between the two groups' performances is significant and it is not attributed to chance. This can be done by applying the 't test of significance' to the results (Van Dalen, 1966: 377). The formula for the t test between the two independent means is:

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$

With M_1 being the mean score of Group B,

M_2 being the mean score of Group A,

$\sum x_1^2$ and $\sum x_2^2$ being the sums of squares around Group B's mean and Group A's mean respectively,

And N_1 and N_2 being the number of students in each group which is equal to 20.

We have:

$$\begin{aligned}
 t &= \frac{3.9026 - 1.9375}{\sqrt{\frac{10.6122 + 17.3580}{20 + 20 - 2} \times \frac{1}{20} + \frac{1}{20}}} \\
 &= \frac{1.9651}{27.9702 \times \frac{1}{380}} = \frac{1.9651}{0.2713} \\
 &= 7.2433
 \end{aligned}$$

Since df (degree of freedom) is 38 and the level of significance at five per cent and one per cent level is respectively 2.337 and 2.986, the calculation of 7.2433 is highly significant, i.e., $t_{cal.}$ (7.2433) is much larger than the $t_{crit.}$ (2.337) at 0.05 and $t_{crit.}$ (2.986) at 0.01 level. The degree of freedom here refers to the number of scores permitted to vary around a constant, i.e., the mean score of each group.

In other words, the finding indicates that the students with one year of high school art will achieve a significantly higher mean score than the students without it, and this is supported by the data gathered in this study and would probably be true when the test was administered to a larger population sample.

Applying the same formula of 't test of significance' to Group C and Group D drawing test results (see Table XIII),

the investigator found that the difference between the performances of grade eleven students (GD) with two years of high school art and those of grade eleven students (GC) without it is even more significant. Whereas Group D achieved a mean score of 4.0201, Group C achieved a mean score of 1.8208 only.

With $M_1 = 4.0201$ for Group D

$M_2 = 1.8208$ for Group C

$\sum x_1^2 = 10.3629$ for Group D

$\sum x_2^2 = 16.5983$ for Group C

$N_1 = N_2 = 20$

$$t = \frac{4.0201 - 1.8208}{\sqrt{\frac{10.3629 + 16.5983}{38} \times \frac{1}{10}}}$$

$$= \frac{2.1993}{0.2664} = 8.2567$$

According to the calculated result, students with two years of high school art achieved a significantly higher mean score than students without previous art training. This takes into consideration that in one (or five) out of one hundred chances; discrepancy may occur.

Inter-Judge Reliability

The inter-judge reliability is important in considering

the drawing test because an instrument is reliable if it yields similar results when different judges reach a determined level of agreement of rating under the same conditions and when they use the same guidelines. It may also indicate how valid (in this instance) the standard scoring guide is in terms of enabling an examiner to obtain a consistently objective measurement.

The calculations used in determining inter-judge reliability are outlined in the following explanation according to the sign test method proposed by Downie and Heath (1970: 265-266).

The first step is to find the number of different overall ratings appearing between a pair of judges' two results taken from the same group. Since that number may be zero if Judge T_1 's results, for instance, are exactly same as those of Judge T_2 , that number obtained beyond zero may be called the number of positive signs.

Letting Y be the number of positive signs, at the five per cent probability level for $n = 20$, i.e., in a group with twenty subjects, one may reject the hypothesis that $T_1 = T_2$ if $Y = 6$. If $Y = 6$, one may conclude that there is no evidence to show any difference between T_1 and T_2 that is significant at the five per cent probability level, but if $Y = 7$ or $Y > 7$, the difference is significant at ten per cent probability level.

The inter-judge reliability of each group's results is obtained by pairing Judge $T_1 - T_2$, and Judge $T_2 - T_3$, and Judge $T_1 - T_3$, at the ten per cent probability level. These are tabulated in Table XIV on page 60.

Table XIV showed that inter-judge reliability of each group's results by $T_1 - T_2$, $T_2 - T_3$, and $T_1 - T_3$ is generally high since in eight out of the twelve cases, the difference between a pair of judges' results taken from the same group is insignificant at ten per cent probability level.

To have a high inter-judge reliability at the 10 per cent probability level means that in ninety out of one hundred drawing test results, the judges as a pair will probably score the same. Therefore the reliability of the developed instrument in yielding a consistent objective VP measurement (used by different teachers) can be considered high. (See also Appendix B - Summarized Drawing Test Results of Judges).

INTER-JUDGE RELIABILITY OF GROUP DRAWING TEST RESULTS

Group A's results			Group C's results		
Comparison	Value of Y	*Result	Comparison	Value of Y	*Result
T ₁ with T ₂	5	Difference not signif.	T ₁ with T ₂	4	Difference not signif.
T ₂ with T ₃	8	Difference significant	T ₂ with T ₃	6	Difference not signif.
T ₁ with T ₃	7	Difference significant	T ₁ with T ₃	5	Difference not signif.

Group B's results			Group D's results		
Comparison	Value of Y	*Result	Comparison	Value of Y	*Result
T ₁ with T ₂	3	Difference not signif.	T ₁ with T ₂	3	Difference not signif.
T ₂ with T ₃	3	Difference not signif.	T ₂ with T ₃	7	Difference significant
T ₁ with T ₃	4	Difference not signif.	T ₁ with T ₃	8	Difference significant

* At ten per cent probability level.

Testing of the Hypothesis

Through findings obtained as a result of the presentation and analysis of data the hypothesis derived earlier were tested:

(1) Hypothesis No. 1 was accepted. The drawing test showed that grade 11 students who have had high school art training (GD)

scored significantly higher than grade 11 students (GC) who had no high school art training. (See Tables XII-XIII).

(2) Hypothesis No. 2 was accepted. The drawing test indicated that students who had two years of high school art training (GD) scored significantly higher than students (GB) who had only one year of past high school art training. (See Tables XII-XIII).

(3) Hypothesis No. 3 was accepted. The drawing test indicated that students who had one year of high school art experience (GB) scored significantly higher than the students who had no previous high school art training. (See Table XII).

(4) Hypothesis No. 4 was rejected. No significant evidence was found to indicate that there was a direct correlation between students' drawing test scores and their creative thinking drawing test scores. However, the consistent superior performances by students who had two years of high school art training over those who had only one year or no high school art training in both tests tend to indicate that having more training in art may be one, but not the sole pre-requisite for higher creative thinking development. (See Appendix B).

The statements about the first three hypotheses serve as an indication of 'validity' and 'practicability' of the drawing test as an instrument for evaluating students' drawing in art. With the aid of such an instrument, an art teacher must inter-

pret cautiously what each test result means in terms of implementing course work which stresses visual training for developing the four desirable traits. For instance, the uses of the instrument in this study had yielded the following information about the Gordon Bell High School art students:

(1) The grade 11 students (GD) with two years of high school art training achieved a mean score of 4.0201.

(2) The grade 10 students (GB) with one year of high school art training achieved a mean score of 3.9026.

(3) The grade 10 students (GA) with no high school art training achieved a mean score of 1.9375.

(4) The grade 11 students (GC) with no high school art training achieved a mean score of 1.8208.

Based upon the results, one might conclude that there is a direct positive correlation between a student's visual development in art and the amount of visual art training he has had. The categories of visual perception being tested here were not necessarily related to visual development as a result of age and maturity since the test results have indicated that grade 11 students without any past high school art training (GC) actually scored lower than the grade 10 students without any past high school art training (GA). It also tended to point out that depending on a particular school situation, an art teacher may find other factors (such as a child's readiness in adapting to a certain teaching method, or the teacher's attitude toward

visual training through art education, etc.,) to be considered carefully in his planning and teaching. There are many factors the drawing test could not and did not measure; one of these includes the lack of control of instructional methods in the art program at Gordon Bell High School. Others may include the area of socio-economic background, the intellectual or emotional domains of students to which an art teacher should pay special attention. However, the information obtained as a result of administering the test to students can result in a more comprehensive knowledge about students' VP achievements or problems, as well as a valuable record of reference for interpreting future testing results.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to summarize briefly the foregoing chapters, to draw conclusions from the study's findings and to make recommendations for further research.

Summary

Whereas extensive research in art education has been done on testing and measuring creativity in art, little has been done about the problem of developing a reliable testing instrument for assessing visual perception. This seems to be reflected in the needs of teachers at the senior high school level. The conditions of the study for developing a visual perception drawing test for utilization in art for high school art students involved a well-controlled instrument and research methodology.

Theoretical foundations for the study were outlined to show the important relationship between a student's visual development in art and his past high school art training. Hypotheses were stated according to the reliability of the visual drawing test which assessed the differences of visual development among different groups of high school students, each having different high school art training backgrounds. The definition

of visual perception in this study was made in terms of four traits -- originality, effort performance, work efficiency and differentiation -- which were derived from major learning theories in art education. The analysis of some research related to the study also yielded valuable information about how a reliable visual drawing test for high school art students could be developed.

The investigator employed a descriptive method for explaining the validity and reliability of the test. The procedures of administering the pilot test to 100 high school students at Gordon Bell High School in Winnipeg and then to four groups of twenty students were explained in detail. The development of a standard scoring guide for the test was also described fully.

The data obtained from the study were presented and analysed, using statistical tools such as the positive sign method in finding out the inter-judge reliability and interpreting the mean scores among different groups of high school student participants for statistical significance.

Conclusions

The findings showed that the drawing test developed in this study may indeed has some practical values for art teachers who would like to study visual perception more precisely,

and who are seeking to understand the visual capabilities or limitations of their students in art.

By using drawing tests high school art teachers and students can be helped to recognize differences based on such visual traits as originality, effort performance, work efficiency and differentiation. These traits are used in this study. Possession of specific information about students' strengths and weaknesses on any of the traits may assist the teacher to design special art activities to improve the students' overall visual development in art. For example, if students are tested and are particularly weak in 'originality' scores, an art teacher may deliberately plan more art activities that necessitate the uses of various eye-levels or angles in observing and studying objects. For promoting 'effort performance' scores, the art teacher may plan art activities for his students that require prolonged or detailed observation of various structural elements of one or two natural objects; e.g., a texture study of a pine cone, a pattern study of a sunflower. For promoting 'work efficiency' scores, the art teacher may plan art activities for his students that stress basic efficient drawing skills like shading and sketching. The number of drawing or painting works required may be related directly to the amount of time allowed by the teacher. For promoting 'differentiation' scores, the art teacher may plan art activities for his students that emphasize visual discrimination of size relationships among

various objects which may be presented from various distances and at different angles; e.g., a drawing study of a number of apples scattered around on area of a large table top or hung at different heights from ceiling with strings.

The drawing test developed in this study may also assist art teachers to observe and record from time to time the characteristic pattern of students' VP performances in terms of originality, effort performance, work efficiency and differentiation in art activities. Such a record is useful to the teacher since it may be a good indicator of the success or failure of an art program in various areas designated by the criterion used in the testing instrument. Furthermore, it may help an art teacher to recognize when drawing problems of still life objects in a controlled drawing environment are being overcome, and how students may be further exposed to multiple variations of the same project in different settings and contexts. For example, a simple value drawing study of an orange may prepare a student sufficiently with a basic drawing skill that is required for a value drawing study of a group of different citrus fruits. The number of variations (e.g., the time allowed, the number of objects, etc.) to be planned for a student or group of students may be guided by their previous test results showing their strength and weaknesses on various behavioral traits.

When the drawing test is used in conjunction with the Torrance Picture Completion Test or other similar tests, it may lead to a better understanding of the research on creative and perceptual development in art.

Recommendations

The researcher recognizes that the development of the drawing test for utilization in art for high school students is only one of the many attempts in art education to try to understand the complex area of visual perception.

Art educators must do more research in this important area. Barsch (1967) pointed out that research knowledge and studies related to visual perception in education have touched on a domain which is still relatively so new and complex, that any study in this realm, and the findings or test results derived thereof, no matter how detailed they may appear to be, can best claim to study visual perception in part only.

The fact remains that visual perception is significant to the understanding of human learning processes and should not be left to chance in an educational program. According to Franz (1958), even at a relatively simple infantile learning level, an individual could not move up to a higher phase of creative learning and a mental developmental ladder, because "in higher form of human intellectual and creative development, sensitive

visual perception precedes action, rather than vice versa as is often assumed." Thus in art education, it would seem logical to assume that a sufficient amount of visual training would facilitate keener visual perception which may in turn add efficiency to a student's overall intellectual and creative responsiveness to his environment.

If we believe that art is a phenomenon of human behavior that can be found wherever form, line, value and color are organized to create the symbols of communication of our society, and for qualitatively changing the experience of those who produce or perceive it, then we must consider the possibilities of art programs in the public schools at least a part of the programs where the instruction is devoted to the training of the visual senses.

All cultures, past and present have used art to maintain their values, attitudes and senses of reality. Art has been used to give character and identity to instructions through such devices as style of architecture and clothing. Religious and political systems constantly use non-verbal visual symbols to stimulate recall of the values they represent. Daily commercial uses of visual art induce psychological effects on people's concept formations. In this sense, the objectives of developing visual perception through art education should be valuable, and the uses of a reliable testing instrument for such an important objective in art could be extensive.

Topics about the importance of VP development and testings have been well documented in educational psychology, but have seldom been taken seriously by art educators for research. A format for study recommendations for further research is outlined as follows:

(1) A replication of the present study with different administrative procedures for collecting the data, which would ensure larger numbers of high school students with variable past high school art training as participants.

(2) A study employing more than one kind of drawing test to evaluate the validity of different criteria of visual perception to be tested in art education.

(3) A study in which the effects of time, lighting condition, number of still life objects, etc., on students' visual performance is analysed.

(4) A study in which the controls for the groups of students from different art programs, and with different years of art training are more defined.

If visual training is important in art because it can help a student to develop a keener response to his world, then the need for a reliable visual drawing test for utilization in art is obvious. Promoting interest in the uses, perfection, or further studies in the evaluation of visual perception in art will certainly be beneficial to the development of art education.

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APPENDIX A

Student's Initials here:

Instruction Sheet For The Drawing Test

This drawing test attempts to evaluate your visual perception in terms of the four following items which emphasize how well you can observe and make a detailed value drawing study:

(1) Originality - the unique way or eye-level you choose to look at the still life objects. Write out briefly in the one line space provided below the eye-level you chose for your drawing study.

I chose _____

(2) Effort Performance - Visual effort concentration in correctly shading each object.

(3) Work Efficiency - Number of still life objects you completed for your drawing within the forty minutes time allowed.

(4) Differentiation - Ability to show as many objects as possible in correct relationship to one another and according to scale. Select one object if possible as the standard reference shape and tabulate it below.

I chose _____

N.B. Since this test is not meant to play any visual tricks on you, we want you to understand the four evaluatory items as clearly as possible. Ask questions if you have to before starting. Treat this like one of those drawing projects on value studies you did in the past, if you have done them before. Thank you for your participation.

APPENDIX B

		High School Grade Level			
		Gr. 10	Gr. 11	Mean	Difference
<u>High School</u>	<u>Art</u>	G.A.	G.C.		
	Without	38.7490	36.415	37.582	2.334
	With	G.B.	G.D.		
		78.051	80.401	79.226	1.350
Mean		58.4	58.408		
Difference		39.302	43.986		

THE MEAN SCORES OF THE FOUR GROUPS' VP TEST RESULTS

		High School Grade Level			
		Gr. 10	Gr. 11	Mean	Difference
<u>High School</u>	<u>Art</u>	G.A.	G.C.		
	Without	59.00	66.00	62.50	7.00
	With	G.B.	G.D.		
		77.00	82.00	79.50	5.00
Mean		68.00	74.00	71.00	
Difference		18.00	16.00		

THE MEAN SCORES OF THE FOUR GROUPS' TORRANCE'S PICTURE
COMPLETION TEST FOR CREATIVE THINKING RESULTS