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Psychological Bases for Children's Preferences for Picture Sequences

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CHAPTER I

Statement of Problem

> Few things are so intriguing to wonder about as human behavior. The adult human being becomes a marvelously adaptable, competently functioning person within a complex society. How he progresses to this point from a beginning as a highly dependent, relatively noncapable newborn is a question of great intellectual interest and importance (Gagne, 1970, p. 3).

Two features of life become relevant when considering man's progression to complex intricacy: (1) growth and development, and (2) learning. The present report will concern itself with the latter, i.e. learning, and specifically with visual discrimination learning.

Learning has been defined as "a change in human disposition or capability which can be retained, and which is not simply ascribable to the process of growth" (Gagne, 1970, p. 3). Through his sense organs, man perceives his environment and is able to learn. Learning occurs as the learner becomes increasingly skilled in attending to the features of his environment such as size, color and shape. Most learning comes about when the learner can successfully attend to only the relevant features of a stimulus and ignore the irrelevant (Glucksberg, 1966; Gagne, 1970). This type of learning may be called "discrimination learning" and is directly related to "distinctive features" or "relevant cues."

Several researchers including House and Zeaman (1963) have demonstrated that if a child's attention is drawn to the relevant features of a stimulus on one occasion of problem solving or discrimination, he will more quickly attend to those features on future occasions. Thus he will be better equipped to deal with the situation, i.e. solve the problem or make the discrimination (Gagne, 1970; Trabasso, 1970; House and Zeaman, 1963). Learning is greatly facilitated when relevant cues rather than irrelevant are provided. Careful selection of meaningful cues cannot be ignored or haphazardly carried out. Travers (1967) presents a strong argument for this point:

> The course of learning is greatly influenced by the nature of the cues provided. Guidance in learning is a matter of providing cues that will help the learner. When these cues should be provided and what they should be are important aspects of learning research. Knowledge about such matters is necessary if learning is to be planned for efficiency. Although this is a matter of central importance to the classroom teacher, it is one that has not been investigated to any great degree (Travers, 1967, p. 48-49).

Several additional researchers have similarly indicated the need for careful stimulus selection and have also reported a lack of systematic research aimed at identifying meaningful stimulus cues (Gagne, 1970; Denenberg, 1970; Berlyne, 1960). Little is presently known about what cues are meaningful for the child faced with a learning task.

Though learning can obviously result from stimuluation of any of the five sense organs, the channel most frequently used to gain information is the visual or a combination of the visual and some other channel. The eye, man's most sensitive sense organ, in combination with one or more of the other sense organs accounts for at learn ninety per cent of man's learning

(Debes, 1968). Nearly all educational attempts make use of some type of visuals in an effort to make children "visually literate."

> Visual literacy refers to a group of vision-competencies a human being can develop by seeing and at the same time having and integrating other sensory experiences. The development of these competencies is fundamental to normal human learning. When developed, they enable a visually literate person to discriminate and interpret the visible actions, objects, and/or symbols, natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communication (First National Conference on Visual Literacy, 1969).

One such frequent use of visuals in visual literacy training is that of visual sequencing. Visual sequential training is an integral part of most early childhood education programs, yet little is known about what children derive from such educational attempts. Many publishing companies distribute sequential materials for use in education which might be classified as visual perceptual materials or reading readiness drills. Teacher-clinicians may either draw from these commercially prepared materials or generate their own for use with their children. Sequential activities used in early childhood education programs are nearly always centered around stimuli that are adult prepared. The young child, for example, may be subjected to several pictures all communicating one central, adult idea such as a temporal or cause-effect sequence. The pictures in the sequence are aimed at enhancing a child's ability to derive meaning from visuals, but may, in fact, be falling quite short of attaining their goal:

> Evidence clearly indicates that the ability of visualization and sequential memory in youngsters from ages five to eight is not adequately developed to enable them to successfully order more than a few ideas in written or oral expression. (LaPolt, 1968).

Olson further suggests that it is not that children cannot find meaningful or informative areas of visuals, it is that they do not know what is likely to be informative or meaningful. "In line with the theory of selective attention it may be suggested that the examination of a stimulus is never done naively; it always reflects the assumptions of the viewer as to what cues are likely to be informative for subsequent purposes (Olson, 1970, p. 165). In other words, there may be a mismatch between what adults expect a child to attend to and what he actually does. When a child fails to be successful in visual sequential activities it may only mean that the cues are irrelevant for him, though they are relevant for the adult.

Such negative reports do not suggest the need to abandon visual sequential activities, but does suggest reform. Systematic research should be carried out until more is known about what visuals do to children. The need for children to derive meaning from visual stimuli has long been recognized. In 1947 Kelly stated that "the most important factor in education becomes the arrangements that the one to be educated makes with his environment through his senses, or which vision is the most important (Kelly, 1947). The importance of the development of these vision competencies and their integration to other sensory modalities cannot be over-emphasized. A child very early in life appears to develop what has been called a "visual vocabulary."

His frequent observations of a sequence of visual events and his attention to the features of the events allow him to learn to interpret its meaning, or, in effect, "read it."

A child receives practice in making visual choices when either attends or fails to attend to the visual phenomena around him. He should learn to draw conclusions from what he sees in an order and variety that satisfies his own needs. Debes (1968) describes this act as a satisfaction of the "hunting reaction" or the need for proprioceptive involvement. The need to do one's own cognitive ordering in response to one's own idea of unfulfilled information should thus be satisfied. The present use of visuals in the educational process is, however, determined by adults in response to adults' perceptions and feelings. The child's cognitive development is largely being shaped not by his own choices of relevant cues but by adults'. Use of visuals in the educational process is presently based on two assumptions:

1. That teachers can recognize relevant materials, whether they be commercially or teacher-prepared, for use in their classrooms, and

2. That they can adequately judge the significance of the materials generated by their students.

If such assumptions are invalid and visual literacy is, indeed, different for the child than for the adult, then the teaching-learning process becomes less effective. The need for research concerning the effects of visuals, including those used in visual sequential activities, thus appears obvious.

This need for identifying meaningful parameters of visual sequential materials used with children is of great importance to teacher-clinicians working with the "average" or "normal" child and may take on even greater significance when considering the education of the "exceptional" child. Cruickshank (1967) defines this child as:

> ...one who deviates intellectually, physically, socially, or emotionally so markedly from what is considered to be normal growth and development that he cannot receive maximum benefit from a regular school program and requires a special class or suuplementary instruction and services (Cruickshank, 1967, p. 3-4.)

Whether he is functioning above or below the normal child, this exceptional child needs instruction that is personally more stimulating than that which is available in the typical classroom. One such educational instruction which might certainly augment learning is that of visual sequencing with particular emphasis on appropriate cue selection.

The child who is language delayed, for example, has for some reason failed to achieve receptive and/or expressive communicative competency. In an attempt to increase the child's communicative skills, teachers and clinicians try many techniques. Recently, two studies have demonstrated the ability of visual behavior including visual sequencing to facilitate verbal behavior. Strandberg and Griffith (1969) in their work with preschool children discovered that those who received visual sequential training talked in significantly longer and structurally more complex utterances when describing picture sequences than did a control group who did not receive sequential training. Also, children spoke in longer and more complex language when talking about self-generated sequences than when describing pictures taken of toys.

Fransecky (1969), in his work with one hundred black migratory children, similarly found that visual behavior could facilitate verbal behavior. His work with the second, third and fourth graders, largely involving sequential training, strongly suggested strengthening verbal language through visual language. Disadvantaged children who were given opportunities to become visually literate were able to "sharpen self-concepts, deepen their environmental awareness, and discover new parallels in verbal language - in its phonology, morphology, and syntax" (Fransecky, 1969, p. 13).

These studies have demonstrated the usefulness of visual sequential training with one type of exceptional child, a type which falls below the "average" or "norm." Thus use of sequential training with emphasis on distinctive features may also be of value in the educational managment of that child who functions above the norm, i.e. the "gifted" or "talented" child. He is one who may not only be intellectually gifted in "knowing, comprehending, and understanding" but may also be gifted in "divergent production or creativity" (Dunlap, 1967, p. 143). Educational attempts often fail to reach this child because schoolwork is not a challenge. Creativity, as well as his accelerated "knowing, comprehending, and understanding" may die out as the gifted to talented child is molded into a "normal" child by the adult perceptions and feelings of educators. Perhaps cues which are meaningful to the educators or even to the average child lack meaningfulness for the gifted child and a new set of cues may merit recognition. Implementing a well-designed program of visual sequencing built around the individual child, educators may stimulate the uninspired gifted or talented child.

If the need for careful stimlus selection, including the selection of visual stimuli, has been recognized by many educators and researchers as previously emphasized (Gagne, 1970; Denenberg, 1970; Berlyne, 1960), it would appear curious that little systematic research has been carried out. Moray (1970, p. 74) suggests that the paucity of research on visual selectivity may be due to technical and conceptual difficulties. The thrust of the present investigation was to solve some of these management problems and to determine the effects of child- and adult-generated picture sequences on young preschool children.

Statement of Purpose

The purpose of this investigation was to assess the ability of preschool children to rate commercially prepared and child-generated visual sequences for visual syntax and to assess the relationship between visual syntax and verbal syntax. Specifically, the following questions were posed at the onset of this investigation:

1. Can children scale child-generated visual sequences with a high degree of reliability?

2. Can children scale adult-generated visual sequences with a high degree of reliability?

3. Do children speak in significnatly longer and structurally more complex utterances when describing child-generated picture sequences than when describing adult-generated sequences?

4. What is the relationship between verbal syntax and visual syntax in children's scalings of child-generated sequences?

5. What is the relationship between verbal syntax and visual syntax in children's scalings of adult-generated sequences?

6. Does a cross validation group of black children rank order the adult-generated sequences in a comparable manner as the initial experimental population?

7. Does a cross validation group of black children rank order the child-generated sequences in a comparable manner as the initial experimental population?

CHAPTER II

Review of Related Literature

The purpose of this chapter is three-fold: (1) to review the available types of psychological scaling methodologies; (2) to review the previous use of the paired comparison scaling methodology; and (3) to review research in the area of visual literacy.

Types of Psychological Scaling

The ability of children to rate picture sequences for visual syntax was a question which necessarily involved methodologies of psychological scaling. The initial step in this investigation, then, became that of identifying a method of psychological scaling for use with young children.

Psychological scaling methodologies require an observer to assign numerals to psychological objects according to the perceptual impact of the objects on the observer. A psychological object is "any phrase, slogan, person, institution, ideal, or idea toward which people can differ with respect to positive or negative effect" (Edwards, 1957). Six discernible psychological scaling methodologies exist: constant sums, direct magnitude estimation, equal-appearing intervals, rank ordering, successive intervals, and paired comparisons.

The method of constant sums is a ratio level measurement. The observer in this scaling procedure is asked to assign numerals to Stimulus A and Stimulus B according to the degree of existence of some selected variable. The two assigned numbers must together equal a predetermined sum , usually 100 points. Thus, if Stimulus A had three times the perceptual impact of Stimulus B on the observer values of seventy-five and twenty-five would be assigned. If both stimuli were judged to have equal amounts of the variable under investigation fifty points would be assigned to Stimulus A and Stimulus B. The two stimuli must always share the number of points in the predetermined sum as represented in Figure 1 below.

CONSTANT SUMS

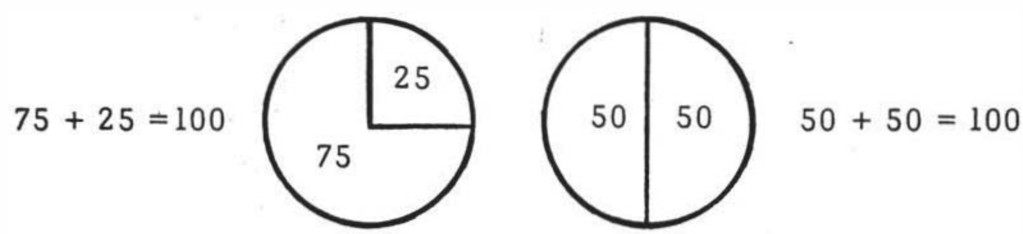

Figure 1. Scaling continuum representing the psychological scaling methodology of constant sums.

The method of direct magnitude estimation is a ratio level measurement which makesu se of a sample model from which all other judgments are made. Once an arbitrary value is assigned to the first stimulus it becomes the standard for all subsequent judgments. The observer, once aware of the qualities of the model, judges the degree of positive or negative approximation of the succeeding stimuli to the model and assigns values accordingly.

As stressed by Stevens (1956), no limits should be placed upon the observer's assignment of values. This scaling methodology is represented in Figure 2.

DIRECT MAGNITUDE ESTIMATION

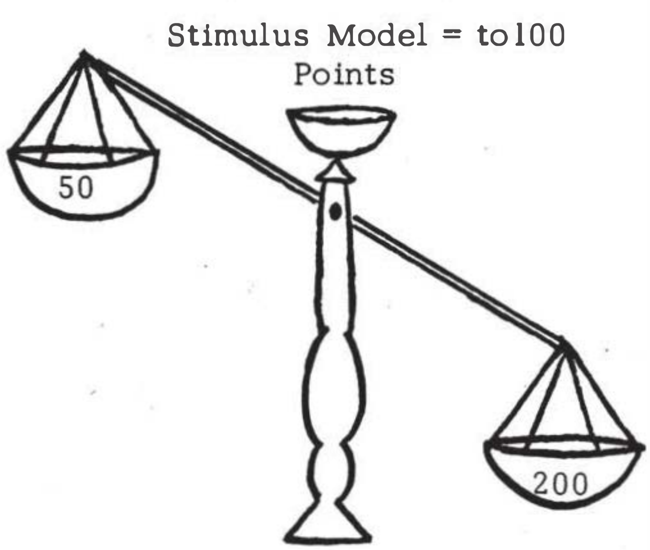

Figure 2. Scaling continuum representing the direct magnitude estimation type of psychological scaling.

The equal-appearing interval type of scaling, represented in Figure 3, makes use of whole integer values and is an interval level measurement. The observer rates the degree of existence of some designated quality in each stimulus on a scale of equal appearing intervals, such as from one to seven where one represents a minimum existence of the quality being scaled,, seven represents a maximum amount, and four is the midpoint between maximum and minimum. This scaling methodology is widely used in that it allows for the comparatively quick management of even a large number of samples and can be employed with relatively naive observers, if they can competently deal with the concept of several integer values (Guilford, 1954, p. 204). The obvious disadvantage of the method is that the stimuli assignments may result in an end-effect or piling up of the judgements at one end of the scale. Thus, for the method to be effective the observer should be exposed to the range of the samples so that he might tie down the end points, i.e. be aware of what constitutes minimum and maximum existence of the quality being scaled. This scaling precaution would result in presentation of the stimuli twice, once to acquain the observer with the stimuli and once to allow him to scale the stimuli, and would thus greatly lengthen the time required to complete the task.

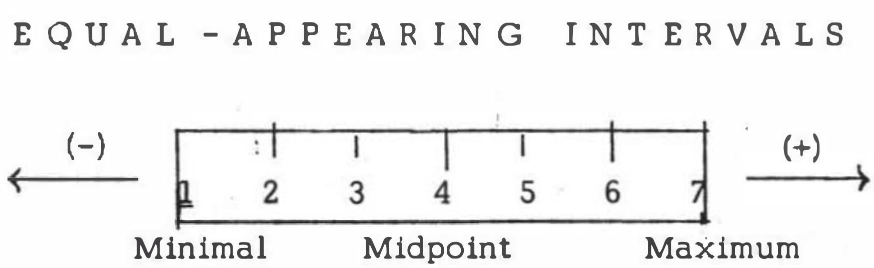

Figure 3. Scaling continuum representing the equal-appearing interval type of psychological scaling.

An ordinal level measurement exists in the rank ordering methodology which is represented in Figure 4. Guilford (1954, p. 178) states that this is both a popular and practical method in that it allows maximum amount of contact with the stimuli. The observer places stimuli on a continuum of high to low in successive fashion. The task is simple when the number of stimulus samples is held low but as the number of stimuli increases the difficulty of the rating task increases.

RANK ORDERING

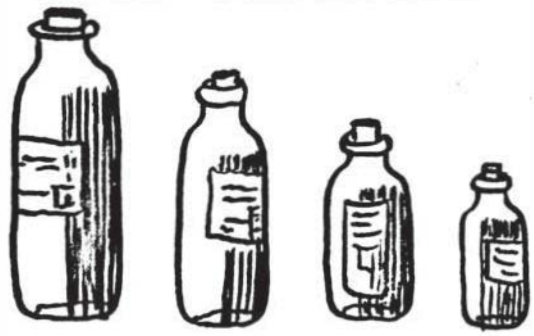

Figure 4. Scaling continuum representing the rank ordering psychological scaling methodology.

Successive intervals is an ordinal level measurement aimed at reducing the end-effect produced by equal-appearing intervals. Guilford (1954, p. 34) explains the scaling task as "that of judging each of several stimuli as belonging in one of a limited number of categories differing quantitatively along a defined continuum." This methodology does not predispose that judgments are intervally spaced along the scaling continuum as does the method of equal-appearing intervals but does assume that the perceptual effects upon the observer are rank ordered. The task for the observer is similar to that in equal-appearing intervals, but data analysis is more complex.

SUCCESSIVE INTERVALS

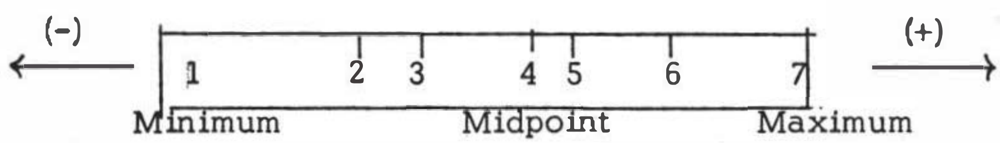

Figure 5. Scaling continuum representing the successive intervals type of psychological scaling.

The method of paired comparisons is a simple scaling methodology of ratio nature which was first described by Thurstone in the 1920's. As stated by Edwards (1957, p. 20-21) "the law of comparitive judgments... made possible the quantitative investigation of all kinds of values and subjective experiences." He further states that this method "assumes that for a given Stimulus i there is associated a most frequently aroused or modal discriminal process on a psychological continuum." A given stimulus is presented in every possible combination with every other stimulus and the observer simply indicates which member of each pair has a greater quantity than the other in some defined respect. This scaling methodology is represented in Figure 6.

PAIRED COMPARISONS

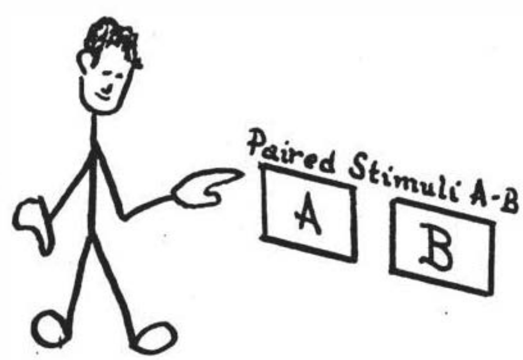

Figure 6. Scaling continuum representing the paired comparisons type of psychological scaling.

In a study which would require young preschool children to rate materials such as visual sequences a technique of psychological scaling was needed that required minimal observer sophistication. Of the existing methodologies just explained the method of paired comparisons seemed the logical choice of measurement. A child would simply have to indicate which member of a pair of sequences had the greatest amount of visual syntax. The rejected methodologies all required a level of sophistication that young preschool children might not possess.

The feasibility of using paired comparisons with young children, on the other hand, has been reported in the literature. A review of such follows.

Review of Paired Comparison Studies

Vance and McCall (1934) used the method of paired comparisons in their work with thirty-two children between the ages of three years, six months and six years, four months. The children rated play materials for preference. Forty-eight toys were photographed and prepared into picture form. The pictures were then presented to each child individually by compairing each picture consecutively with every other picture. The pictures were placed side by side on a small stand. Though the task of having the child point at the pictured toy he preferred was effective, the presentation of the pictures themselves was weak. Presentation of the pictures in consecutive order had the adverse effect of saturating the child with a constant picture. Consequently the child frequently indicated a preference for the new picture, a choice which might not have reoccured under more optimal presentation methods. Despite the weakness of their study, the investigators recognized the potentiality of the paried comparisons scaling method with young children.

> ...the paired comparisons of pictures has some value as a method in determining the preferences of children for certain types of materials....It appears concrete and definite and affords opportunity for direct contact with the individual child (Vance and McCall, 1934, p. 276).

In his work with eighteen children between the ages of three years,' four months and four years, nine months Clifford (1939) also utilized the method of paired comparisons. The children rated verbally presented stimuli in the areas of physical size, types of fruit, punishment, and reward. The subjects at the upper limits of the age range displayed fewer circular triads or inconsistencies in their judgments than did the younger subjects. The authors suggest caution in the use of paired comparisons with children but it should be noted that the routine verbal presentation of stimuli may have lacked appeal to the preschoolers, thus effecting their results. The investigators conclude that the method of paired comparisons, being weak in the abstract areas, showed usefulness in the psychological scaling of physical parameters.

Koch (1933) worked with seventeen four-year-old children from a nursery school program. Utilizing the method of paired comparisons the investigator assessed the children's preferences for playmates. Each child listened to pairs of names and was asked which of the two playmates he liked the best. The child would scale no more than twenty pairs of names during each session and thus several sessions were required. The study took three months for completion. The investigator recognized the weakness of the time element and felt that such seriously affected the children's choices. In general, boys tended to like boys and girls liked girls. Unpopular children were more inconsistent in their judgments than the other subjects.

Working with 787 subjects between the ages of six years and nineteen years Thomas (1966) assessed geometric shape preferences through methods of paired comparisons. Preferences were determined by two criterion: the shape which the subject designated as preferred and the shape viewed for the longest period of time. Subjects up to sixteen years of age preferred more complex stimuli whereas the older subjects showed a systematic decreased preference for complexity. There was good correspondence between indicated preference and viewing time in even the young elementary subjects, a finding which implicates the future utility of the method.

Furth (1961) investigated the visual memory skills of deaf children and hearing children utilizing methods of paired comparisons and found that the visual memory abilities of deaf and hearing children were comparable up to ages ten, after which the hearing children were inferior. His 180 subjects between the ages of seven and twelve years were given visual pair-associate tasks. The investigator presented the stimuli in a rather cumbersome and inefficient manner. He apparently simply handed a pair of colored and lettered cards to the subject. Forty stimulus cards were used.

In determining children's color preferences Child <u>et</u> <u>al</u> (1968) used the methodology of paired comparisons. Whole classrooms of children from ages one to twelve were shown thirty-five pairs of color patches on small cards. Uniform presentation of the stimuli was used in an attempt to separate similar pairs or two occurences of identical colors. A pair of cards were presented side by side on an easel until all pairs had been presented. This procedure lacked sophistication and probably resulted in a rather dull and time-consuming scaling task.

In summary, the use of the method of paired comparisons with young children appears profitable. The child involved in this scaling task is not confronted with a complexity of stimuli all at once but only with one pair of stimuli at a time. By a simple pointing gesture or short verbal response the child can indicate which member of each pair is preferred. As demonstrated in the above review, however, application of the methodology has previously be inefficient. Management of the paired stimuli has often been dull, cumbersome, and time-consuming. Comprehensive statistical analysis has often been lacking or not truly revealing of the results. Most investigators report only scale values or discriminal processes for each stimuli and though this information yields some information concerning the subjects' choices for the various stimuli, reliability information is seldom reported.

Though the methodology has not been previously employed as a scaling tool to allow young children to scale visual sequences, it appeared promising and applicable to the needs of the present investigation.

Review of Visual Literacy Research

Visual literacy research is a fresh area of educational investigation though the concepts underlying visual literacy have been widely recognized for some time. Systematic research in the area of visual literacy apparently had its beginning in 1968 when a small group of speech pathologists launched the first investigation with the goals of assessing the effects of visual materials on verbal language samples. A number of sequel studies have followed including the present investigation.

Mintun (1968) investigated the effects of three stimulus media on language samples obtained from thirty EMH children. Her eight-year-old subjects, divided into groups of ten each, were exposed to either toys, pictures of the toys or action films of the objects represented by the toys and language samples were obtained. The samples were scored by the Length-Complexity Index (LCI), Mean Length of Response (MLR), Total Number of Words (TNW), and Number of Different Words (NDW). Due to computation difficulties no results were available for the effects of the media on the samples scored by the TNW and NDW. The obtained results on the LCI and MLR, however, indicated that the media did have differential effects on the language samples depending on the measurements applied to the samples. The MLR yielded no significant differences for the media whereas the LCI, which is currently accepted as the most sophisticated of the four language tools, yielded significantly higher language scores for the toys and the films than for the still pictures. It should be noted, however, that since the children viewing the films tended to described the action in them, the extra points for frequent use of the present participle tended to skew the LCI scores evoked from those subjects.

Later, Strandberg (1969) replicated the Mintun study using the same three media and four language measurements. Her subjects differed from Mintun's, however, in age and intelligence. She used thirty four- and five-year-old children of normal or above intelligence. Strandberg's results indicated no statistically significant differences in the language samples for the three media, but she suggests that "there is no reason to expect that normal and mentally retarded children even of the same mental age would respond in the same fashion to the stimulus media" since their experiences and interests would quite likely differ. Webb (1972) postulates that the stimulus media might not be the most crucial factor "if the clinician is highly skilled with much experience and natural ability in working with normal children."

The most recent study concerning the effects of stimulus media on language behavior was carried out by Webb (1972). Language samples were evoked from each of ten five-year-old children under four conditions. These were: (1) while talking about toys, (2) in response to fifteeen verbal directives, (3) while describing self-generated pictures, and (4) while engaged in free play. Free play language samples were obtained through methods of radio telemetry. The LCI was the linguistic measurement tool utilized. Results indicated that mean LCI scores for verbal directives and self-generated pictures were equivalent and significantly higher than mean LCI scores for either toys or radio telemetry. Further analysis, however, indicated that verbal directives were more stable than child-generated pictures while both were consistently superior to toys and radio telemetry. For diagnostic purposes, then, the stimulus method of verbal directive would seem recommended, though it is obvious that young children can get linguistically involved in child-generated pictures. Child-generated pictures may, therefore, be of great utility in various therapies and educational attempts and be of lesser utility and convenience in diagnostic evaluations.

Fransecky (1969) was likewise interested in visual-verbal relationships in his work with 100 black migratory children in first, second and third grades. These children were involved in a six week summer program where they were instructed in the use of instamatic cameras and were encouraged to take as many pictures as they wished of themselves and their environment. One hundred control subjects, also black migratory children, were not enrolled in the program. Criterion measures for judging the worth of the program consisted of "standardized tests, selected subtests, and specifically devised instruments....The oral language responses of the 100 migrant pupils tested indicated a majority of the the migrant youth in the control groups were well below the median performance expected, while the pupils in the experimental classess scored slightly above the norm." More sophisticated analysis of the results was not offered in Fransecky's report though he does suggest that a detailed analysis would probably result in "significant differences" between the experimental subjects and those in the control.

Three recent visual literacy research projects have involved picture sequences, of which the present investigation is a sequel.

Strandberg and Griffith (1969) studied the effects of training in visual literacy on verbal language behavior. Specifically, they attempted to determine if visual behavior could facilitate verbal behavior in four- and five-year-old children. All subjects were given training on the independent use of a Kodak Instamatic 154 camera; all took pictures on three occasions: once of pictured toys, once at home, and then again at home. Between the second and third sessions the experimental group received training in visual sequencing activities. Language samples were evoked from each subject at each of the three sessions and were measured by the Length-Complexity Index (LCI), the Spontaneity Index, Total Number of Words (TNW), and Number of Different Words (NDW). The results of the study were:

1. Significantly longer and structurally more complex utterances were obtained when the children talked about self-generated sequences than when they talked about specified individual objects.

2. Visual literacy training significantly increased the length and complexity of the subjects' language responses.

3. Verbal language was significantly more spontaneous when the children describing pictures taken at home as opposed to pictures taken of the toys.

4. The LCI seemed to be the most sensitive measure to language changes brought about by visual literacy training.

5. Children do sequence pictures without special training.

Their study, then, indicated the importance of child-generated materials and sequential training in the teaching of visual literacy.

Examination of the child-generated sequences from the Strandberg and Griffith study brought about intriguing observations. Children seemed to sequence pictures differently than adults. Some children would sequence two or more totally dissimilar pictures. Not only did the children apparently perceive different relationships in the pictures than the adults, but the length of the sequence was often no indication of the length and complexity of the verbal output the children would use in describing their sequences. The conclusion from these observations was that visual literacy might be quite different for the child than for the adult, and a sequel study was undertaken by Strandberg, Griffith and Miner (Miner, 1970). The purpose of this investigation was to determine if adults could reliably scale both child- and adult-generated picture sequences and to assess the relationship between verbal syntax and visual syntax. The investigators prepared twenty adult picture sequences using commercially prepared materials to serve as adult-generated sequences. These sequences were shown to three four-year-old children to evoke language samples. The LCI (Miner, 1968) was used to measure the length and complexity of verbal output since its worth as a measurement tool had been demonstrated in the Strandberg and Griffith study. A second set of twenty stimuli cam from allowing preschool children to generate their own sequences. The children talked about their self-generated sequences and LCI scores were again obtained.

A panel of adult judges interested in childhood education then rated the sequences according to the psychological scaling methodology of equal-appearing intervals. One panel of judges rated the adult-generated sequences, another scaled the child-generated. Ratings were made on the degree of visual syntax each sequence portrayed. The investigators defined visual syntax as "the ability to string pictures together for the purpose of telling a story." Results of the study indicated that adults can scale adult-generated sequences to a high degree of reliability; that is, the adults tended to rank order the adult sequences in the same manner. Also adult observers can scale child-generated sequences, but with less reliability, or in other words, a much larger number of adult observers would be required to achieve as stable a rank ordering of the child-generated sequences as that existing for the adult sequences. There was an extremely weak, positive correlation between the children's LCI values for either the adult- or child-generated sequences and the manner in which the adult observers rated both kinds of sequences for visual syntax. The LCI scores of the children's sequences were significantly higher than the LCI scores of the adult-generated sequences. This last finding was in keeping with the results of the Strandberg and Griffith study just cited.

In summary, then, prior visual literacy research has indicated the following generalizations:

1. Children who receive visual literacy training talk in longer and structurally more complex utterances when describing picture sequences than do children who receive no training.

2. Children use longer and more complex language in explaining self-generated sequences than when describing adult-generated sequences.

3. Adults agree highly with other adults as to what constitutes a visually literate sequences but do not agree as highly with children.

4. There is an extremely weak, positive correlation between LCI scores and adult scale values for both kinds of sequences.

Though the studies just reviewed have yielded valuable information concerning the effects of visuals on children, the importance of continued research to assess other unknown areas becomes increasingly evident.

In summary this chapter has served as a three-fold review. Initially the six types of psychological scaling methodologies were briefly explained. Because the method of paired comparisons requires only minimal observer sophistication, this method was indicated as the one most suitable to the present investigation and a review of previous use of the method with young children was offered. Previous visual literacy research was then outlined and the need to investigate the abilities of young children to psychologically scale visual sequences was indicated.

CHAPTER III

Procedure

I. Selection of Subjects

Forty children between the ages of four years, six months and four years, eleven months served as subjects for this investigation. These children were chosen from the available population of preschool children in the East-Central Illinois area. The sources from which the children were obtained were typically nurseries, day care centers, or kindergarten programs; sources were selected on the basis of their willingness to cooperate. The children used from each source were randomly selected from those meeting the age criterion and the number of children from each source is listed in the following table.

TABLE I

LIST OF SOURCES FROM WHICH SUBJECTS WERE SELECTED

Source	Location	N
Mark Twain Elementary Kindergarten	Charleston	4
Mrs. Armstrong's Day Care Center	Charleston	4
Mrs. Phillips' Nursery School	Charleston	3
Mrs. Swickard's Nursery School	Charleston	5
Mrs. Van Bellehem's Nursery School	Charleston	2
Methodist Day Care Center	Charleston	1
Central Community Church	Mattoon	3
Adult Extension Center Nursery School	Mattoon	6
La Petite Academy	Mattoon	5
Funland Nursery School	Effingham	4
Colonel Wolfe School-cross validation	Champaign	6
Other		3
		46 Total

Six black subjects of the same chronological age were available from an experimental learning program affiliated with the University of Illinois in Champaign, Illinois. The six were used in a cross validation study.

II. Examiner

Research by Cowan *et al* (1967) has demonstrated that the examiner can be a crucial variable in an investigation. Therefore, the investigator carried out all testing with the children including eleiciting and scoring all language samples. This precaution paired with the use of standard instructions and prompting attempted to minimize examiner bias. An assistant was present at each testing session to operated the equipment.

III. Selection of Stimuli

Twenty picture sequences were used in this investigation; there were ten adult-generated sequences and ten child-generated sequences. The ten adult-generated sequences were randomly selected from thirty-five sequences which had been prepared in previous visual literacy research projects conducted at Eastern Illinois University. These sequences consisted of three inch by three inch commercially prepared pictures from Kodak's Photo Discovery Sets. The sequences ranged in length from two to six pictures. The ten child-generated pictures sequences, also made up of three inch by three inch pictures, were randomly selected from 309 existing child-generated sequences. These sequences were also the result of previous research projects and also ranged in length from two to six pictures. Use of these ten adult- and ten child-generated sequences was carefully planned into previous research, making the present investigation a sequel to prior visual literacy research conducted at Eastern Illinois University.

After the twenty sequences were selected they were photographed and prepared into slide form. Since the sequences ranged in length from two to six pictures all were prepared at a constant image size of six pictures; that is, once the camera was in focus for a six pictures sequence it was not re-adjusted to take a larger image of shorter sequences. Two identical slides were prepared for each sequence since two sets of stimuli were needed for the investigation. A constant image size was maintained in both sets.

IV. Equipment

A Rheem Califone tape recorder, Model 70-TEP was used to record the language responses as the children talked about the sequences.

As demonstrated in the second review section of Chapter II, most older paired comparison studies resulted in the cumbersome and inefficient management of stimuli. The methodological problems encountered in the use of paired comparisons in this investigation were solved with the purchasing of two Kodak Ektagraphic RA-960 projectors. These projectors differ from other carousel models in that they have unique random access retrieval systems which allow an operator to call forth any of eighty slides in any desired order in four seconds or less. Since only twenty sequences (the ten adult- and ten child-generated) and, thus, twenty slides, were used in the present investigation the selection time for any desired slide was even further reduced.

Through the coordination of the two slide projectors visual sequences were presented in a quick and effective manner to be scaled. The search time for any desired pair of sequences was approximately two or three seconds. Total testing time for each subject was about thirty minutes. The success of the methodology indicated its future application in needed areas of psychological scaling research projects with young children.

An IBM 360 computer was utilized during data analysis.

V. Language Measure

As emphasized by Webb (1972) several measurement strategies exist from which linguistic analysis may be made. The Length-Complexity Index or LCI has, however, been demonstrated to be the most sensitive tool to linguistic changes brought about by the stimulus, and was, therefore, the logical choice of measurement for use in this investigation. More is known about its statistical and linguistic characteristics than about any other linguistic tool (Miner, 1970; Barlow and Miner, 1969; Hon, 1970). Scoring procedures adhered to those outlined by Miner (1969).

VI. Methodology

The present investigation occurred in three basic phases: Phase I involved eliciting and scoring a language sample for each of the twenty sequence; Phase II involved having the children scale the sequences for visual syntax; and Phase III involved a cross validation of the visual syntax scaling.

Phase I

Ten of the forty children in the initial experimental population were randomly selected to talk about the twenty sequences. Each of the ten children was randomly assigned to view one adult-generated sequence and one child-generated sequence. Each child was seen individually. In as quiet a testing environment as possible and in a room with reduced lighting each subject was seated approximately four feet from a slide screen with the examiner. The assistant was six to eight feet from the screen with one projector since only one was needed in this phase of testing.

Whether the child first viewed an adult sequence or a child sequence was also randomized. Verbal directives to the child were:

> Sometimes pictures can tell stories. When you see pictures in your books at home, then you know what's happening in the story. We brought pictures with us today and our pictures tell stories, too, but we don't have a story to go with our pictures. Make up a story about the pictures and tell that story to me.

On viewing the second sequence the child was told:

> Here are some more pictures that tell a story. Make up a-nother story to tell about these pictures---just like you did before.

All language samples were tape recorded, transcribed, and linguistically analyzed according to the LCI. Strandberg and Griffth (1969) had earlier proven its worth in assessing visual-verbal relationships.

Phase II

So that the remaining thirty children from the initial experimental population might scale the sequences for visual syntax, two projectors were needed for Phase II. Again each child was seen individually and was seated with the examiner while an assistant operated the equipment. The instructions to the child during this phase of investigation were:

> Sometimes pictures can tell stories. When you see pictures in your books at home, then, you know what's happening in the story. We brought lots of pictures with us today and our pictures tell stories. You'll see two picture stories at the same time. We want you to tell us which one tells the best story or which one you would rather hear a story about. Here are two picture stories. Which of these tells the best story - this one or this one?

Thus, each child was involved in a simple pointing task. Each of the twenty sequences was paired in every possible combination with the other sequences and the child simply indicated which of each pair displayed more visual syntax. Each child viewed 190 pairings of slides; there were 190 different ways the twenty sequences could go together. These 190 pairings represented the following: 45 pairings where adult sequences were paired with adult sequences; 45 pairings where child sequences were paired with child sequences; and 100 pairings where adult sequences were paired with child sequences. If the child showed signs of tiring he was allowed a short break after 100 pairings and then resumed the scaling task.

Phase III

The task for the six black subjects was the same as that just explained. They did not describe the picture sequences, but only scaled them for visual syntax.

VII. Statistical Analysis

The questions posed in this investigation were answered according to the following analyses:

1. Can children scale child-generated visual sequences with a high degree of reliability?

The child sequences paired with each other yielded forty-five such pairings for analysis. After running an initial paired comparisons analysis as outlined by Edwards (1957) a scale value was obtained for each child-generated sequences. With an alpha level set at 0.05 the scale values were utilized to compute a split-half correlation and the Spearman-Brown formula was applied as a correction factor for small sample size.

2. Can children scale adult-generated visual sequences with a high degree of reliability?

Again forty-five pairings were available for analysis, these representing the adult sequences apired with the adult sequences. The analysis procedure was like that just explained except that the scale values for the adult sequences were manipulated.

3. Do children speak in significantly longer and structurally more complex utterances when describing child-generated picture sequences than when describing adult-generated sequences?

Mean LCI scores were computed for each adult- and child-generated seuqnce and were applied to a t-test for significance of differences.

4. What is the relationship between verbal syntax and visual syntax in children's scalings of child-generated sequences?

A Pearson product moment correlation was run between the LCI scores for each of the child-generated sequences and the scale values for the child-generated sequences.

5. What is the relationship between verbal syntax and visual syntax in children's scalings of adult-generated sequences?

This question was answered by doing the same kind of statistical analysis as that just described but using the data on the adult-generated sequences.

6. Do a cross validation group of black children rank order the adult-generated sequences in a comparable manner as the initial experimental population?

Six of the thirty children from the initial experimental population were randomly selected for comparison purposed with the six blacks. A Pearson product moment correlation was computed between the scale values for the adult-generated sequences for the two experimental groups of six subjects.

7. Do a cross validation group of black children rank order the child-generated sequences in a comparable manner as the initial experimental population?

The scale values for the six black subjects' ratings of the child-generated sequences were correlated with the same data for six randomly selected white subjects.

CHAPTER IV

Results and Discussion

Thirty children between the ages of four years, six months and four years, eleven months scaled ten adult- and ten child-generated picture sequences for visual syntax. Ten additional children of the same chronological age talked about the adult and child sequences so the length-complexity scores might be obtained. Six black subjects also scaled the twenty sequences for visual syntax in a cross validation study. These procedures were carried out to answer seven specific questions which were posed at the onset of this study. This chapter lists those questions, reports the statistical computations applied to the obtained data, and interprets the results.

1. Can children scale child-generated visual sequences with a high degree of reliability?

The child-generated sequences paired with each other in all possible combinations yielded forty-five such pairings for analysis. Application of the data to the paired comparisons analysis outlined by Edwards (1957, p. 19-82) yielded a scale value for each of the child-generated sequences. With a desired reliability level of 0.95 the scale values were used to compute a split-half correlation as described by Guilford (1954, p. 376). The Spearman-Brown formula (Guilford, 1954, p. 377-378) was then applied to the obtained reliability coefficient as a correction factor for small sample size. The resultant reliability coefficient was + 0.95, a level which exactly met the level preset by the examiner. The children in the initial experimental population of this investigation, then, could scale the child-generated sequences with a high degree of reliability. The small judging panel of thirty children agreed highly with each other concerning what constituted a visuall literate child-generated sequence. The thirty children displayed a high degree of internal consistency in that they rank ordered the child-generated sequences in a stable manner.

2. Can children scale adult-generated visual sequences with a high degree of reliability?

Again forty-five pairings were available for analysis, these representing the ten adult-generated sequences paired in all possible combinations. Scale values for the adult-generated sequences were once again available from the initial computation process described by Edwards (1957). The desired reliability level was again set at + 0.95. The scale values for the adult-generated sequences were utilized in computing a split-half correlation and the Spearman-Brown formula was applied to the obtained reliability coefficient as a correction factor for small sample size. The obtained reliability level for the adult-generated was only + 0.83 and thus did not meet the desired level which the examiner had established. This level of reliability indicated, then, that the children in the investigation could scale adult-generated picture sequences but with less reliability than when scaling child-generated sequences. That is, a larger number of child observers would be required to achieve as stable a rank ordering of the adult sequences as that obtained for the child-generated sequences with a judging panel of thirty children. The initial experimental population did not display as much internal consistency or agreement with each other in the scaling of the adult-generated sequences as they had in the scaling of the child-generated sequences. It might be concluded, then, that there is some disagreement among child observers as to what constitutes a visually literate adult sequence.

Experimenters are able to calculate how many additional observers would be required to raise an existing reliability level to that which is desired; the method of calculation is that of sequential sampling. Utilizing this method the investigator determined that eighty-seven additional observers would be needed to raise the existing reliability level of + 0.83 to a desired + 0.95. Only after adding an estimated eighty-seven additional child observers to the judging panel could there be a rank ordering as stable for the adult-generated sequences as that already obtained for the child-generated sequences with only thirty observers.

The significance of these two correlations, 0.95 for children's scalings of child-generated sequences and 0.83 for children's scalings of adult-generated sequences, may take on clearer meaning when contrasted with comparable data.

Reliability is a function of sample size. The fewer observers required to reach a high degree of reliability, the greater the meaning of the correlation. Recall that through methods of sequential sampling with alpha levels set at a constant an investigator can determine how many observers are needed to reach a desired level of reliability. Re-examination of the data from the Strandberg, Griffith and Miner study (Miner, 1970) in comparison with that from the present investigation may be helpful in emphasizing the significance of the obtained reliability coefficients of 0.95 and 0. 83. Recall that Strandberg, Griffith and Miner investigated adults' abilities to scale both child-generated and adult-generated picture sequences.

Figure 7 represents the number of adult observers from the Strandberg, Griffith and Miner study and the number of child observers from the present investigation required to scale both adult-generated and child-generated picture sequences at a reliability level of 0.95.

JUDGING PANEL

PICTURE SEQUENCES	Adult	Child
Adult	26	117
Child	82	30

Figure 7. THE NUMBER OF ADULT AND CHILD OBSERVERS REQUIRED TO SCALE ADULT- AND CHILD-GENERATED SEQUENCES TO A RELIABILITY LEVEL OF + 0.95.

The following points may be noted from the results of these two studies:

1. A small judging panel of adults can scale adult-generated picture sequences to a high degree of reliability. Specifically, only twenty-six adult observers were needed to reach a reliability level of 0.95.

2. A large number of adult observers are needed to scale child-generated picture sequences to a reliability level of 0.95, the exact number of observers being eighty-two.

3. A small judging panel of thirty children can scale child-generated visual sequences to a reliability level of 0.95.

4. A much larger number of children are needed to scale adult-generated sequences to an 0.95 level of reliability. Specifically, 117 children are needed.

These four points strongly suggest, then, that there is a mismatch between children's perceptions of a meaningful picture sequence and adults' perceptions of a meaningful sequence.

The significance of the findings of the present investigation concerning children's abilities to scale both adult-generated and child-generated picture sequences cannot be over-emphasized. Many educators and researchers involved in visual literacy have intuitively assumed that visual literacy might be different for the child than for the adult. The results of the present study support this assumption. To know that thirty children can rank order child-generated sequences to a high degree of reliability but cannot rank order adult sequences with the same degree of reliability is significant information with important ramifications. The small judging panel of thirty children was in high agreement with each other on the child-generated sequences but lacked such strong agreement in scaling the adult-generated sequences. Children apparently see and value the same elements in child-generated materials but must not see and value what adults do in adult-prepared materials. Conversely, adults apparently see and value the same elements in adult-generated materials but do not see and value what children do in child-generated materials as demonstrated by the work of Strandberg, Griffith, and Miner.

Knowledge of children's abilities to scale visual sequences suggests obvious methodological and academic implications.

Methodologically, the investigator's hypothesis that the technique of randomly pairing picture sequences by slide presentation would be effective in quantifying the perceptual impact of visual stimuli on young children was confirmed. Older paired comparison studies involved cumbersome and inefficient management of stimuli. Reliability levels, if reported, were consistently low - usually 0.43 of less (Clifford, 1959). These low-level reliability levels would seem to suggest one or more of the following points: (1) failure of the investigators to analyze the data in the most efficient manner; (2) the effect of the poor presentation methods on the children's scaling abilities; or (3) children's actual inabilities to scale the stimuli under examination. The success of the procedure in the present study might suggest more of the first two points than the last in older paired comparison studies. In the present investigation the procedure proved itself quick, practical and efficient; data analysis resulted in an accurate and comprehensive picture of the findings.

The success of the procedure and analysis of this study, then, would suggest similar applications in future investigations. Investigators now have a tool to assess effectively the perceptual impact of many kinds of stimuli on even the very young observer. Such stimuli might include drawings, art projects, photographs, and numerous other forms of visual stimuli.

In terms of academic success two points should be stressed concerning the findings of this study:

First, the results of the present investigation were consistent with the assumptions and findings of previous researchers in visual literacy, a fact which lends support to the present study.

Secondly, as previously mentioned, there appears to be a mismatch between adults' and children's perceptions. This mismatch exerts itself in the planning and execution of educational programs. Demonstration of such mismatches in the present study indicates important implications in terms of learning theory. Recall from Chapter I that discrimination learning occurs as a child becomes increasingly skilled in attending to relevant environmental cues such as size, shape or color. In the classroom the teacher provides these cues for learning either through commercially- or self-prepared materials. Mismatches between the perceptions of the teacher and her students makes the teaching-learning process less than optimal. Because the present investigation has demonstrated the visual literacy, or cue attention, is different for the child than for the adult the need for future research becomes apparent. The questions of "What is visual literacy for the child?" or "What are relevant visual cues?" become increasingly important as more is revealed about how little is known about what visuals do to children. As these questions become answered educators will be in a better position to make visual experiences meaningful for their students. Not only will they be able to select relevant visual stimuli for use in the classroom but they will also be in a position to evaluate adequately the work of their students.

3. Do children speak in significantly longer and structurally more complex utterances when describing child-generated sequences than when describing adult-generated sequences?

Each of the children who participated in Phase II of this investigation viewed one adult and one child-generated picture sequences. The language samples which were evoked as the children generated stories about the sequences were recorded, transcribed, and linguistically analyzed according to the Length-Complexity Index (Miner, 1968). A mean LCI score was thus obtained for each adult- and child-generated sequence. A *t*-test was applied to the mean LCI scores to determine whether the scores for the child-generated sequences were statistically significantly higher than the scores for the adult-generated sequences. A nonsignificant *t* of -0.40 with nine degrees of freedom was obtained indicanting that the children in this investigation did not speak in significantly onger and structurally more complex utterances when describing the ten child-generated sequences than when describing the ten adult-generated sequences. The finding of nonsignificant difference in the present investigation was not compatible with the results of previous visual literacy projects. As reported in Cahpter II, in previous research the children had used singificantly longer and structurally more complex language when describing child-generated sequence than when describing adult-generated sequences.

One explanation of the nonsignificant differences in the present study may lie in examination of the subjects and stimuli used. Recall that in previous studies the child-generated sequences were self-generated, i.e. each child took his own pictures, sequenced them, and then talked about his self-generated materials. In the present investigation, however, the children were not describing sequences they had generated themselves. They talked about sequences made up by other children of the same chronological age. The subjects in this study did not have a personal investment in the pictures and consequently may not have become as linguistically involved in the task of telling a story as the children in previous investigations. One might expect that a young child of four years would use complex language when describing materials he had generated himself and had a deep interest in especially when one recalls that the self-generated sequences from previous studies were the result of the child having and operating his own camera independent of adult constraints. Such an unusual experience might certainly act as a language catalyst. There also appears to be the possibility that the same four-year-old child might not get as linguistically involved when describing sequences that were not self-generated in that the personal involvement would be lacking. An investigation similar to the present one at several age levels might indicate an emergent age level at which children are able to talk about child-generated sequences with similar length and complexity as when talking about self-generated sequences.

An alternate explanation, and one which might appear more acceptable in view of previous research, may be evident when considering the mathematical factor involved in the analysis of the question. Since all ten adult sequences and all ten child sequences were grouped in the analysis it becomes impossible to assess the possible differential effect the various sequences might have had upon language behavior. If the children in this investigation had spoken in significantly longer and structurally more complex language when describing highly syntactical child picture sequences than when describing highly syntactical adult sequences but did not speak in significantly more complex language when describing child sequences with low visual scale values than when describing comparable adult sequences the differential effects may have cancelled each other out. That is, the less complex language on the child sequences with little visual syntax would have lessened the weighting of the highly complex language on child sequences with much visual syntax, if such differences actually existed in the study. The grouping of the sequences would thus make it impossible to accurately assess the visual-verbal relationship in the present investigation. Only after further investigation could the differential effects of visual syntax on verbal language behavior be clearly established.

With the limited information presently available the generate conclusion cannot be made, then, that children will speak in longer and more complex utterances when describing child-generated sequences than when describing adult-generated sequences, though such may be the case when the subjects and sequences with specific degrees of visual syntax are under investigation. Further study into the differential effects of various sequences on verbal behavior should allow more accurate conclusion.

4. <u>What is the relationship between verbal sytnax and visual syntax in children's scalings of adult-generated sequences</u>?

From the language samples evoked from the ten subjects in Phase II as they viewed the adult-generated sequences an LCI score was obtained for each adult sequence and from the scaling procedure completed by the children in Phase I a visual scale value was also obtained for each adult sequence. The mean LCI scores and scale values were the measurements used in answering the above question. A Pearson product moment correlation was computed between these mean LCI scores and scale values for the adult-generated sequences. The resulting correlation coefficient was -0.43 , a value which indicated only a chance or random relationship between the variables. In this investigation, then, there was no significant relationship between measures of verbal syntax and visual syntax among the adult-generated sequences. That is to say that there was no statistically significant rank ordering for the two variables. Knowledge of a value for one of the variables would not allow a relaible prediction of the value of the second variable.

5. <u>What is the relationship between verbal syntax and visual syntax in children's scalings of child-generated sequences</u>?

This question was answered by doing the same kind of statistical analysis as that just described but using the data for the child-generated sequences. Specifically the LCI socres for the child sequences were correlated with the scale values for the child sequences utilizing the Pearson product moment correlation. The resulting correlation coefficient was four to be -0.25, a value that again indicated a chance or random relationship between the variables. There was, then, no significant relationship between measures of visual and verbal syntax among the child-generated sequences and once again knowledge of the value of one variable would not allow reliable prediction of the value of the second.

To put these findings into perspective compare them to those of the Strandberg, Griffith and Miner study (Miner, 1970). In their study a high, positive relationship exsited between measures of visual and verbal syntax when the measures were based on responses from subjects describing their self-generated sequences. The magnitude of the relationship was higher for child-generated sequences that adult-generated sequences. According to the present study, however, the nature of the relationship changes drastically when those measurements are based on child- as opposed to self-generated sequences. Specifically a less than chance relationship exists. The present study would suggest that this low reliability level would hold true for either type of stimuli employed in the present investigation, namely child- or adult-generated sequences.

6. Does a cross validation group of black children rank order the adult-generated sequences in a comparable manner as the initial experimental population?

Methodologically, the answer to this question involved a direct replication of the Phase I experimental procedure except using black children instead of white children as subjects. Six black children between the ages of four years, six months and four years, eleven months were available from a nearby nursery school porgram which met the same criterio for selection of subjects as did the initial experimental population. From the population of white subjects in Phase I six were randomly selected for comparison purposes with the black children. The resulting Pearson product moment correlation coefficient derived from the scale values for the adult-generated sequences for the two experimental groups was 0.05. A weak correlation of this magnitude indicates the lack of a stable rank ordering among the variables, or an only random or chance relationship. Such a correlation would seem to indicate that the black children either could not scale the adult sequences with any acceptable degree of reliability or that they could relaibly scale them but in a different manner than the white children. Which of these two possibilities was in operation in the present investigation is impossible to assess since a correlation coefficient was not availalbe for the black children's scalings of the adult sequences. Such could not be computed due to an insuggicient number of black subjects. Thus, only a tentative explanation can be offered for the randon correlation between the black and white children's scalings of the adult sequences. Controlled observations of the response latencies, examination of the coefficients of consistency and correlation coefficients for a larger number of black children's scalings of adult-generated sequences would hield a more complete picture of the similarities and differences between the scaling abilities of black and white children. If an examiner could assess that the black children could scale the adult-generated sequences with a high degree of reliability and then discovered an only chance or random relationship between the two groups scalings, it might be hypothesized that the sequences had differential effects on the scaling abilities of the two groups, or in other words, it would then appear that there was disagreement among black children and white children concerning what constitutes a visuall literate adult-generated sequence. Further investigation into the scaling abilities of the black children is indicated.

7. Does a cross validation group of black children rank order the child-generated sequences in a comparable manner as the initial experimental population?

Methodologically, the same procedure as that just described was employed but the stimuli under investigation were the child-generated sequence. Specifically scale values for the six black subjects for the child-generated sequences were correlated with the same data for six randomly selected white subjects from

Phase I. The resulting Pearson r was +0.70 which is significant beyond the level of chance. There was then some degree of rank ordering between the scale values for the black children's ratings of the child-generated sequences and the scale values for the white children's ratings of child-generated sequences. Since the investigator had previously found that the white subjects could scale the child-generated sequences to a high degree of reliability (0.95) a correlation of 0.70 in the present analysis with such a small sample size might seem to suggest that the child-generated sequences yielded a comparable perceptual impact on both experimental groups. In other words, it might appear that the black children were scaling the child-generated sequences with some degree of reliability. Again such a reliability coefficient for the black children's scalings of the child-generated sequences could not be computed on the small sample size of six, so only a tentative explanation of the 0.70 correlation is possible. One might logically hypothesize, though, that increasing the number of black and white subjects beyond six would increase the magnitude of the correlation. If the correlation did increase significantly with an increase in sample size it would appear that both black and white observers agree among themselves and with each other concerning what constitutes a visually literate child-generated sequence.

Further investigation into black children's abilities to scale both adult- and child-generated visual sequences for visual syntax and comparisons of their abilities with those of white children would seemingly yield information of great importance in educational planning.

In summary, the major findings of this investigation were that young children can scale child-generated sequences to a high degree of reliability and can scale adult-generated sequences but with less reliability. These two findings paired with the Strandberg, Griffith and Miner (Miner, 1970) findings that adults can scale adutl-generated sequences with a high degree of reliability and child sequences with less reliability demonstrate that a mismatch exists between adults' and children's perceptions. In other words, visual literacy is different for the child than for the adult.

Additional findings were that LCI scores for child sequences were not significanlty higher than LCI socres for adult sequences which might indicate either the effect of no personal involvement in the child sequences or the differential effects of sequences with varying degrees of visual syntax on verbal language behavior. Also there was not a statistically significant relationship between visual and verbal syntax for either kind of sequence in this investigation. A cross validation involving six black subjects indicated the need for additional research concerning black children's abilities to scale both adult- and child-generated sequences.

In addition to investigating the effect of visual sequences on young children this investigation also served to assess the research utility of the methodology. Presenting randomized pairs of visual stimuli by slide presentation proved the method to be quick, efficient and applicable to future research projects.

Implications for Future Research

During the course of this investigation one thought remained constant, i.e. that visuals are powerful mediators of learning yet little is known about their effects of the learning child. With the finding that perceptual mismatches exist between adults and children the need for identification of relevant learning cues for the child becomes evident. The need for assessing the parameters of visual literacy for the child appears a must.

One investigator from Eastern Illinois University (Hipskind, 1972) has recently become involved in an investigation that could lead educators one step closer to identifying these meaningful parameters of picture sequences. She is attempting to make physiological measurements of a child's eye movemtns while attending to visual stimuli as he views adult- and child-generated picture sequences.

Other research attempts should follow in an effort to make the use of visuals in early childhood education more fitted to the child. The logic of applying the methodology of the present investigation to the assessment of the perceptual impact of all kinds of stimuli on young observers also becomes evident.

The following specific research needs are evident:

1. Further assessment of the visual-verbal relationship is strongly indicated in light of the present investigation in comparison with the Strandberg, Griffith and Miner study (Miner, 1970) While they found that children spoke in more complex language when describing self-generated sequences than when

describing adult-generated sequences, the present investigator found that there was no significant differences between the language children used in describing either a child- or adult-generated sequence. Whether the lack of self involvement brought about the nonsignificant differences remains to be seen. It may be that only older children are capable of using similarly complex language when describing either a child- or self-generated picture sequence. An alternate hypothesis that also warrants investigation is that adult- and child-generated sequences representing varying degrees of visual syntax may yiled differential effects on children's language. It may be that nonsignificant language differences exist between adult and child sequences when those sequences have received low scale values for visual syntax whereas significant language differences between adult and child sequences may exist when both kinds of sequences have recieved high scale values for visual syntax.

2. Further investigation is needed into the abilities of black children to scale both adult- and child-generated picture sequences for visual syntax. Also, there is need for assessing the abilities of visual behavior to facilitate verbal behavior in black children.

CHAPTER V

Summary and Conclusions

Ninety per cent of a child's learning occurs through interrelation of the eyes with other sensory modalities (Debes, 1968). Much of this visually oriented learning might be called discrimination learning. Discrimination learning occurs as a child becomes increasingly skilled in attending to relevant environmental cues such as size, shape, and color and when he learns to make appropriate discriminations based upon those cues. It follows, then, that when relevant rather than irrelevant cues are provided for the learner the teaching-learning process is enhanced. In the classroom the teacher provides these visual cues for learning but the cues that she brings to the learning experience may not be those which are most relevant for the child since little systematic research has investigated the effects of visuals on children. The present investigation was carried out as one of many logical research steps toward identifying meaningful parameters of visuals for the learning child.

The purpose of this investigation was to determine if children could reliably scale adult- and child-generated picture sequences for visual syntax and to assess the relationship between visual syntax and verbal syntax. Seven specific questions were posed at the onset of this investigation:

1. Can children scale child-generated visual sequences with a high degree of reliability?

2. Can children scale adult-generated visual sequences with a high degree of reliability?

3. Do children speak in significantly longer and structurally more complex utterances when describing child-generated picture sequences than when describing adult-generated picture sequences?

4. What is the relationship between verbal syntax and visual syntax in children's scalings of child-generated sequences?

5. What is the relationship between verbal syntax and visual syntax in children's scalings of adult-generated sequences?

6. Does a cross validation group of black children rank order the adult-generated sequences in a comparable manner as the initial experimental population?

7. Does a cross validation group of black children rank order the child-generated sequences in a comparable manner as the initial experimental population?

A review of the literature was three-fold. Initially the six types of psychological scaling methodologies were briefly explained and the method of paired comparisons was indicated as the preferred method since relatively naive observers can validly complete the "either-or" scaling task. A review of older paired comparison studies, however, indicated the cumbersome and ineffiecient management of stimuli and the need for a more workable application of the paired comparison method was apparent. Review of previous visual literacy research resulted in the following generalizations:

1. Visual literacy training increases the length and complexity of children's language as they describe picture sequences.

2. Language is more complex when children talk about sequences generated themselves than when describing those generated by adults.

3. The length of a visual sequence is an unreliable indicator of the length and complexity of the oral language the child will use in describing either an adult- or child-generated sequences.

4. Adult observers can scale adult-generated picture sequences with a high degree of reliability and can scale child-generated sequences but with less reliability.

The procedures employed to answer the questions posed at the onset of this investigation consisted of the following:

1. Ten adult- and ten child-generated visual sequences were randomly selected from a number of existing sequences.

2. The twenty sequences were prepared into slide form with care taken that a constant image size was maintained. An identical set of slides was also prepared and the two sets of duplicate slides were placed into each of two Kodak Ektagraphic RA 960 projectors. These projectors differ from other carousel projectors in that they have random access retrieval systems, a feature which insured quick presentation of the stimuli.

3. Ten children between the ages of four years, six months and four years, eleven months talked about the sequences and language samples were obtained for linguistic analysis.

4. Thirty children scaled the sequences for visual syntax by the psychological scaling methodology of paired comparisons.

5. A cross validation group of six black children also scaled the sequences for visual syntax.

The results of the study warrant the following conclusions:

1. Four-year-old children can scale child-generated visual sequences with a high degree of reliability. A panel of thirty child observers were able to scale the ten child-generated sequences in their forty-five pairings with a reliability of 0.95. Thus, children agree highly with each other as to the constitution of a visually literate child sequences.

2. Children can also scale adult-generated visual sequences for visual syntax but with less reliability than when scaling child-generated sequences. That is, a much larger number of children would be required to achieve a rank ordering as stable for the adult sequences as that existing for the child sequences with only thirty observers. Children, then, though they agree among themselves as to the constitution of a visually literate child sequence do not agree nearly as highly with adults.

If the children in this study had been able to scale the adult-generated sequences with as high a degree of reliability as that displayed in their scalings of the child-generated sequences, it would have appeared that children and adults see and value the same elements in a picture arrangement. The children did not, however, scale the adult-generated sequences with as high a degree of reliability. In fact there was some disagreement among the child observers concerning what constituted a visually literate adult sequence. The children's performances, thus demonstrated that visual literacy or cue attention is different for the child than for the adult.

3. The children in this investigation did not speak in longer and grammatically more complex utterances when describing child-generated sequences than they did when describing adult sequences. This finding was not in keeping with the results of previous research. Previously significantly higher LCI scores were obtained when children described sequences they had generated themselves as opposed to when they talked about sequences generated by adults. In the present investigation the children were not describing self-generated sequences; they were talking about sequences generated by other children. The lack of self involvement or the differential effects of the visual syntax of the various adult and child sequences may have brought about the lower LCI scores for the child-generated sequences than had previously been noted. The general conclusion concerning the visual-verbal relationship at the present seems to be, then, that children will speak in significantly longer and structurally more complex utterances when describing self-generated sequences than when describing adult-generated sequences, but may not necessarily talk in longer and more complex language when describing child-generated sequences than when describing adult sequences when the degree of visual syntax each sequences portrays is not taken into account or when the involvement of the child is not considered.

4. There was only a random or chance relationship between verbal syntax and visual syntax for either an adult- or child-generated sequence in this study.

5. The only tentative results concerning black children's abilities to scale both adult and child sequences in comparison to white children suggests further research.

6. The method of randomly pairing picture sequences by slide presentation was proved to be a practical and effective way of allowing children to psychologically scale the stimuli. The method of paired comparisons is a seemingly valid measurement tool for use with even very young children if care is taken to present the stimuli to be scaled in an optimal manner.

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