A DESCRIPTION OF ALTERED VISUAL PERCEPTUAL DIFFERENTIATION AS AFFECTED BY INSTRUCTIONAL PROCEDURES UPON THE RESPONSES OF INDIVIDUALS TO VISUAL DATA

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The purpose of this study was to analyze, evaluate, expand, and implement instructional procedures designed in order to increase individual visual perceptual differentiation. The literature revealed visual perceptual differentiation to be pervasive and stable across situational variables. Visual perceptual differentiation is defined as the degree to which the human system has attained specificity of its separate components, i.e., the individual responds primarily with specific responses to specific stimuli.

Because the concepts of visual perceptual differentiation are grounded in theory and empirical research, it was selected as an initial variable for investigation of factors effecting the responses of individuals toward certain visual data.

The initial hypothesis had three facets: that persons who were identified as field-independent during pre-testing would achieve an even greater degree of independent visual perception; more importantly, that those subjects who were

identified as field-dependent during pre-testing would achieve a significant degree of field-independence of visual perception; and, finally, that whatever increase of analytical functioning which would be achieved would be retained at a significant level for a period of four weeks. The latter hypothesis would be subjected to post-testing measurement.

This investigation was conducted during the 1976 spring semester, using male and female undergraduates enrolled in freshman art courses at Anderson College, Anderson, South Carolina. The sample was obtained by an initial administration of Witkin's Group Embedded Figures Test (GEFT). From the test results the 27 subjects scoring highest were classified as field-independent (16 males and 11 females); the 29 subjects scoring lowest on the GEFT were classified as field-dependent (12 males and 17 females). The sample was then randomly sub-divided by use of a toable of random numbers into four groups: field-independent, 13 for treatment, 14 for control, and field-dependent, 15 for treatment and 14 for control.

The treatment and control groups were to be post-tested with the GEFT at the conclusion of a twelve-week instructional period. The control groups were post-tested for comparison with the treatment groups to determine the extent of visual perceptual learning and possible changes that might be attributed to the treatment procedures.

The GEFT was again administered to the treatment groups only after a treatment discontinuation period of four weeks in order to determine if gain retention of increased analytical functioning on the post-test measure would remain significantly consistent.

The instructional procedures were developed primarily from two areas dealing with visual perceptual principles. The first area was developed from related literature and involved characteristics of field-independence and Gestalt Laws of Visual Organization. The second area of development came from principles and methods that deal with the maxims of perceptual unity used in designs in order to achieve "satisfactory" pictorial organization.

Data in this study were subjected to analysis of variance for hypothesis testing and set at the .05 level of significance. The result of these data showed significant findings and indicated that higher scores on the GEFT were associated with treatment effect. These findings were evident in comparative differences between control and treatment post-test measures. The increased scores on the post-test measures were suggestive of greater visual perceptual differentiation by the subjects and reflected increased ability to analyze, segregate, and integrate elements within the visual field.

Revealed also in the study was that the number of subjects identified as field-independent increased significantly as a result of the treatment. A total 13 subjects identified as field-independent and 15 subjects identified as field-dependent on the pre-test measure were to receive treatment. When evaluated on the post-test measure, the combined number revealed 22 subjects as field-independent and 6 identified as field-dependent. The control groups which received no treatment during the treatment period, with 14 field-independents and 14 field-dependents on the pre-test measure, revealed no significant gain of field-dependency on the post-test measure. The GEFT was also used as a post-post-test, administered to the treatment groups only. According to the data after a discontinuation period of four weeks, subjects' gain retention of increased analytical functioning on the post-test measure remained significantly consistent.

A comparision of data between treatment and control groups reflects improved GEFT score and denotes increased visual perceptual differentiation only with the treatment groups. Therefore, it was concluded that increased visual perceptual differentiation was due to instructional procedures. Since increased visual perceptual differentiation resulted from these instructional procedures and the procedures were based upon characteristics of differentiation, Gestalt Visual Laws of Organization and other related factors, it is concluded that attempts to alter visual perceptual differentiation

should be based on characteristics discriminative of differentiation.

As a result of this study and based upon the conclusions drawn from it, the following recommendations are made:

The crux of this study was to develop an instructional methodology designed to alter visual perceptual differentiation as defined by the GEFT. Since it was concluded that visual perceptual differentiation can be altered and will respond to treatment, it is recommended that the concept of differentiation be used where visual organizational development is an educational objective of highest priority. This would be especially appropriate for areas where fundamental compositional elements are of prime consideration in both the appreciation and application of aesthetic development.

Since this investigation was conducted with male and female undergraduates, it is suggested that a similar study or series of studies might be attempted to include graduate students who are generally older and have more xperience with compositional principles. It might then be possible to evaluate the instructional procedures at various academic levels.

It is suggested that research in reference to gain retention of increased analytical functioning be extended beyond four weeks to one year in order to see whether retention impinges on and permeates those intellectual

components which help individual design their lives aesthetically.

Further inferences are that there is a need for instructional procedures like those envisioned in this study; that an approach, using the Gestalt Laws of Visual Organization, can be utilized in order to manipulate hauman vision for the purposes of communication, both affective and conceptual.

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CHAPTER I

INTRODUCTION

Since 1920 there has been an increasing number of questions concerning the responses of people as they assimilate visual data from their environment. The aim of the researchers, in general, has not been necessarily to approach the question on the basis of what people respond to visually, but rather why they respond and how they come to form their judgment of value. Munro says

> Psychologically, we should try to find out more about the nature and varieties of such visual experiences, under different conditions and for different types of individuals. Educationally, we should then try to find out how these can best be developed, along with other factors in the growing personality (2, p. 144).

Within this framework, one initial step is to measure a specific dimension of personality, visual perceptual differentiation, which has been shown to be pervasive and stable across situational variables and to determine the degree of relationship between this measure and specific responses of individuals as they respond to and assimilate visual data from the environment. A search of the literature reveals that few attempts have been made using a specific personality variable as a possible correlate to individual responses to visual data. A few researchers have noticed the problem

area, however, as can be seen in a recent report which identifies visual perception as one of many interrelated factors in the thought processes of an individual as he responds to and assimilates data from his environment (3). Visual perception is defined by Attneave (1) as an information-handling process through which one gathers and processes visual data. Generally, research has focused on the information-handling process since evidence indicates that differences in processing affect the experience of perceiving (4).

The search to provide explanations about perceptual differentiation led Witkin and his associates to develop the theory of psychological differentiation. Witkin (4) defines psychological differentiation as the degree to which the human system has attained specificity of its separate components; i.e., the individual responds primarily with specific responses to specific stimuli.

To mark the limits of differentiation, Witkin identified two perceptual modes of information-handling: field-dependence and field-independence.

These two modes are defined in terms of analytical functioning in perception:

> The person with a more field-independent way of perceiving tends to experience his surroundings analytically, with objects experienced as discrete from their background.
>
> The person with a more field-dependent way of perceiving tends to experience his surroundings in a

> relatively global fashion, passively conforming to the influence of the prevailing field of context (4, p. 35).

Because the concepts of perceptual differentiation are grounded in theory and empirical research, Witkin's approach was selected as an initial variable for investigation of factors affecting the responses of individuals toward certain visual data.

Problem of the Study

The problem of this study was to analyze, evaluate, expand, and implement an instructional procedure designed in order to increase individual visual perceptual differentiation.

Purposes of the Study

The purposes of this study were to

1. determine the relationship of visual perceptual differentiation, identified as field-dependent and field-independent, to responses of individuals as they respond to and assimilate certain visual data,

2. determine the effects of an instructional procedure upon subjects identified initially as field-dependent or field-independent,

3. determine the gain retention of effects of an instructional procedure upon subjects identified as field-dependent or field-independent.

Hypotheses

Hypothesis I

There will be no significant difference between pre-test and post-test measures of field-dependency among subjects initially identified as field-independent.

Hypothesis II

There will be no significant difference between pre-test and post-test measures of field-dependency among subjects initially identified as field-dependent.

Hypothesis III

There will be no significant difference between field-dependency scores on the post-test and the post-post-test for subjects in the treatment group.

Background and Significance of the Study

The importance of this study lies in the continuing search by man to provide explanation to the question of how we organize what we see. Research related to this study indicates that there are many interrelated factors in the thought processes of an individual as he responds to and assimilates visual data from the environment. One factor basic to this process is visual perception. Visual perception research provides a large body of evidence in support of differentiation. As a result, characteristics of visual perception are identified that will provide

information about individual differences in response to visual data. These differences yield a constellation of attributes that tend to range in a continuum. The range of the continuum is from field-dependency to field-independency with clusters of attributes related to each mode. The degree of visual perceptual differentiation is determined by the extent of field-independence. Because of the attributes related to it. Witkin (4) suggests that field-independence is, in cases of responses to visual data, a more preferred perceptual task. If differentiation is desirable, it will be significant to implement and describe an instructional method designed specifically to facilitate this aim in order to contribute to the body of knowledge related to differentiation.

A variety of theoretical constructs about the function of human visual perception has provided explanation about perceptual difference among individuals and how these differences affect his responses to visual data. One such construct is that of differentiation. It was developed by H. A. Witkin and his associates.

Witkin (4) maintains that all psychological functions are interrelated in all that are functions of levels of differentiation. This concept of differentiation refers to the degree to which the human system has attained specificity of its separate components. For example, the perceptual and psychological functions are developed to the point that the

individual responds primarily with specific responses to specific stimuli as opposed to global functioning experienced in early life.

In delimiting differentiation, Witkin (4) identified two perceptual modes of information-handling. The analytical type or field-independence individual, who is highly differentiated, is able to deal with an item independent from its surroundings to a given degree. At the opposite extreme is the global perceiver or field-dependent, one who is said to be relatively undifferentiated in his psychological functioning and who to an extent exhibits difficulty in separating an item from its content.

With regard to these two modalities and the individuals who have them, Witkin found that extent of activity in dealing with one's environment is the characteristic that "most effectively discriminates among people with different modes of perception" (4, p. 467). Witkin further states that the analytical or field-independent individual " . . . tends to be characterized by activity and independence in relation to environment" (4, p. 468); i.e., activity and independence with relatively little support from the environment exhibiting a capacity for initiating and organizing control over social and environmental forces. They are also " . . . better able to structure their experiences" (4, p. 113). Witkin suggests that field-independence is a more preferred method of information-handling because individuals with this mode of

perception tend to have better memories and greater "cognitive " clarity, i.e., information and impressions are discreet, structures, and assimilated. However, Witkin sees global or field-dependent individuals characterized by a passivity which "signifies inability to function independently of environmental support, in absence of initiating activity, and a readiness to submit to forces of authority" (4, p. 467). He again suggests that global or field-dependence is a less preferred method of information-handling because individuals with this mode of perception tend to have poor memories and lesser cognitive clarity: i.e., information and impressions are blurred, confused, and unassimilated (4, pp. 81-114). To reemphasize his preference for field-independence, Witkin states that this mode is likely to be valued since " . . . the differentiated person has richer, more diversified resources for coping than the less differentiated person" (4, p. 21). Because the concepts of differentiation are grounded in theory and empirical research, Witkin's modes were selected as initial variables for investigation of factors affecting the thought processes of an individual as he responds to the visual environment.

The significance of the research presented was more comprehensible in light of Witkin's construct about the function of human visual perception and its value in enabling an individual to more accurately respond to his visual

surroundings. It appears, according to this theoretical position that the most efficient way to relate the many variables found within the personality of an individual, as he perceives a visual stimulus, would be to measure a specific dimension of that personality, his visual perceptual modes of informational-handing. A review of the literature reveals that few attempts have been made using any specific personality variables as possible correlates to improve the responses that people make to their visual environment. A few researchers have noticed the problem area, however, and have reported findings in literature. According to Munro (2) there are many vital issues in the psychology of aesthetics, which can profit from investigations into the nature of visual perception-personality relationships.

In overview, differentiation measurements have shown significant correlation with numerous variables across experimental situations which could improve the responses of individuals to their visual environment. The predominant patterns which have emerged for field-independent individuals show them to have emotional distance, internal directedness, task-orientation, achievement-orientation, analytical approaches, and ability to establish a sharp distinction between self and other. In contrast, the predominant patterns which have emerged for field-dependent individuals are:

emotional ebullition, strong reaction to social influences, social-orientation (as opposed to task orientation), impulsivity in responding, and poor differentiation of self and other.

To date, the literature reveals that there are a few studies which use visual perceptual differentiation as a basis to measure the effectiveness of instructional methods on individuals identified as field-independent or field-dependent. Reeves (3), in one such study, utilizes the characteristics of each visual perceptual mode as a basis for developing instructional procedures, considered to be effective for each mode. Therefore, it is the purpose of this research to expand and provide additional evidence about instructional procedures designed to alter individual visual perceptual modes in order to effectively manipulate human vision for the purposes of communication, both affective and conceptual.

Definition of Terms

Analytical Functioning--The ability of an individual to separate a whole, whether material or intangible into its constituent elements (3).

Artifact--An article produced or shaped by a subject in the experimental treatment.

Cues--Stimuli that give perceptual information (3).

Embedded Figures Test (EFT)--A timed visual perceptual test consisting of twenty-four complex figures and eight simple figures in which the subject's task on each trial is to locate a previously seen simple figure within a larger complex figure which has been so organized as to obscure or embed the sought-after simple figure (5).

Group Embedded Figures Test (GEFT)--A timed test designed to provide an adaptation of the original individually administered EFT which would make possible group testing. The GEFT was modeled as closely as possible on the individually administered EFT with respect to mode of presentation and format. It contains eighteen complex figures (seventeen of which were taken from the EFT) and eight simple figures (5).

Field--(Visual Field) the area perceived through one's vision (4).

Field-dependence--The perceptual tendency to experience the visual field in a relatively global manner with passive conformance to the influence of the prevailing field or context. A field-dependent individual is one who falls within the lowest range of correct responses on the Embedded Figures Test (4).

Field-independence--The perceptual tendency to experience the visual field in an analytical manner without necessarily conforming to the prevailing field or content. A field-independent is one who falls within the

highest range of correct responses on the Embedded Figures Test (4).

Gestalt--A term applied to organized units processing specific properties not derivable from parts and their relations alone; a whole is greater than the sum of its parts (1).

Gestalt Laws of Visual Organization--The organization of the visual field that occurs when perceived shapes, patterns, or combinations thereof become connected to form constellations of structures (3).

Gestalt Laws of Visual Organization (3):

Pregnance--The tendency to perceive a figure as accurately as possible under stimulus conditions.

Similarity--The tendency to group items according to the elements they have in common.

Proximity--The tendency to group items that are positioned close together in space and/or time.

Closure--The tendency to complete incomplete visual data.

Constancy of Form--A form that is invariable and retains its shape when perceived.

Continuity--A continuous or connected shape; the tendency for one to organize form or forms into continuous, uninterrupted units when a form or forms suggest continuity.

Area--Any surface, region or space in the visual field; the size of the area is a determinant of one's ability to form closure, i.e., one tends to form closure on smaller areas than on larger ones.

Delimitations

Several variables were not considered in this descriptive measure. No effort was made to obtain an equal distribution of female subjects in both treatment and control groups. The literature reveals that female subjects generally perform at a lower level of differentiation on the GEFT than do male subjects. However, in using a table of random numbers for dividing subjects into treatment and control groups, no attempt was made to influence the variable. Therefore, the effect of that variable is not known.

No attempt was made to compare treatment and control group interactions. Separate data analysis was employed in order to determine gain-score relationships.

In addition, the control group did not undergo post-post-testing as the treatment group did. And, finally, the experimenter bias effect was not compensated for. Since treatment, control, and data collection were administered by one investigator, the extent to which this variable might have influenced the results is not known.

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CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Since 1920 a number of research projects concerning visual perceptual differentiation have been conducted utilizing a theory of psychological differentiation developed by H. R. Witkin. The basic assumption of this theory involves the individual's ability to ignore the distracting field and perform the task of overcoming "embeddness" by the visual separation of a simple figure from a complex ground and is indicative of a more general and pervasive way of perceiving. Within the scope of this theory a number of experimental projects used psychological differentiation in conjunction with other experiments. The bulk of related literature reveals four areas of differentiation research: (1) studies relating it to other psychological variables, i.e., perception, intellectual functioning, personality, creativity; (2) investigations involving the stability of psychological differentiation; (3) research attempting to alter visual perceptual modes; (4) methodological studies utilizing the psychology of differentiation. This chapter surveys these areas and the instruments devised by Witkin to measure differentiation.

Differentiation Instrumentation

In 1962, Witkin with his co-workers (27) reported measures provided by an array of instruments such as the Embedded Figures Test, Body-Adjustment-Test and Rod-Frame-Test to be highly correlated and capable indices of field-dependent and field-independent modes of visual perception. This information provided a constellation of individual differentiation characteristics.

The chief task of the Embedded Figures Test (EFT) and the eventual measured behavior is the identification of a simple geometric figure which had been embedded in a more complex one. A number of investigations concerning this behavior have been reported. According to Reeves (21), Kurt Gottschaldt was the first investigator to research the disembedding behavior phenomenon. He incorportated a number of experiments with geometric figures to determine if prior experience is primary to visual perception differentiation.

Gottschaldt developed an instrument in which the subject was asked to observe a simple line drawing. After reviewing the drawing the subject was then requested to find that same drawing which was embedded into a more complex figure. His research reveals that subjects who actively searched for the familiar, simple drawing encountered difficulty in locating it. He explains this occurrence in terms of Gestalt Laws of Perceptual Organization:

> (1) there is a change in boundry-function of the simple line drawing when it is embedded in a more complex figure, i.e., the exterior contour line of a simple line drawing becomes an interior line in the complex figure; (2) the character of the simple drawing changes when it becomes a function of a complex figure, and (3) the unity of a simple figure appears altered when embedded in a complex figure (21, p. 12).

Gottschaldt's research was included in research by L. L. Thurstone (23) on the factoral aspects of perception. He reports the easier figures as well as the more difficult ones to be normally distributed. The investigation also suggests that the figures are high on two elements. The first element represents one's ability to formulate as well as hold closure against disorder (23, p. 101). The second element, flexibility or closure, represents " . . . the ability to shake off one set in order to take in another . . . and the flexibility in manipulating several more or less conflicting gestalts" (23, p. 111).

Witkin (24) utilized twenty-four of the original Gottschaldt figures for his EFT. According to Reeves, (21) Witkin made the disassembling task more difficult by adding disruptive color patterns to the more complex embedded figures. Performances on the EFT were reported significantly correlated with other measures of visual-spatial orientation, the BAT and RFT by Reeves.

According to Witkin (25) the BAT evaluated the subject's perception throught his ability to orient himself in relation to the upright. The subject's task is to adjust his body to an

upright position after the room and chair in which he is sitting are independently tilted. The manner measured by this device is similar to the one measured by the EFT. The EFT measures the subject's ability to separate an item from a complex field and " . . . one's ability to separate his body from the surrounding field in relation to upright . . . " (21, p. 13).

A similar type of perceptual behavior is measured by the RFT. It evaluates the subject's perception of an item within a visual field in relation to the upright. The subject is seated in a totally dark room, and his task is to adjust to a rod of light within a frame of light after the rod and frame are independtly rotated.

Subjects who attain a high score on the EFT, BAT, and RFT Witkin found are " . . . able to overcome the influence of the surrounding perceptual field, and according to differentiation theory, they are identified as field-independent" (26, p. 78).

Sex Differences in Disembedding

Witkin (28, pp. 214-221) and Reeves (21, p. 14) report differences in disembedding skills. The female subject constantly performed at a lower average level on the EFT than male subjects. This led both researchers to believe that there are individual differences according to the sex of the subject. Goldstein and Chance (6) suggest that these differences might be due to previous experiences with similar

tasks that require an individual to manage elements within his environment. Other theory reflects that colors may be used as a distracting factor in the EFT and since some forms of color blindness are genetically sex linked to approximately 10 percent of the male population, some males may have an advantage over females on the EFT.

Studies Relating Differentiation to Other Variables

In order to discover more about differentiation there have been a number of investigations involving relationships between psychological differentiation and other variables through correlative research. This chapter is designed to explore the relationships between differentiation and perception, intellectual functioning personality, and creativity.

Perceptual Variables

A technique introduced by Klein and Holzman (10, 11) to identify levelers and sharpeners was used in order to understand and determine individual differences in visual perception. The technique discerns that levelers primarily are swayed by context and are less accurate in their visual percepts than are sharpeners. By the same indication, sharpeners perceive differences more accurately and thereby attain a higher score on the EFT than levelers.

Koffka (14) relates that discrimination between figure and ground is basic to all visual perceptual tasks. The ability to make a distinction between a figure and its ground

may be determined by the number of figure-ground reversals indicated by a subject while being subjected to a series of ambiguous figures. Gardner (4), Immergluck (12), McGurk (17), Pressy (20), and Reeves (21) also report that the rate of figure-ground reversals is significantly related to field-independence.

Thurstone's study identifies flexibility of closure as a visual perceptual variable. The study used a modification of the Gottschaldt figures as did Witkin for the EFT. A relationship between flexibility of closure and the EFT was demonstrated by Witkin. A second test defining this variable is the Hidden Figures Test. Goodman (7) finds it not highly related to the EFT. A third test, the two-hand coordinated test, defining this variable was found to be significantly related to the EFT by Podell and Phillips (19). They also found these tests and others related in a cluster described as "spatial decontextualization."

Rate of closure, another visual perceptual variable, although somewhat related to flexibility of closure refers to immediate, spontaneous identification of an incomplete figure. Using the Gestalt Completion Test as a measure of this variable, Crutchfield, Woodworth, and Albrecht (2) found rate of closure not related to the RFT. Based on this information, Witkin (25, pp. 55-57) presupposes that the EFT would then not involve rate of closure. However, contrary to this supposition, Goodman found the Mooney Closure Test,

which also measures this variable, to be correlated with the EFT. In the wake of this argument, there exists uncertainties concerning the relationship of this variable to differentiation.

Intellectual Functioning

Witkin postulates that the ability of an individual to separate an item from its context as a factor of visual perceptual and intellectual functioning is supported by correlative investigations. Witkin reports significant correlation between his perceptual battery and the Wechsler Intelligence Scale for Children (26, pp. 61-71) and also with the 1937 Revised Stanford Binet. He infers that the relationship is due largely to the fact that portions of each of the tests require intellectual functioning.

Witkin (27, pp. 73-74) reports significant correlation between the EFT and the following measures of intellectual functioning: Guilford's (9) Insight Problems, .58; Guilford's Match Problems, .60; Subtest of the Weschler Adult Intelligence Scale: Picture Completion, .72; Block Design, .80; Vocabulary, .15; Comprehension, .39.

Thus, the data presented clearly indicates a relationship between intellectual functioning and extent of differentiation.

Personality

Witkin and his associates (27) found that the process of perceiving visually is related to the entire personality of the perceiver. They identify patterns of interrelated characteristics of both personality and differentiation. With the use of many varied testing procedures (e.g., Rorschach Test, Thematic Apperception Test, a figuring test, interviews, a word association test, a sentence completing test and autobiography), Witkin emerged with a body of findings which systematically relate personality to the continuum of field-dependence and field-independence. He states

> Field-dependent persons tend to be characterized by passivity in dealing with the environment; by unfamiliarity with and fear of their own impulses, together with a poor control over them; by a lack of self-esteem, and by the perception of a relatively primitive, indifferentiated body image. Independent or analytical perceptual performers, in contrast, tend to be characterized by activity and independence in relation to the environment; by closer communication with, and better control of, their own impulses; and by relatively high-esteem and a more differentiated mature body image (26, p. 469).

Creativity

Getzels and Jackson (5), in their study of creativity, report that subjects who are ranked as highly-creative usually come from a "growth-fostering" home environment. By the same token, those who ranked low-creative usually come from a "growth-restricting" background. Witkin (26) reveals that his field-independent subjects usually come from a growth-fostering background and field-dependents usually have growth-restricting home environments.

Based primarily upon Witkin's research with related support from Getzels and Jackson, McWhinnie (18) sought to find a relationship between differentiation and creativity. He administered a series of instruments composed of the Torrance Test of Creative Thinking (TTCT), EFT, RFT, and Hidden Figures Test to 90 sixth grade subjects. He reported insignificant correlations between the RFT and subtests of the TTCT. The correlations between the EFT and TTCT subtests were as follows: fluency, .01; flexibility, .09; originality, .12; elaboration, .25. The Hidden Figures Test was insignificantly correlated.

Grossman (8), exploring the same hypothesis, administered the TTCT and the Children's Embedded Figures Test to 60 kindergarten subjects. He also reported insignificant correlation between the two instruments with the exception of the elaboration subtest which correlated .29 (p .05) with the EFT.

It can, therefore, be assumed that differentiation is not closely related to the factors of creativity identified and measured by the TTCT with the exception of the elaboration factor found to be significant, with Grossman, but moderately correlated to the EFT.

Stability Studies

In order to clearly examine the stability of differentiation during the developmental growth years of children, Witkin, Goodenough, and Karp (28) employed a cross-sectional

and two longitudinal studies. The cross-sectional studies utilized subjects at ages 8, 10, 11, 12, 13, 17, and college students. All were given the three perceptual tests to identify extent of differentiation. One longitudinal study tested and retested subjects at 8 and 13 years of age with the perceptual battery. The other longitudinal group was tested at ages 10, 14, and 17; the males from this group were retested again at age 24. Data from these studies reveal significant test-retest correlations and insignificant mean score differences. The results indicate a trend toward increasing field-independence during developmental growth years with no change after age 17, at which time scores level off. This leveling off is attributed to the completion of the average child's development of differentiation by age 17. The authors conclude that within this developmental trend, children show high relative stability in extent of differentiation during growth years. The evidence gathered from their study supports Witkin's earlier conclusion that field-independence increases during developmental growth.

Three longitudinal studies have been conducted to determine the stability of perceptual modes in adulthood. With a sample of college students and one-year test-retest interval, Witkin (24, p. 370) reports a high test-retest correlation on the RFT and BAT. Obtaining similar results on the same population after a three-year interval, Bauman (1) reports test-retest correlations of .77 and .74 respectively for males and females

on the BAT; .84 for males and .66 for females on the RFT; and .89 for both men and women on the EFT. Fliegel (3) retested Witkin's original 17-year-old subjects at age 20, and reports EFT correlations of .97 (p .01) for males and .68 (p .01) for females. The difference in mean scores for males 1.5 and for females is 1.3. Fliegel's data were subjected to a test by Reeves to determine if there was a significant difference in mean score, and none was found.

Witkin (27, pp. 374-380) concludes from these studies that there is a developmental trend with differentiation. Children are mostly field-dependent and gradually move toward field-independency as a whole until about the age of 17. After this age, they tend to level off and become increasingly field-dependent, especially in the case of women. However, Witkin suggests that adulthood differentiation tends to remain stable.

Studies Attempting to Alter Perceptual Modes

Few studies have dealt with the problem of altering perceptual modes; those that have undertaken this problem have been only moderately successful. Witkin (24), working under contract to the Civil Aeronautics Administration, developed two methods of approach in attempting to alter perceptual modes. He randomly selected 180 females and 16 males at Brooklyn College to participate in his experiment. The 196 subjects were divided into four equal groups. Two of these

groups were training groups and two were control groups. Training Group I received supervised visual training on how to right oneself in the room in the BAT and Room-Adjustment Test (RAT); they were also permitted to practice with the test instrument. Training Group II was also allowed to practice with the test instrument; however, the tilted-room-tilted-chair device was altered. The square room was made circular; horizontals and verticals were eliminated, and the upholstery was removed from the seat to accent detection of pressure change and sliding when the chair was tilted. This group received training on the BAT and RAT with emphasis on bodily sensations rather than visual cues. Pre- and post-test scores for the BAT, RAT, RFT, and Rotating-Room-Test (RRT) were analyzed. The results revealed general improvement for the training group for the BAT and RAT, but not for the RFT or RRT.

Studies (27, pp. 371-373) suggest that alcoholization, tranquilizer therapy, drugs, hypnosis, and sensory-isolation have little or no effect on differentiation. Witkin concludes: "The studies of the effect of drugs, stress, and training suggest that the mode of field approach is, on the whole, resistant to change by experimental means, and thus appears to be a stable characteristic of a person" (27, p. 373). Reeves (21, p. 64) states, however, that it is possible to alter differentiation by instructional procedures, thus effectively manipulating human vision for the purpose of communication, both affective and conceptual.

Concern with the effects of practice and sex related differences in performance with the embedded figures, Goldstein and Chance (6) administered a sixty-eight item EFT to 13 men and 13 women college students in two sessions separated by forty-eight hours. Their finds show that the initial significant mean differences in scores reduced to almost zero by the final trials. The investigators drew several conclusions as a result. First, if the EFT and other perceptual measures are measuring differentiation, then there is a possibility that field-dependency is trainable and will respond to practice. Secondly, if body orientation is not trainable, then the EFT does not measure the same aspect of perceptual functioning. Thirdly, unless other explanations are postulated for the improved performance, the concept of differentiation must be modified to include the effect of practice or training.

Methodological Experiments Utilizing Differentiation

There exist two types of methodological studies utilizing differentiation. One attempts to measure the effects of existing instructional methods on the modes of field-dependency and field-independency. The other utilizes the characteristics of each mode as a basis for developing instructional methodologies.

Utilizing the traditional, step-by-step method of instruction, Kensler (13) hypothesizes that junior high school

students identified as field-independent will improve more and perform at a higher level of skill in perspective drawing than those identified as field-dependent. The results of his experiment indicate that there is no difference in improvement or performance between the two perceptual modes.

Rennels (22) developed two instructional methodologies, analytical and synthetic. The analytical method is based on the characteristics of field-dependence. He applied the methodologies to two intact groups of eight-grade, disadvantaged students. The EFT was administered to identify which students were field-dependent and which were field-independent. Thurstone's Primary Mental Abilities Test (PMA) and a spatial problems test were administered as pre-post-test measures. The investigation reveals differences between male and female subjects and beween perceptual modes with regard to performance on the PMA. Males identified as field-independent scored significantly higher on the Spatial Relations and Perceptual Speed subtests of the PMA than female field-dependents. Based on the results, he states that the analytical method tends to be superior to the synthetic method for both modes of perception.

Lovano (15) investigated relationships between cognitive style and perceptual mode in the context of children's artistic expression. She hypothesized that an individual with an analytical mode of perceiving prefers an analytical style of conceiving. The Children-Embedded-Figures-Test was used

to indicate conceptual style, and a drawing test designed by Lovano was used to indicate preferences for global and analytical artistic expression. Although Lovano reports no high correlations, she concludes that differences in children's artistic expression appear to be related to modes of perception, and to a lesser extent, related to cognitive style.

Summary of Related Research

Differentiation as identified by Witkin (27) and Reeves (21) is a psychological state through which one experiences himself and his environment. It refers to the extent to which one regenerates, integrates, and structures his environment. A relatively undiffernetiated individual is characterized by a field-dependent mode of perceiving. This perceptual mode is dominated by a global articulation of a field, and a relative inability to perceive parts of a field as discreet. A relatively differentiated individual is characterized by field-independence perception. This mode of perception is analytical and more structured, parts of a field are experienced as discreet from an organized background.

A number of researchers have investigated the relationship of differentiation and variables of perception, intellectual functioning, personality, and creativity. Correlative evidence relates differentiation to a similar perceptual mode identified as sharperners; it is also found to be related to figure-ground reversal, flexibility of closure, intelligence,

autonomous behavior, personality, and not significantly related to creativity as defined by the TTCT.

Educational reserachers have used differentiation to construct methodological studies that test the effects of certain aspects of curriculum on these modalities. The results of these studies demonstrate the application of perceptual research and provide further insights into the nature of differentiation.

Empirical research demonstrated differences in differentiation related to sex; on the whole, females are more field-dependent than males. Differences are also related to developmental levels. Young children are relatively undifferentiated, and with maturity, differentiation increases until about the age of 17 where it levels off and remains relatively stable throughout adulthood. Females, tend, however, to revert toward field-dependency after passing this age.

The studies reviewed tend to suggest that modes of perception are seemingly stable and resistant to change through environmental and psychological means. However, the studies of Reeves (21) and Goldstein and Chance (6) do not totally support this premise. Consequently, there seems to be a justification for further research regarding the possibility that field-dependency and field-independency are alterable and will respond to an instructional method.

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CHAPTER III

DESIGN OF THE STUDY

Subjects

This investigation was conducted during the 1976 spring semester, using as subjects male and female undergraduates enrolled in freshman art courses at Anderson College, Anderson, South Carolina. The subjects were assumed to be a random sampling of their corresponding population since the art courses were open to all academically eligible students during their two years at Anderson College.

The sample used for this study was obtained by an initial administration of the Group Embedded Figures Test, Form V (GEFT). The total number of subjects tested was 72. From test results the 27 subjects scoring highest and 29 scoring lowest were selected to participate in the study. The subjects were divided into field-dependent and field-independent. The 27 scoring highest were randomly sub-divided and classified as field-independent; 13 were designated as treatment group (8 males and 5 females) and 14 as control group (8 males and 6 females). The 29 scoring lowest were designated field-dependent classification; 15 were randomly designated for treatment group (8 males and 7 females) and 14 for control group (4 males and 10 females). These groups

were formed and classified according to scores on the Group Embedded Figures Test, Form V (GEFT), as shown in Table I. Classification of subjects as field-independent, field-dependent, or field-neutral was based on normative data for college samples in the Manual for the Embedded Figures Test (14, p. 28). Subjects who scored in the third and fourth

TABLE I

FIELD-INDEPENDENT - NEUTRAL - FIELD-DEPENDENT CLASSIFICATIONS

Field Classification	Treatment Group	Control Group
Field-Independent	13	14
Field-Neutral	9	7
Field-Dependent	15	14

quartile were designated as field-independent, and in the first quartile, field-dependent, using separate normative data for males and females, the latter scoring slightly lower on field dependence measures across most samples in their culture. All others were considered to be field-neutral. Field-neutral students were treated exactly as if they were actual participants in the study, both in treatment and control procedures; however, they were not included in the collection of data because information reveals that visual perceptual differentiation is valid only when extreme scores are used, and

no prediction can be made for those individuals whose score falls in the neutral ranges (13, 10, 7).

The age range of the field-independe classification includes a treatment group, 18-21 years with a mean age of 19 years, 3 months and a control group, 17-21 years with a mean age of 18 years, 7 months. The age range of the field-dependent classification includes a treatment group, 17-21 years with a mean age of 19 years, and a control group, 18-20 years with a mean age of 19 years.

Instruments

The Group Embedded Figures Test, Form V, was used for both initial and final classification of subjects according to level of field-dependence-independence. Based upon the same suppositional assumptions and empirical foundations as the Embedded Figures Test, the Group Embedded Figures Test, Form V, was selected because of the relatively large sample size and the fact that it may be administered one or more times in order to satisfy the hypothesis concerning visual perceptual differentiation. Reliability for the group form was reported

> . . . separately for males and females, using the Kuder-Richardson formula 21 for alternate forms of the Embedded Figures Test (EFT). Correlations of .84 for males and .75 for females were found for the individual short form of the EFT and Form V of the group form . . . (7, p. 41).

Based upon a constellation of empirical research and available data, this form was selected for use in the present study.

Use of the GEFT is fully supported by Gough (4), in the Mental Measurements Yearbook, sixth edition, and partially supported by Reeves and Johnson. Gough states that reliability, regardless of type, had a median of .905, and Tyler cites Bauman's (1) study which reported reliability of .83 for both males and females over a three-year interval. According to Johnson, none of the reviews questions the validity of the instrument, and Gough suggests

> One of the most attractive features of the test is its form anchoring in a systematic context of theory and empirical evidence. There is no question concerning the importance of the approach to cognitive testing, represented by the device . . . one can discern the gradual crystallizing of a concept of measurement of truly fundamental significance (4, p. 210).

Since the time of this publication, a number of the criticisms presented by Gough have since been reevaluated and restated accordingly. Gough's major criticism of the instrument was that there was (a) no group form, (b) no parallel form, (c) no manual containing normative data, inter-item correlations, and (d) no short form of the individual form of the test.

As stated earlier, these criticisms were taken for consideration, alleviated, and are now incorporated into a new form, available from publishers along with a manual. Gough's final criticism concerning the Group Embedded Figures Test

may be mentioned and is apparently still valid. Gough claimed that more evidence is needed on the level of cognitive functioning since it is seemingly another dimension categorically independent of intellectual ability.

Procedures

The sample used in this study was obtained by the administration of the Group Embedded Figures Test, Form V, to a group of 72 students enrolled in freshman art courses at Anderson College, Anderson, South Carolina, during the spring semester of 1976. The 27 highest and 29 lowest scores were selected to be included in the study. To ensure that extraneous variables would not introduce systematic bias in the experimental results, the subjects were randomly subdivided by use of a table of random numbers available in Fisher and Yates (3). The subjects included field-independent, 13 for treatment, 14 for control; and field-dependent, 15 for treatment and 14 for control.

The treatment groups and the control groups were to be post-tested with the GEFT at the conclusion of a twelve-week treatment period. The control groups were post-tested for comparison with the treatment groups to determine the extent of visual perceptual learning and possible changes that might be attributed to the treatment procedures. The GEFT was again administered to the treatment groups after a four-week period to compare their gain retention levels that were determined by the post-test measure.

Treatment

The experimental instructional treatments were developed primarily from two areas dealing with visual perceptual principles. The first area was developed largely by Reeves and involves characteristics of field-independence principles of Gestalt Laws of Visual Organization (8, 9, 2) and factors suggested from related literature. The second area of development came from principles and methods that deal with the maxims of perceptual unity used in designs to achieve satisfactory pictorial organization (15, p. 24).

Basic to the principle of differentiation and to Gestalt theory is field organization. (A more complete discussion about field organization and its relationships to differentiation is offered in Appendix A.) Therefore, it was postulated that in order to promote a more differentiated visual perception, the treatments should incorporate Gestalt Laws of Visual Organization. It was also postulated that Gestalt concepts might be more facilitated by application of those concepts to the principles that underlie the elements of establishing satisfactory pictorial organization. It is believed that by so doing, the treatments would increase individual articulation by developing analytical visual perception and by application of that articulation.

To facilitate this objective, the treatments included illustration, examination, discussion, and application by the subjects, exemplars of Gestalt Visual Organization that

reveal structure, segregation, and integration of the visual field.

The related research suggested four other factors included in the treatment: Thurstone's factors of (1) forming and holding closure against distraction, and (2) flexibility of closure, (3) Holzman and Klein's (6) delineation of sharpeners, and (4) figure-ground reversal. Subjects were shown deprived illustrations that required formation and maintaining closure against destructive elements to render comprehension of the illustration. To affect flexibility of closure, ambiguous figures were viewed that afforded the subjects an opportunity to manipulate two or more conflicting Gestalts. To facilitate sharpening, subjects were asked to accentuate cues from the field. The subjects were shown a series of illustrations depicting figure-ground relationships of varying complexity and were asked to reverse the figure and ground.

Thus, the treatments were formulated from the Gestalt Laws governing visual perception, principles underlying pictorial organization, and factors related to differentiation, thus forming the basis for differentiated perception. These treatments together provided the subjects with methods for examining the entire visual field contemporaneously with its parts and also provided the subjects with a visual vocabulary to deal with and articulate the field. In addition, the subjects achieved application of pictorial principles involved with the visual field.

The instructional methodologies of the treatment group involved twelve weeks of classroom and laboratory instruction. They incorporated a series of one-hour lecture-discussions in which Gestalt Laws of Visual Organization were illustrated and examined. A second hour was devoted to application and production of artifacts incorporating designs involving pictorial organization of the Gestalt Laws (See lesson plans and activities; Appendix B, C, and D).

Each lecture-discussion was based on one or more Gestalt Laws, and was illustrated by projecting slides made by the investigator. (See Appendix B and C for examples.) The slides included simple illustrations of the Laws, photographs of elements within man's visual environment that depict the Laws, and illustrations that provide a stimulus for application of those Laws in relation to elements of pictorial organization. (See Appendix D.) Each lecture included a cumulative review of the previous lectures with discussions and inquiry encouraged throughout. Care was taken so that each subject understood the concept under discussion and accomplished and applied the visual perceptual tasks required of him. The required tasks were to apply to a projected slide or visual field the Gestalt Law or Laws being discussed, to seek out relationships between and among items in a field, and to articulate the visual field. To further illustrate these principles, the final lecture and application in the laboratory was a comprehensive review of all the Laws

and included a group critique of artifacts produced during the treatment period.

By producing and evaluating in group critiques, artifacts that incorporated Gestalt Laws of Organization, an opportunity was provided for the subjects to practice, manipulate, apply, and analyze themselves and their peers, the concepts they learned. By so doing, they were provided with a practical and theoretical experience that could reinforce learning.

Objectives

This study was undertaken to follow up and examine studies that involved visual factors of differentiation, to assess the effects of instructional methodology designed with intent to increase an individual's visual analytical perceptual functioning, to compare the subject's gain retention of such increased functioning after a four-week duration, and to determine if subjects identified initially as field-dependent would perform as field-independents on a post-test measure. The resulting research and directional hypotheses were generated and tested at the .05 level of significance.

Hypotheses

Hypothesis I

There will be no significant differnece between pre-test and post-test measures of field-dependency among subjects initially identified as field-independent.

Hypothesis II

There will be no significant difference between pre-test and post-test measures of field-dependency among subjects initially identified as field-independent.

Hypothesis III

There will be no significant difference between field-dependency scores on the post-test and the post-post-test for subjects in the treatment group.

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CHAPTER IV

RESULTS AND DISCUSSION

Results

The findings of this investigation are reported in the order in which the hypotheses were presented in Chapter III. The level of significance for testing the hypotheses was set at .05.

Since scores from the Group Embedded Figures Test, Form V (GEFT) were used as a pre-test, post-test, and post-post-test measure of visual perceptual differentiation, it was not necessary to evaluate the instrument's consistency and accuracy. The GEFT is, according to Witkin, a "speed test." Therefore, the appropriate method of estimating reliability would be a correlation between parallel forms with identical time limits. Such a method was conducted by Witkin in a small pilot study using correlations between the nine-item First Section scores and the eight-item Second Section scores. These data were computed and correlated by using the Spearman-Brown prophecy formula and yielded a reliability estimate of .82 for both males (N=80) and females (N=97). These data compared favorably with the GEFT's "parent" form, the Embedded Figures Test (EFT).

As a result of these data reported by Witkin (4), it was assumed that the reliability coefficient of the GEFT was significant enough to merit confidence in the instrument as a reliable measure of visual perceptual differentiation.

Hypothesis I states that there will be no significant difference between pre-test and post-test measures of field-dependency among subjects initially identified as field-independent. The level of rejection was at the .05 level of significance.

Data from the F-ratio and analysis of variance are reported in Table II.

TABLE II

SUMMARY OF ANALYSIS OF VARIANCE FOR HYPOTHESIS 1--TREATMENT GROUP

Source of Variation	Sum Squares of Variation	Degrees of Freedom	Mean Squares of Variation	F-ratio
Treatment	28.04	1	28.04	17.30
Rows	16.54	12	1.378	
Error	19.46	12	1.62	
Total	64.04	25		

The value of F (1,12) = 17.30 indicates a significant difference between the pre-test and post-test scores at the .05 level. It can, therefore, be concluded that as a result

of these data, the obtained F-ratio is greater than the value required and the differences indicated by this value would occur less than 5 percent of the time by chance alone.

The support of this assumption which rejects Hypothesis I is reflected in the control group which received no treatment during the treatment period. Data from the F-ratio and analysis of variance are reported in Table III.

TABLE III

SUMMARY OF ANALYSIS OF VARIANCE FOR HYPOTHESIS I--CONTROL GROUP

Source of Variation	Sum Squares of Variation	Degrees of Freedom	Mean Squares of Variation	F-ratio
Treatment	.32	1	.32	0.15
Rows	62.61	13	4.81	
Error	27.17	13	2.09	
Total	90.11	27		

The value of F (1,13) = 0.15 indicates there was not a significant difference between the pre-test and post-test scores at the .05 level. It can be concluded that the obtained F-ratio is less than the value required. Subjects in the control group received no treatment during the treatment period and as a result were not able to improve their score significantly on the post-test measure.

Hypothesis II states that there will be no siginficant difference between pre-test and post-test measures of field-dependency among subjects initially identified as field-dependent. The level of rejection was at the .05 level of significance.

Data from the F-ratio and analysis of variance are reported in Table IV.

TABLE IV

SUMMARY OF ANALYSIS OF VARIANCE FOR HYPOTHESIS II--TREATMENT GROUP

Source of Variation	Sum Squares of Variation	Degrees of Freedom	Mean Squares of Variation	F-ratio
Treatment	320.13	1	320.13	54.82
Rows	106.67	14	7.33	
Error	81.87	14	5.84	
Total	504.67	29		

The value of F (1,14) = 54.82 indicates a significant difference between the pre-test and post-test scores at the .05 level. It can be concluded that the obtained F-ratio is greater than the value required, and the differences indicated by this value would occur less than 5 percent of the time by chance alone.

The support of this assumption which rejects Hypothesis II is reflected in the control group which received no treatment during the treatment period. Data from the F-ratio and analysis of variance are reported in Table V.

TABLE V

SUMMARY OF ANALYSIS OF VARIANCE FOR HYPOTHESIS II--CONTROL GROUP

Source of Variation	Sum Squares of Variation	Degrees of Freedom	Mean Squares of Variation	F-ratio
Treatment	.89	1	.890	.45
Rows	188.46	13	14.49	
Error	25.61	13	1.97	
Total	214.96	27		

The value of F (1,13) = .45 indicates there was not a significant difference between the pre-test and post-test scores at the .05 level. It can be concluded that the obtained F-ratio is less than the value required. Subjects in the contrast group received no treatment during the treatment period and as a result were not able to improve their score significantly on the post-test measure.

Hypothesis III states that there will be no significant difference between field-dependency scores on the post-test

and the post-post-test for subjects in the treatment group. Data form the F-ratio and analysis of variance are reported in Tables VI and VII.

TABLE VI

SUMMARY OF ANALYSIS OF VARIANCE FOR HYPOTHESIS III--FIELD-INDEPENDENT

Source of Variation	Sum Squares of Variation	Degrees of Freedom	Mean Squares of Variation	F-ratio
Treatment	.1538	1	.1538	.316
Rows	16.615	12	1.3846166	
Error	5.846	12		
Total	22.6154	25		

The value of F (1,12) = .316 indicates there was not a significant difference between the post-test and post-post-test measure at the .05 level. It can be concluded that the obtained F-ratio is less than the value required. Therefore, Hypothesis III for field-independent subjects was not rejected and indicates that gain retention of subjects on the post-test measure of analytical functioning remained significantly consistent after a four-week period.

TABLE VII

SUMMARY OF ANALYSIS OF VARIANCE FOR HYPOTHESIS III--FIELD-DEPENDENT

Source of Variation	Sum Squares of Variation	Degrees of Freedom	Mean Squares of Variation	F-ratio
Treatment	4.04	1	4.04	4.20
Rows	261.47	14	18.68	
Error	13.97	14	.962	
Total	278.97	29		

The value of F (1,14) = 4.20 indicates there was not a significant difference between the post-test and post-post-test measure at the .05 level. It can be concluded that the obtained F-ratio is less than the value required. Therefore, Hypothesis III for field-dependent subjects was not rejected and indicates that gain retention of subjects on the post-test measure of analytical functioning remained significantly consistent after a period of four weeks.

Discussion

The analysis of data in this descriptive measure revealed significant findings which indicated that higher scores on the GEFT were associated with treatment effect. These findings were evident in the comparative differences of post-test measures of treatment and control groups. An intervening

variable related to testing procedures for the treatment and control groups has already been noted as a delimiting factor. Separate data for field-independent and field-dependent analyses was utilized in order to determine gain-score relationships. However, no attempt was made to compare the interactions of treatment with control group relationships. In addition, there was an unequal distribution of female subjects within the two groups. Although the literature indicates that female subjects perform at a lower level of differentiation than males, no attempt was made to control this variable; therefore, the extent of the variable's effect is not known.

Revealed also in the study was the fact that the number of subjects identified as field-independent increased significantly as a result of treatment. This can be illustrated by combining the number of field-independent and field-dependent subjects found in the treatments. There was a total of 13 subjects identified as field-independent and 15 subjects identified as field-dependent on the pre-test measure that were to receive treatment. When evaluated on the post-test measure, the combined number revealed 22 subjects as field-independent and 6 identified as field-dependent. The control groups which received no treatment during the treatment period, with 14 field-independents and 14 field-dependents on the pre-test measure revealed no significant gain on field-dependency on the post-test measure.

A variable for which compensation was not provided was the experimental bias effect. Treatment, control, and data collection were administered by one investigator. Therefore, the effect of this variable is not known.

The results of this investigation are consistent with those discussed by Reeves (2). His study refuted the argument established by Witkin (3) which states that differentiation is a stable function and is resistanct to change despite attempts to alter. Reeves (2) reveals that in the instance investigated, visual perceptual differentiation, as defined by the EFT, can be altered and in some respects, is not resistant to change.

The influence of treatment or the subjects' visual perceptual differentiation may be attributed to a series of factors. The intent and content of treatments was a positive force since all tasks and activities within the treatment parameters were geared to analyze, segregate, integrate, organize, and apply both optical and conceptual elements. The use of examples and slides for illustrative purposes also generated the subjects' interest (See Appendix B, C, and D).

Several implications can be deduced from the results of this study with respect to educational research and development in the area of visual perceptual differentiation. Relevant to visual perceptual research is the implication that since the subjects' visual field was altered significantly,

the proposal of a teaching methodology designed to alter the visual field can result in the effects accordingly.

McFee (1) and Reeves (2) state that improvement of visual perception is a desirable objective for those involved with visual arts education. In support of this position the instructional methodologies incorporated in this study can facilitate that objective. Therefore, it is affirmed that results of this research can lend itself to kinds of activities and procedures needed to achieve this desired goal. By incorporating the principles of Gestalt Field Organization into theories and applications needed to organize a visual field, by producing artifacts related to that organization, analytic functioning and visual perceptual differentiation can be, for the individual, significantly increased.

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CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study dealt with the problem of evaluating the effects of an instructional methodology that would alter visual perceptual differentiation as defined by the Group Embedded Figures Test, Form V (GEFT).

This study involved male and female undergraduates enrolled in freshman art courses at Anderson College, Anderson, South Carolina for the spring semester, 1976. An instructional methodology was designed to alter visual perceptual differentiation based upon characteristics of field-independence, principles of Gestalt Laws of Visual Organization, and factors suggested in the writings of Witkin (3), Reeves (1), and in related literature.

Two groups were selected to receive the instructional method; those classified as field-independent and those classified as field-dependent. The bases for classification were an initial administration of the GEFT and the normative data established by the instrument.

The field-independent group was then randomly subdivided. Thirteen subjects were selected as members of the treatment group and 14 were selected as members of the control

group. The field-dependent group was, likewise, randomly subdivided. Fifteen subjects were selected as members of the treatment group and 14 were selected as members of the control group. A total of 56 subjects were selected to participate in the study.

The GEFT was used to indicate differentiational abilities of the subjects and to evaluate the effects of the treatment on the subjects. The GEFT has the same reliability and validity as its "parent" instrument, the Embedded Figures Test. However, it is more adaptable to large group testing (4). The GEFT was administered as a pre-test, a post-test, and a post-post-test. The pre-test functioned as an initial classification element. It was used to identify the subject field dependency. The post-test was administered after a twelve-week period to evaluate the effect of instruction methodology on treatment groups. The post-test was also administered to the control groups in order to measure any changes occurring without exposure to instructional methodology. The post-post-test was administered to treatment groups only. The post-post-test was administered four weeks after the post-test, and was designed to evaluate gain retention.

The study tested the following research hypotheses in order to evaluate the effects of the instructional methodologies.

1. Subjects identified as field-independent on a pre-test measure will not achieve a significantly greater field-independence of visual perception on the post-test measure.

2. Subjects identified as field-dependent on the pre-test measure will nto achieve a significantly greater field-dependence of visual perception on the post-test measure.

3. Subjects' gain on a post-post-test measure of increased analytical functioning will not remain significantly consistent after a period of four weeks.

The hypotheses were subjected to the appropriate statistical test. The level of significance was set at .05 for rejection of the research hypotheses. The findings of these tests are as follows.

Hypothesis I was rejected since analysis of variance revealed significant differences between the pre-test and post-test measure of field dependency. These differences were obtained by comparison of F-ratios at the .05 level of significance.

Hypothesis II was rejected since analysis of variance revealed significant differences among the pre-test and post-test measures of field dependency. The differences were obtained by comparison of F-ratio at the .05 level of significance.

Hypothesis III was not rejected since analysis of variance revealed no significant differences between the post-test and post-post-test measure of dependency after a four-

week period. No significant difference between the post-test and post-post-test measure was revealed by comparison of the F-ratios at the .05 level of significance.

The findings of this research show that subjects, after treatment, did significantly improve their scores on the GEFT post-test measure of dependency. Subjects, however, who did not receive treatment did not significantly improve their score. Also, it was shown that after a period of four weeks, and on a post-post-test measure of the GEFT, subjects' gain of increased analytical functioning remained significantly consistent.

Identification of field-independent and field-dependent subjects initially by the GEFT revealed an approximate equal number of each visual perceptual mode for both groups. On the post-test measure, however, there were significantly more subjects identified as field-independent after receiving the treatment than there were before the treatment. As for the control groups, there was no significant increase in number of subjects identified as field-independent on the post-test measure of dependency.

In overview, data from this study revealed altered visual perceptual modes as measured by the GEFT. This alternation is in the form of increased differentiation, and is assumed to be a result of the treatment effect.

Conclusions

From the results of this study, with respect to the concepts of visual perceptual differentiation and an instructional methodology geared to alter that concept, the following conclusions were drawn:

It may be concluded that it is possible to alter visual perceptual differentiation as defined by the GEFT at least over a short period of time. This conclusion is supported by data which reveal significant increases in GEFT performances which provide an index of increased visual perceptual differentiation. There is also data to support the conclusion that gained retention of visual perceptual differentiation remain consistent after a period of four weeks.

A comparison of data between treatment and control groups reflects improved GEFT scores and denotes increased visual perceptual differentiation only with the treatment groups. Therefore, it is concluded that the measured increases were due to an instructional methodology.

Recommendations

As a result of this study and based upon the conclusions drawn from it, the following recommendations are made.

Since the crux of this study was to develop an instructional methodology designed to alter visual perceptual differentiation as defined by the GEFT, it was concluded that visual perceptual differentiation can be altered and will respond to treatment. It is recommended, therefore, that the focus of

this investigation be used as a pilot study in areas where visual organizational development is an educational objective of highest priority. This would be especially appropriate for areas where fundamental compositional elements are of prime consideration in both the appreciation and application of aesthetic development.

It is further recommended that such future investigations expand the procedures of the present study to include an equal distribution of female subjects in treatment and control groups in order to control the variable of female performance at a lower level of differentiation. Additionally, any analysis of variance should provide for combining the data in order to determine the interactions between treatment and control groups. Procedures should be so structured to include more than one investigator in order to insure that experimenter bias effects are kept at a minimun. Sub-tests of the Weschler Adult Intelligence Scale: Picture Completion, Block Design should also be given. The results of these sub-tests should be correlated to GEFT findings in order to determine whether other personality traits are subject to change along with an individual's perceptual mode. And, finally, any future investigations of a nature similar to the present one should include a post-post-test for the control group as well as the treatment group in order to determine more fully whether improvement was due to treatment procedures or to practice effect.

Since this study was conducted using one instrument (GEFT), it would be significant to use all four measures of dependency as established by Witkin (EFT, GEFT, Rod-Frame-Test, and Body-Adjustment-Test). Reeves (1) indicates that this would provide an array of data related to the effects of treatments on performances with other visual perceptual differentiational tests. It would also provide further validation of the capacity of the four indices used to measure differentiation.

Since the concept of visual arts education is to help foster individual analytical functioning, it is suggested that a pilot study be conducted in order to further the skillful control and manipulation of human vision for the purpose of communication, both affective and conceptual. This study should include the principal ideas of visual perceptual differentiation which is to record and analyze how we organize what we see. In its clarification and emphasis the Gestalt theory of visual perception differentiation can provide the preliminary tools for an understanding of the principles of visual organization and the language of the visual arts.

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APPENDIX A

A DISCUSSION OF INDIVIDUAL VISUAL PERCEPTUAL DIFFERENTIATION AS USED IN THE INSTRUCTIONAL PROCEDURES[1]

Reeves states:

> . . . differences in differentiation is the extent to which individuals are able to keep an item apart from a context (p. 73).

In order to accomplish this task of altering an individual's visual perceptual mode, it is theorized that an instructional methodology should be set up dealing with this behavior and to also examine the mechanics of the visual field. It is also proposed that instructional procedures affecting visual perceptual differentiation should also include the attributes of developed differentiation. Reeves cites these reasons for using the characeristics of the Gestalt theory of visual perception as the primary tools for an understanding of the principles of visual organization and the language of the visual arts.

Witkin states:

> individuals experiencing field-independent behavior articulate perception. Articulated perception is achieved by analyzing visual data. Analyzing is accomplished by segregating, structuring, and integrating the field. Segregation refers to separating items and increasing the discreetness of items within the field. Structuring involves the relationship of inter dependent parts and field arrangement; this includes perceiving and organization (pp. 13-14).

---

[1]Derived from "The Assessment of Altered Differentiation as Affected by Experimental Treatments," by Daniel J. Reeves, 1971.

The ability of an individual to structure his visual field is accomplished by the individual's ability to separate items from their background. Organization of an individual's visual field is accomplished by inherent perceptual organization, a reorganization of a visual field that is organized and by forming structure on a visual field that contains relatively little structure.

"Integration is effected by joining cues and visual data" according to Reeves, into a common arrangement within the visual field by using complex field integration principles.

The delineation of differentiation and Gestalt Visual Organization suggests the following parallel-behavioral concepts.[2]

1. Articulation is contingent upon understanding gestalqualitat.

2. Analytical perception depends upon field analysis.

3. Segregating results from seeking figure-ground relationships and persistence of form.

4. Increasing discreetness of objects is derived from perceiving items that constitute proximity, similarity, good figure, good continuation, and continuity groupings.

5. Structuring by perceiving items discreet from their backgrounds is not only due to figure-ground discrimination and isolating items from a field, but is also due to good figure and transposition of form.

---

[2]Ibid.

6. Organization is contingent upon utilization of all the Gestalt Organizational Laws.

7. Perceiving a field's inherent organization results from perceiving the field as a whole, its gestalqualitat and meaningfulness of form.

8. Reorganizing an organized field can be accomplished by forming closure and pragnaz from constituent parts.

9. Imposing structure on a field that contains relatively little form is achieved through fusion of forms, closure, and most Gestalt Laws.

10. Integrating is a consequence of incorporating the qualities of all of the Gestalt Laws when perceiving.

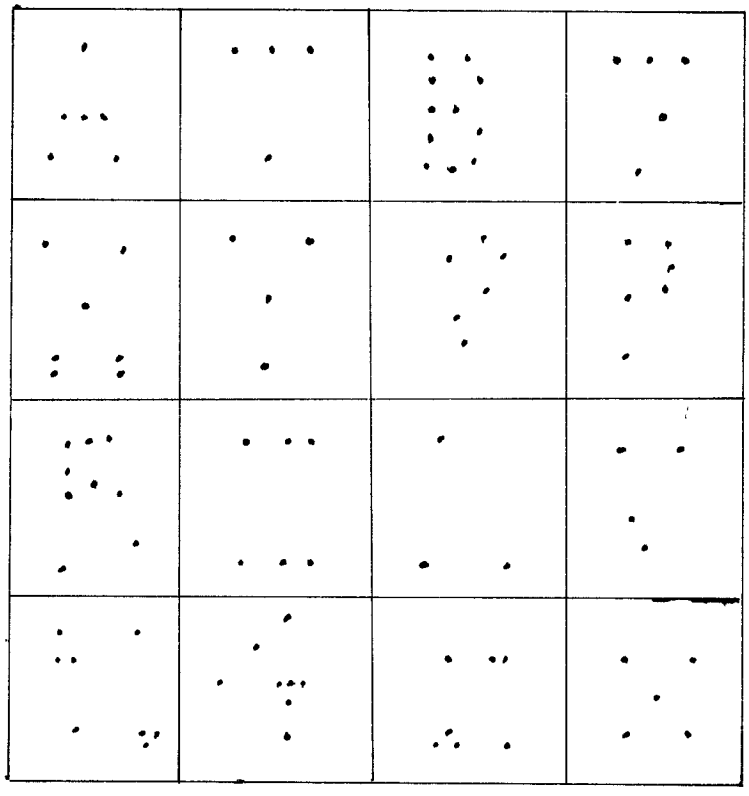
Development of individual visual perceptual differentiation and relative to the Gestalt theory of visual perception is field organization. It is, therefore, proposed that visual perceptual differentiation is the physiognomic quality of an individual's articulation of visual perception through full employment of Gestalt Laws of Organization. Therefore, to increase an individual's visual perceptual differentiation, the instructional methodology incorporates the Gestalt Laws of Organization as the preliminary tools for the development and understanding of the principles of visual organization and the language of the visual arts.

APPENDIX B

ILLUSTRATIONS OF GESTALT LAWS OF VISUAL ORGANIZATION USED IN INSTRUCTIONAL PROCEDURES

ILLUSTRATIONS OF CLOSURE FACTORS[1]

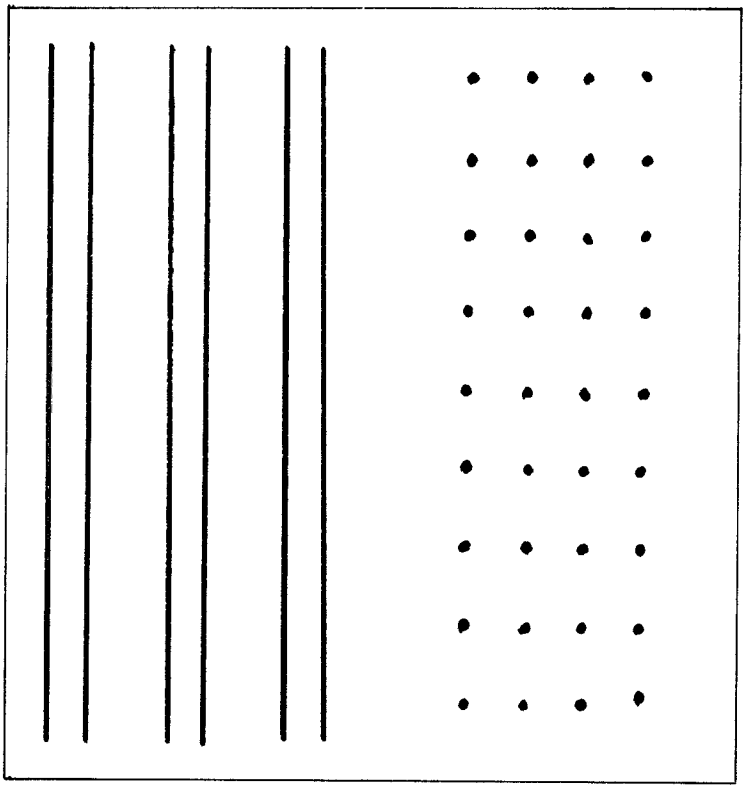
Figure 1



[1]This example is derived from "Further Study of Visual Perception," by M. D. Vernon (1952).

ILLUSTRATION OF PROXIMITY FACTORS[1]

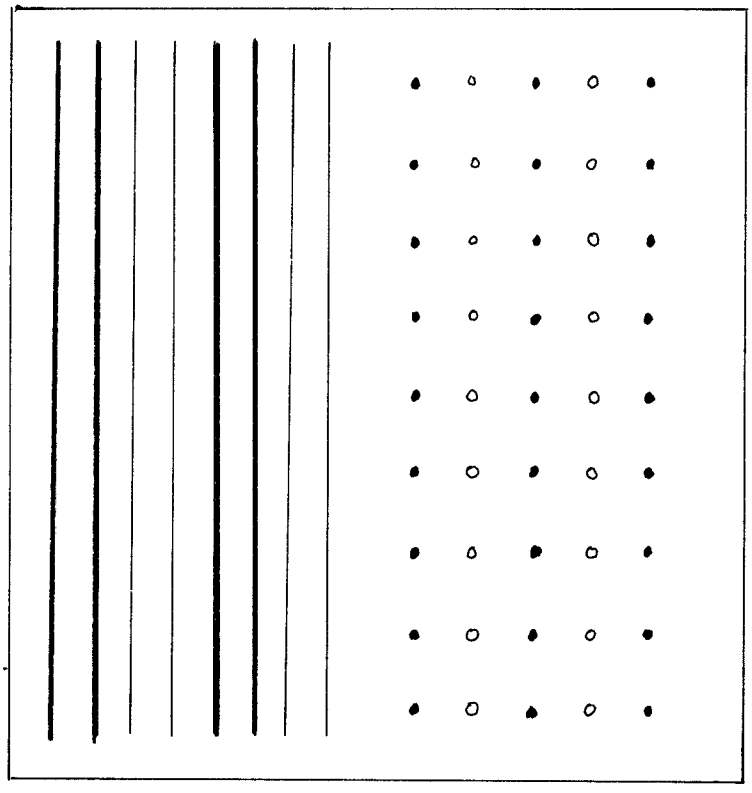
Figure 2



[1]This example is derived from "Gestalt Psychology," by David Katz (1950).

ILLUSTRATION OF SIMILARITY FACTOR[1]

Figure 3

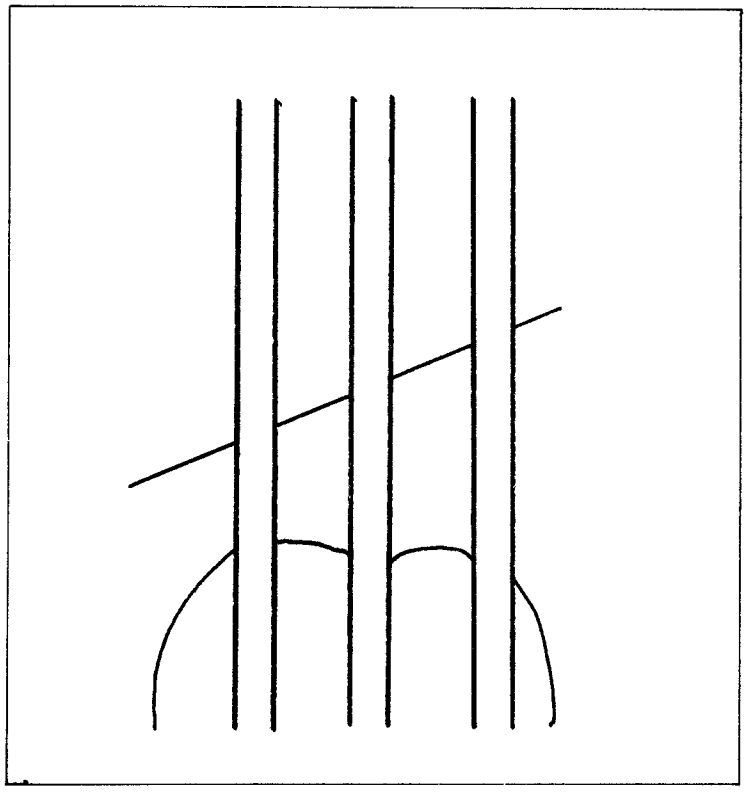


[1]This example is derived from "Gestalt Psychology," by David Katz (1950).

ILLUSTRATION OF "GOOD" CONTOUR

OR COMMON DESTINY FACTOR[1]

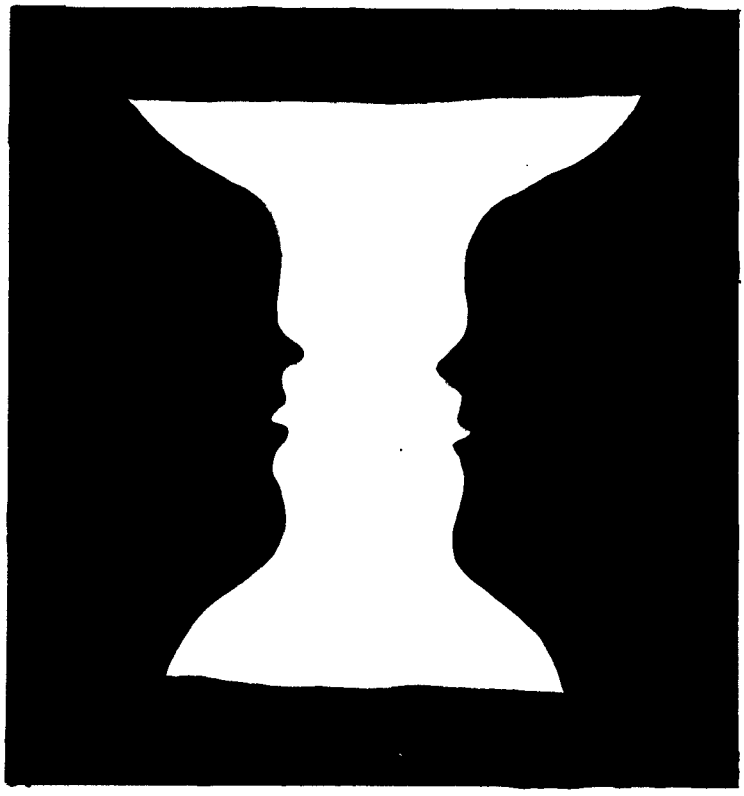
Figure 4



[1]This example is derived from "Gestalt Psychology," by David Katz (1950).

ILLUSTRATION OF FIGURE-GROUND REVERSAL FACTOR[1]

Figure 5



[1]This example is derived from "Gestalt Psychology," by David Katz (1950).

ILLUSTRATION OF COMPLETION FACTOR[1]

Figure 6

[1]This example is derived from "A Gestalt Completion Test," by R. F. Street (1931).

EXAMPLE: LESSON PLAN AND ACTIVITIES

Topic: Gestalt Law of Proximity

I. Introduction

A basic problem for Gestalt psychology is the identification of factors which organize the visual field into independent units.

There is reason to believe that factors other than those to be outlined play a role in shaping objects seen in everyday life. It is easy to overlook the significance of these laws far from actual environmental conditions, the figures illustrated are over simplified. We will study six conditions which play an important, if not exclusive role in producing "actual world" visual forms.

II. The Laws of Proximity

Definition: Other things being equal, in a total stimulus situation those elements within the visual field which are closest to each other tend to form groups.

A. Example and Explanation

Slide-dipicting lines which are closest from pairs, or stripes, separated from each other by larger spaces. Dots closest to each other are grouped into rows separated by larger spaces.

B. Discussion

C. Activity

Materials: Ink, Paper, Quill pen

Procedure: On sheets of paper produces as many variations as you can think of using lines and dots which would illustrate Gestalt laws of proximity.

D. Discussion of Activities

APPENDIX C

PHOTO-EXAMPLES OF GESTALT LAWS OF VISUAL ORGANIZATION FOUND WITHIN MAN'S VISUAL ENVIRONMENT

PHOTO-EXAMPLE OF CLOSURE FACTOR

Figure 7

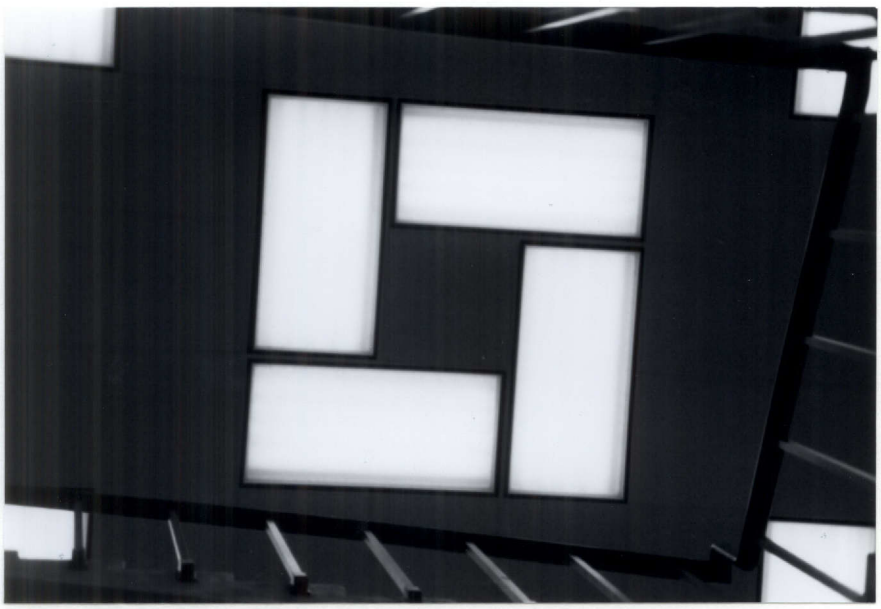


PHOTO-EXAMPLE OF PROXIMITY FACTOR

Figure 8

PHOTO-EXAMPLE OF SIMILARITY FACTOR

Figure 9

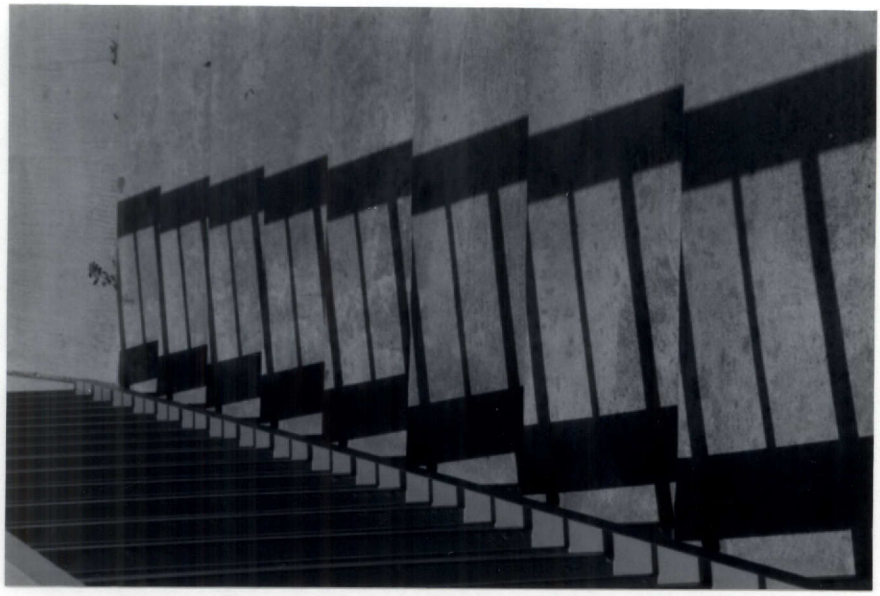


PHOTO-EXAMPLE OF CONTINUITY FACTOR

Figure 10

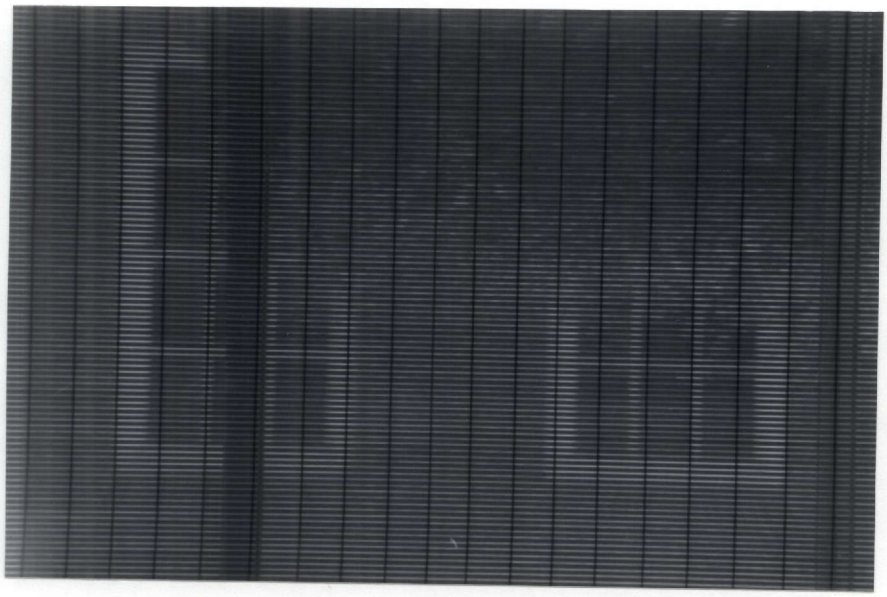
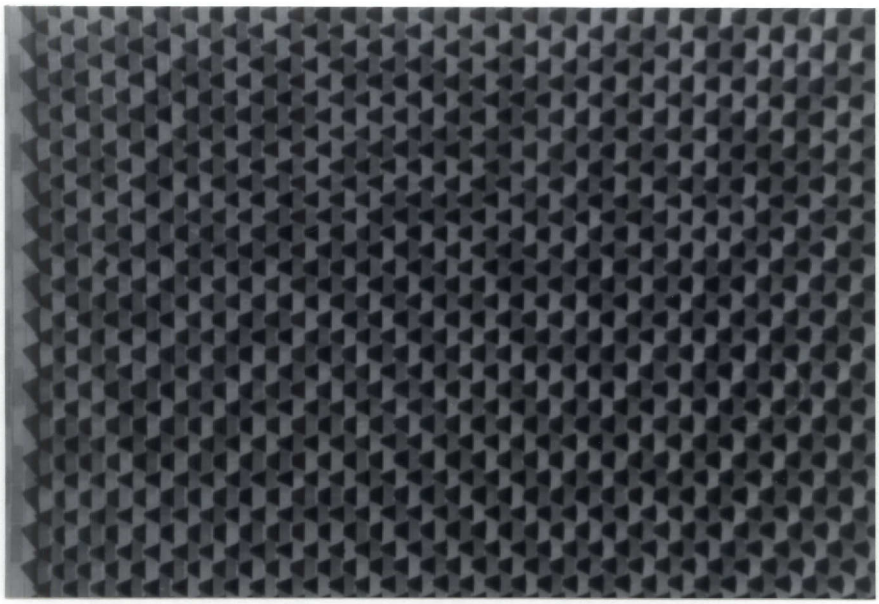


PHOTO-EXAMPLE OF FIGURE-GROUND REVERSAL FACTOR

Figure 11

PHOTO-EXAMPLE OF OPTICAL ILLUSION FACTOR

Figure 12



EXAMPLE: LESSON PLAN AND ACTIVITIES

Topic: The Environment and Visual Organizational Principles

I. Introduction

Within the visual field there are many examples of environmental organizational principles. The eye must learn to see in a world which evolves around in a composition of lines, shapes, forms, and colors. The emphasis of this discussion is with the control and manipulation of the individuals eye. The intent of this section is not to inhibit the observer to the extent he may become overly conscious and inhibited. The learning experiences suggested are intended to stengthen the individuals inmate sense of visual perceptual differentiation and to gradually lead him to an awareness of some of the basic principles of organizational unity.

II. Law of "Good" Continuation or Common Destiny

Definition: Parts of a figure which have a "good" contour, or common destiny, tend to form units.

A. Example and Explanation:

Slides depicting environmental examples of "good" continuation or common destiny, one sees a straight line which is crossed by pairs of lines it will suggest continuation.

B. Discussion

C. Activity

1. Try some outside experiments in "seeing" examples of "good" continuation.
2. Capture most important element is environmental aspect that best render example of law by camera
3. Use sketch pad and charcoal to draw environmental examples.
4. Group discussion and project involving environmental example

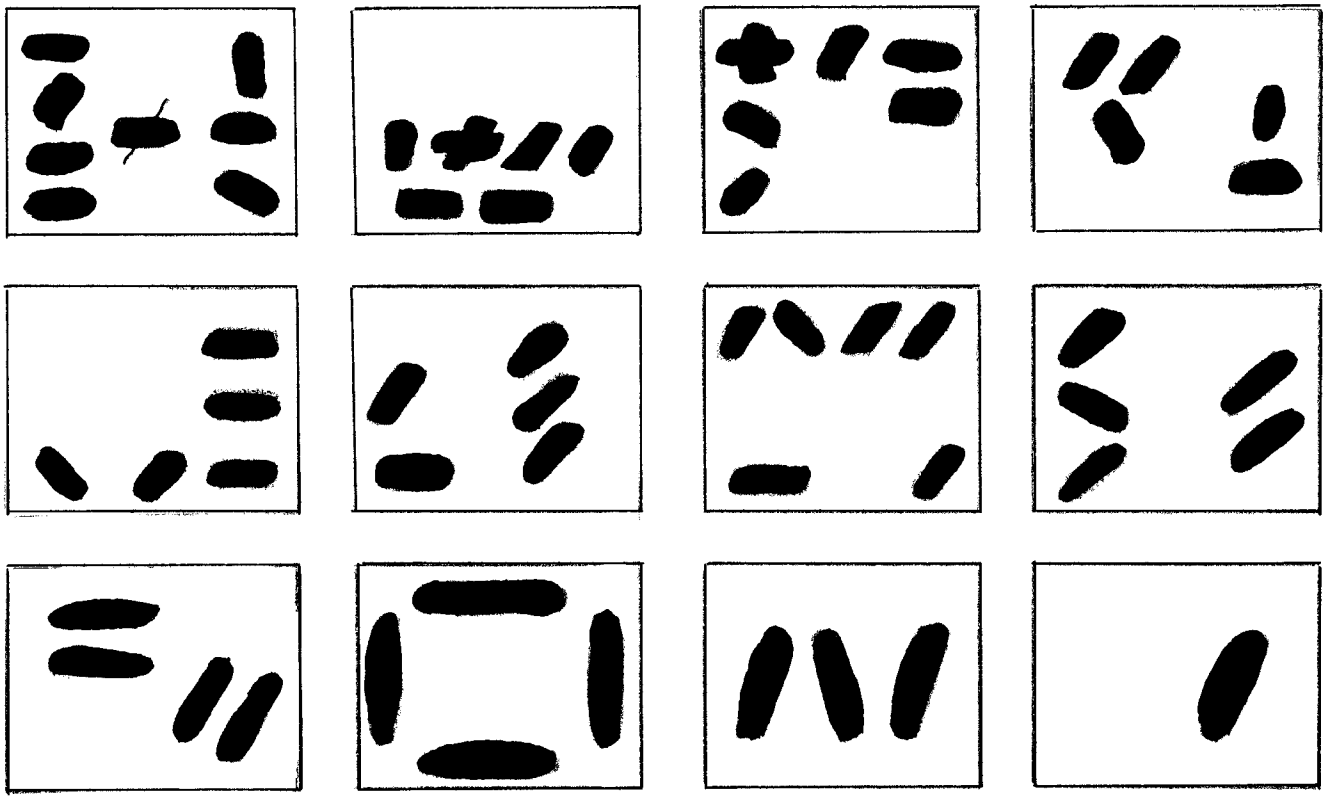
D. Discussion of Activities

APPENDIX D

EXAMPLES OF SLIDES PRODUCED FOR THE APPLICATION OF GESTALT LAWS OF VISUAL ORGANIZATION IN RELATION TO ELEMENTS INVOLVED IN PICTORIAL ORGANIZATION

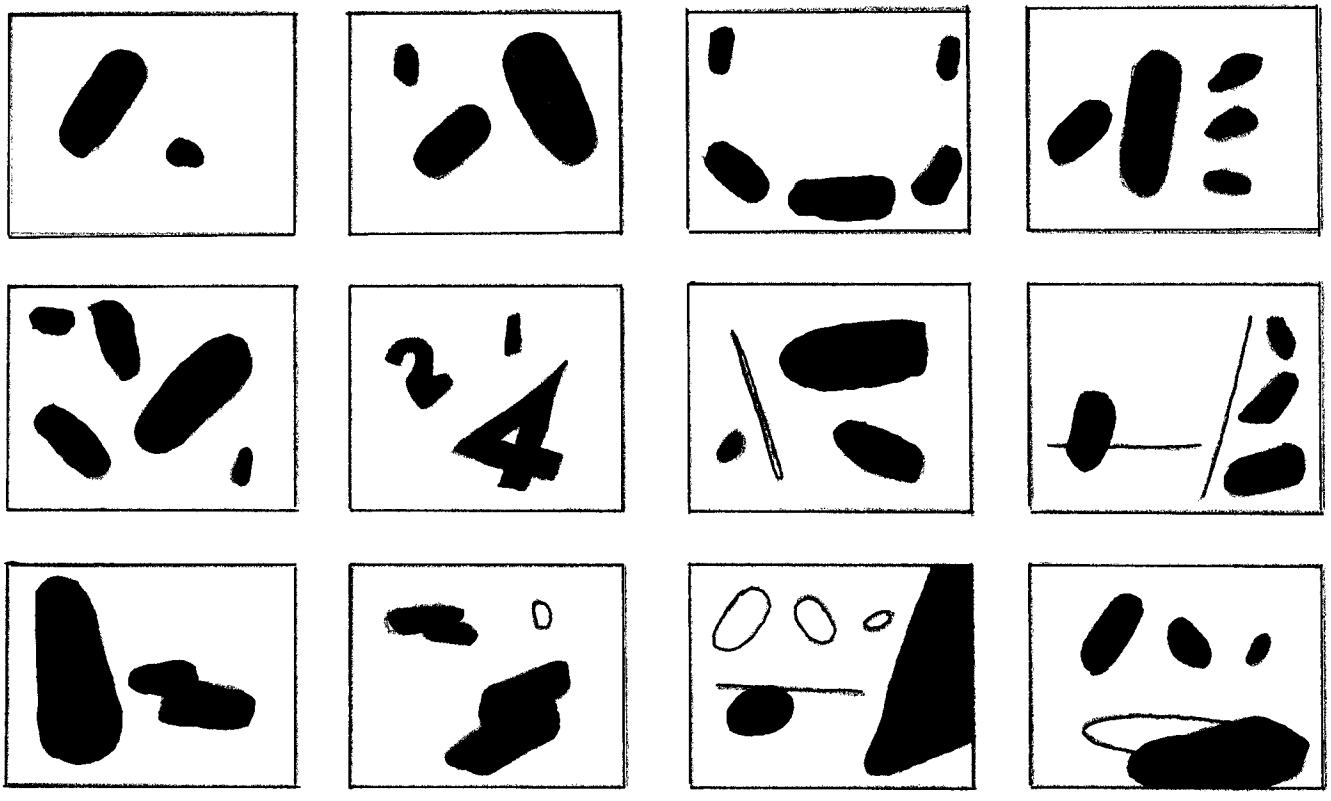
EXAMPLES OF SLIDES EMPHASIZING POSITION

Figure 13



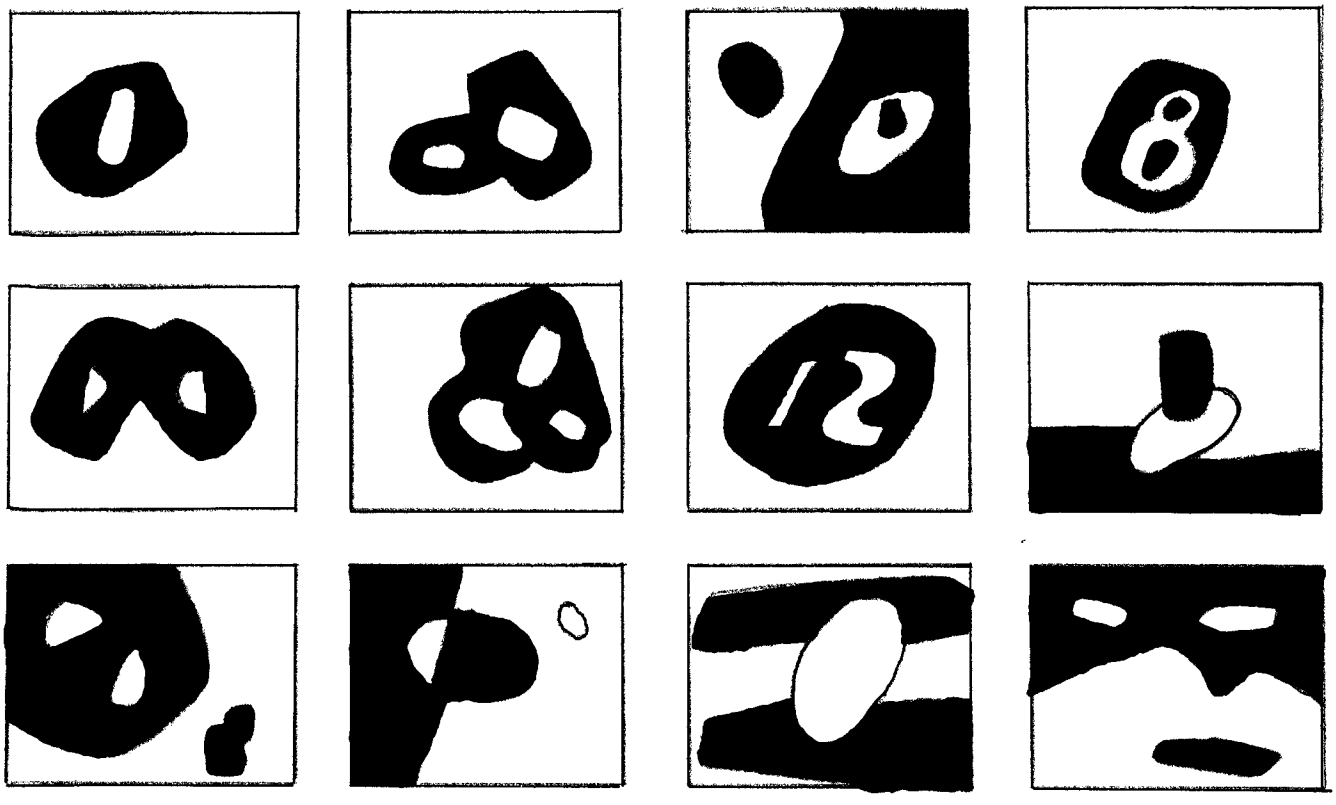
EXAMPLES OF SLIDES EMPHASIZING SIZE

Figure 14



EXAMPLES OF SLIDES EMPHASIZING SIZE-AND-BACKGROUND

Figure 15



EXAMPLE: LESSON PLAN AND ACTIVITIES

Topic: Organizational Principles

I. Introduction

There are certain elements basic to all visucal organization, both pictoral and three-dimensional which the individual should be familiar. To express these elements effectively organizational principles must be applied.

II. Principles

A. Rhythm is achieved through the repetition of line, form, color, value, and texture

B. Slide examples

C. Discussion

D. Activity involved in securing rhythm

1. Repetition of elements as in an over all pattern
2. Subtle repetition in an informal way
3. Achievement of rhythm is the creation of a sensation of movement

E. Discussion of Activities

III. Balance is a feeling of equilibrium

A. Slide examples

B. Discussion

C. Activity in serving balance and effects of balance

1. Equal distribution of elements
2. Compair elements of unequal size, shape, color, or tecture
3. Formal balance effects
4. Informal balance effects

D. Discussion of Activities

IV. Variety refers to the variation in size, shape, color, value, or texture of the component parts of an visual field.

A. Slide examples

B. Discussion

C. Activity in ways of securing variety in another "dully created" organizational

1. Change in size
2. Change in some forms or shapes
3. Rearrangement of colors or other combinations
4. Change in the texture of certain areas for contrast
5. Effects of variety added interest
6. Relief from monotony

V. Proportion is the adjestmentof size relationships between the elements.

A. Slide examples

B. Discussion

C. Activity involved in the placement of varied sized objects in visual field

1. Effects of placements
2. Relationship created three-dimensional or space involved.

D. Discussion of Activities

VI. Unity is achieved by grouping and massing the various visual elements in the least discordant and the most cohesive and pleasant arrangement.

A. Slide examples

B. Discussion

C. Activities in grouping of elements

1. Discordant
2. Cohesive

D. Discussion of Activities

EXAMPLE: LESSON PLAN FOR CONTROL GROUP

I. Paleolithic and Neolithic Artifacts

A. Dr. Louis B. Leakey's work in Africa
B. Stonehenge
C. Egypt
E. Meso-American Cultures
F. Origins of Literate Cultures

II. The Classical Period

A. The Hellenic Style
1. Architecture:
a. The Acropolis and the Propylea
b. The Parthenon
2. Sculpture
a. The Parthenon Marbles
b. The Course of Hellenic Sculpture
3. Drama
4. Music
5. Ideas
a. Humanism
b. Idealism
c. Rationalism
6. Conclusions

B. The Hellenistic Style (Pergamon, 2nd Century B.C.)
1. Architecture
2. Sculpture
3. Paintings
4. Mosaics
5. The Asia Minor Arts
6. Music
7. Ideas
a. Individualism
b. Realism
c. Empiricism
d. The Road to Rome

C. The Roman Style
1. Architecture
a. Forum of Trajac
b. Imperial Baths
c. Colosseum
d. Aqueducts and Apartment Houses
e. The Pantheon
f. The Roman Architectural Contribution
2. Sculpture
a. Spiral Frieze of Trajan's Column

3. Literature and Music
4. Ideas:
    a. Organization
    b. Utilitarianism
5. Conclusions

III. The Medieval Period

A. The Early Roman Christian and Byzantine Styles Ravenna, Late 5th & 6th Centruies)
    1. Architecture and Mosaics
    2. Sculpture
    3. Music
    4. Ideas
        a. Authoritarianism
        b. Mysticism

B. The Monastic Romanesque Styel (Monestrary at Cluny, Late 11th & Early 12th Centuries)
    1. Architecture
        a. The Great Third Abbey Chruch at Cluny
    2. Sculpture
    3. Painting and Other Monastic Crafts
    4. Ideas
        a. Asceticism
        b. The Scholastic Synthesis

APPENDIX E

GROUP EMBEDDED FIGURES TEST SCORES FOR TREATMENT GROUP--FIELD-INDEPENDENT

TREATMENT GROUP--FIELD-INDEPENDENT

(m=13)

Subject Number	Pre-test Score	Post-test Score	Post-post-test Score
1	16	18	18
2	15	16	17
3	17	18	17
4	16	16	15
5	16	17	17
6	13	16	15
7	15	15	17
8	15	17	17
9	13	17	16
10	13	18	17
11	14	17	16
12	13	18	18
13	16	16	17
	$\bar{x} = 14.76$	$\bar{x} = 16.84$	$\bar{x} = 16.69$

APPENDIX F

GROUP EMBEDDED FIGURES TEST SCORES FOR CONTROL GROUP--FIELD-INDEPENDENT

CONTROL GROUP--FIELD-INDEPENDENT

(m=14)

Subject Number	Pre-test Score	Post-test Score
14	13	15
15	17	16
16	14	16
17	16	14
18	14	16
19	16	18
20	15	13
21	13	10
22	13	13
23	15	15
24	15	17
25	14	16
26	14	11
27	15	17
	$\bar{x} = 14.57$	$\bar{x} = 14.78$

APPENDIX G

GROUP EMBEDDED FIGURES TEST SCORES FOR TREATMENT GROUP--FIELD-DEPENDENT

TREATMENT GROUP--FIELD DEPENDENT

(m=15)

Subject Number	Pre-test Score	Post-test Score	Post-post-test Score
28	6	10	12
29	8	16	18
30	6	13	13
31	6	14	16
32	7	14	15
33	6	10	13
34	3	16	16
35	8	18	18
36	5	8	9
37	7	12	10
38	3	9	8
39	8	10	11
40	8	9	11
41	7	16	15
42	3	14	15
	$\bar{x} = 6.06$	$\bar{x} = 12.6$	$\bar{x} = 13.3$

APPENDIX H

GROUP EMBEDDED FIGURES TEST SCORES FOR CONTROL GROUP--FIELD-DEPENDENT

CONTROL GROUP--FIELD-DEPENDENT

(m=14)

Subject Number	Pre-test Score	Post-test Score
43	4	6
44	9	8
45	4	6
46	5	3
47	2	4
48	8	10
49	9	5
50	4	4
51	8	8
52	2	4
53	9	11
54	1	3
55	2	2
56	8	6
	$\bar{x} = 5.35$	$\bar{x} = 5.71$

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