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The Effects of Training in Visual Cognitive Skills on Reading Comprehension

Valerie Joan Croll

Eastern Illinois University

This research is a product of the graduate program in Special Education at Eastern Illinois University. Find out more about the program.

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The Effects of Training in Visual Cognitive Skills on Reading Comprehension

BY

Valerie Joan Croll

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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1983

YEAR

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The Effects of Training in Visual Cognitive Skills on Reading Comprehension

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Master of Science in Education

1983
Abstract

In an effort to design learning materials which de-emphasize the decoding process, and concentrate instead upon cognitive and critical thinking processes, picture study has been chosen as a potentially effective vehicle for providing delivery of programs for remediation of reading problems. The purpose of this study was to investigate the effectiveness of training in visual cognitive skills as an alternative remedial technique for increasing the reading comprehension of children whose reading skills are considered to be lower than expected due to a learning disability. The population was a group of children in grades four, five, and six (n=34) in a rural, midwestern elementary school. The study was conducted using a Pretest-Post-test Control Group experimental design. Over a period of 8 weeks, the experimental group received 14 lessons in picture study, each of 20-minute duration, while the control group received 14 lessons, each of 20-minute duration, in which other methods of reading remediation were used. The subjects were instructed by university seniors during a practicum in methods of teaching in learning disabilities, following assignment to experimental and control groups by random number generator. Statistical analysis of the data suggested that the two groups were equivalent on factors of
age, grade levels, I.Q. levels, and pretest scores. After the post test, gain scores were computed, and a Mann-Whitney U test was performed on the differences in gain scores between the experimental and control groups. The experimental hypothesis was supported (\( \alpha < .02 \)) suggesting that visual cognitive training did increase reading comprehension scores. The results of the study indicate that there is support for the hypothesis that children can be taught to read more effectively through instruction in cognitive skills.
Dedication

I dedicate this thesis to the memory of my father, Thomas Arthur Saul, who died on the day before I defended it; his utmost faith in me has been and continues to be my inspiration to strive for excellence.
Acknowledgments

The friendship and encouragement of a number of people over a number of years have contributed to my love of teaching as a profession and to my pursuit of knowledge as a lifelong goal. I thank my parents, Tom and Bernice Saul, who never let me settle for less than excellence; my children, Cynthia and Andrew, whose faith in and support for their mother has been superb; my best friend and mentor, Nettie Harland, whose love and support of me as a person and as a professional have carried me from self-doubt to a belief in my own capabilities; my friends John Gisiger and Kris Breckman, who convinced me that professional development is a continual process; Howard Loewen, who taught me that the belief in an ideal makes one a winner despite overwhelming obstacles; Win Gardner and Marg Bean, who enabled me to understand that personal integrity is the only legitimate means to any end; Ron Baron, who knew that the best way to challenge me is to ask me, "What are you going to do about it?"; Neville Trevenen, who taught me that everyone can learn to think creatively; Ernie UnRuh, who taught me that no kid is irretrievable; Lionel Orlikow, who taught me what the basics in education really are; Dan Kelleher, who taught me to examine all sides of every issue and to substantiate my
opinions; Harry Larson, whose immense knowledge of humanity and the world have forced me to keep my ideas in perspective; Andy Brulle and Frank Lutz, whose patience and impressive knowledge of research methodology keep me humble; John Jacobs and Kathy Shank, who have given me immeasurable support while never allowing me to settle for mediocrity; and Debbie Wolfson and Elaine Jett, whose unflagging friendship, loyalty, and support have kept me sane throughout a difficult and challenging year. Without the encouragement of all these people, I would still be thinking that education consists merely of teaching children what I know. I have never before been so aware that the more I learn, the more I discover how little I know.

Very special thanks go to Claudia Zimarowsky and her practicum class, for their tremendous cooperation in carrying out the study on which this thesis is based; and to the faculty of the Department of Special Education, Eastern Illinois University, for their unqualified assistance, both professionally and personally, throughout the past year. Finally, I thank Nancy Cunningham for her patience and skill in typing this thesis under difficult circumstances.
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Today's world is increasingly dominated by the sense of vision, evidenced by the observation that a primary activity of people of all ages, aside from the time spent in school and/or at work, is television viewing (Neumann & Prowda, 1982). However, Neumann and Prowda also report that there is evidence that the passive watching of television does not necessarily assume comprehension by the viewer, either in terms of observation skills or of critical analysis of the content. Just as there are deficiencies in comprehension concerning television viewing, there exist many children who, while able to word call, have deficiencies in reading comprehension. These deficiencies in comprehension are cited as a primary reason for lack of achievement in reading by children who are judged to have a reading disability (Golinkoff, 1976). Such children are often the subjects of remedial reading programs in the school.

Remediation of reading traditionally involves reteaching of the skills in a progression which begins with word attack and continues through specific skills of comprehension such as noting details, sequencing, following directions, and getting the main idea (Walker, 1977). Alternatively, some remediation programs follow a sequence of perceptual skills involving vision and hearing, with some attention to gross and fine motor skills (Anderson & Stern, 1972). There are indications that many remedial reading programs have only initial short-term effectiveness in
increasing reading achievement (Crosby, 1978; Gittleman & Feingold, 1980; Hall et al., 1978).

Reading comprehension is a process that is dependent upon visual and cognitive abilities. Since vision is the chief means by which children examine their environment, it would seem reasonable to address reading skills in a framework known as visual literacy, in the effort to increase the verbal literacy of children growing up in our society (Debes, 1970).

**Review of the Literature**

The literature review focuses upon remedial reading research, reading comprehension theory, and visual literacy as both a theoretical and a practical base for promoting success in reading. It attempts to identify the relationships between reading comprehension skills and remedial reading programs; in addition, it attempts to address the importance of comprehension to visual literacy and, in turn, the suitability of visual literacy skills training to allow transfer of learning from visual elements to verbal elements.

**Research in Remedial Reading**

In reviewing the state of the art of reading achievement in 1969, C. B. Smith estimated that nearly 25 percent of school children require remedial assistance in reading, to be delivered by either an itinerant reading clinician or a reading disability specialist within the school. He also stated that because two-thirds of all school children
require some extra help with specific reading concepts, all classroom teachers must be capable of providing some remedial instruction. His observations appear to have been well taken. Research on remedial reading during the 1970's and early 1980's indicates that educators are concerned about the improvement of reading achievement; they appear to agree that the emphasis of remedial programs should be on semantic and syntactic elements, rather than upon phonetic and structural; and they tend to lean towards the regular classroom teacher as the chief purveyor of instruction.

Commenting on the implications of Public Law 94-142, Johnson (1981) makes several predictions about the future identification and treatment of reading disabilities. First, she feels that there will be more attention to children's apparent capacity for achievement; secondly, discrepancies between actual and potential rates of achievement will be detected early in the child's school career; and thirdly, teacher preparation programs will pay greater attention to the diagnostic teaching and correction of reading disabilities. She notes that there is one guarantee about failure to assess and remediate effectively: the longer the disabilities persist, the more serious they will become.

Since reading instruction at the primary level is developmental in nature (Stauffer, 1975), a large proportion of students who require remedial assistance are at the upper elementary and junior high levels, a group roughly encompassed by the middle school. Both Early (1973)
and Burnett (1974) have conducted studies of middle school teachers and of children who are served by remedial reading programs. Although middle schools are seeking new approaches to teaching reading, Early (1973) reports that there appears to be some reluctance by content area specialists to teach reading in an active fashion. The evidence cited by Burnett indicates that these teachers expect performance at grade level, using prescribed learning materials; and that they tend to expect work of equal quality from all students. Because students with reading disabilities do not have the necessary reading and writing skills to adhere to such expectations, their level of achievement is low in most academic subjects. The data of Early (1973) and Burnett (1974) could provide a basis for further research on the relationship between remedial reading programs and the attitudes and practices of subject area teachers.

Quintiliani (1978) and Guy (1976) report conflicting results of research on the effects of remedial reading instruction on reading achievement scores and attitudes towards reading. Quintiliani's (1978) results with seventh graders indicated significant gains in achievement, but none in attitudes. Guy (1976) found no lasting effect on high school students' reading achievement, regardless of the amount of time spent in the program; student self-reports appeared to indicate more favorable attitudes towards reading. Their observations lead to the question of possible untested variables which may have affected their results.
the comparative sophistication of remedial approaches between junior and senior high school levels, and of self-concept attitudes of the students at the same school levels.

Hall et al. (1978) reports that there seems to be no clear pattern of success in remedial reading programs. They give three reasons for this dilemma: First, there is the fundamental problem of identification of the specific problem in a reading disability. Secondly, most research is done in the short term, which prevents any conclusion that positive results of a particular program will have long-lasting effects. Thirdly, because most research has been done on groups, the effects on individual readers identified as disabled are often lost in the statistical analysis. Their conclusion is that since reading disability results from a "multiplicity of interrelated and interacting factors, and not a single homogeneous factor" (p. 31), remedial instruction should be practiced as an eclectic approach wherein individual programs are devised for individual readers.

In noting the various approaches used by reading specialists and by teachers of children with learning disabilities, Hartman and Hartman (1974) conclude that the latter concentrate upon the processing ability of the reader labeled disabled, while the former deal directly with the reading task. Yet despite their seemingly complementary efforts, many children fail to learn to read well. Burnett
(1974) examines this apparent anomaly in reference to a number of studies about lack of success in reading. These studies indicate that reading disabilities are unlikely to have occurred because of inadequate approaches used in beginning reading instruction. Burnett (1974) suggests that a more likely explanation is that the approaches used were not compatible with the individual needs of the learners, with the result that the children did not learn to read despite the presumed efficacy of the reading programs.

Walker (1977) states that an assumption underlying many programs in remediation of reading comprehension is that skills are learned in much the same way as muscle strength is attained: by repeated exercise. There is little attention paid to conceptualization, but simply to the principle that "practice will make perfect" (p. 26). According to Gray (1970), a reader must have the benefit of all available clues - phonic, syntax, semantics, and conceptual - in order to understand the material. He states that the differences among readers exist mainly in the complexity and purpose of the reading materials. Furthermore, in noting that reading is never independent of meaning and function, Vacca and Vacca (1981) state that the value of reading lies in using it as a means to "understanding, solving problems, and enjoyment" (p. 515).

F. Smith (1975) complains that schools teach decoding as a primary activity, and discourage students from making guesses if they are uncertain about the meaning of what they
have read. Such a practice is contrary to his notion that meaning is dependent upon the context in which words are used, rather than upon the identification of letters in order to recognize words which compose the basic unit of meaning i.e. the sentence. His opinions are shared by Spiegel (1974), who claims that the teaching of comprehension as a specific set of subskills tends to result in a loss of attention to the real reason for reading: getting the meaning from language. He suggests that there should be a shift from decoding words to decoding ideas, or from the phonological to the semantic and syntactic skills. Similarly, Lexier (1978) suggests that strategies be adopted which shift attention from words to concepts, in order to reduce children's uncertainty in their search for orderly reading. He cautions against removing children from the day-to-day language discourse in the classroom because of the tendency to focus upon small isolated units of language rather than the acquisition of language fluency. Allington (1977) reinforces this opinion in noting that although the poorest readers receive the heaviest doses of skills instruction, they receive very little opportunity to read freely, which is fundamental to acquiring fluency.

There appears to be little disagreement in the research as to the nature of emphasis upon which remedial reading programs should focus: the identification of meaning from written language. The latter constitutes a general definition of reading comprehension, the topic of the next section.
Reading Comprehension

Models of reading comprehension have proliferated through the 1970's and 1980's, in the effort to promote higher levels of literacy among school children. At the same time, a number of researchers have challenged the assumptions of reading comprehension assessment instruments, particularly on the question of whether comprehension is a unitary skill or a composite of subskills.

Comprehension theory. Miller (1978) delineates a number of aspects of reading comprehension, including anticipating outcomes, following directions, reasoning cause and effect, making comparisons, drawing conclusions, understanding word meanings, dealing with complex sentence structures, decoding, and reading orally fluently. She suggests that instructional activities be based upon inference, critical reading, purposes for reading, analysis and synthesis, convergent thinking, divergent thinking, word recognition and vocabulary development.

F. Smith (1975) defines comprehension as the identification of meaning whose basis is prediction, which assumes the reduction of uncertainty by eliminating alternatives. "Predictions are questions that we ask the world, and comprehension is receiving answers. If we cannot predict, we are confused. If our predictions fail, we are surprised. If we have nothing to predict because we have no uncertainty we are bored" (p. 68). He illustrates this principle in a
cascade model of the comprehension of reading material.

Insert Figure 1 about here

Prediction begins with global expectations about reading material, perhaps arising from the title or from prior knowledge. Throughout the reading process, predictions focus more intensively upon progressively smaller units. The model is based upon Smith's contention that reading is based not upon letter and word identification per se, but upon the context in which the individual units are presented. Written language, he says, "makes sense when readers can relate it to what they already know" (p. 167). Thus the reader's predictions about the content and theme of reading material are the basis upon which comprehension is accomplished.

Similarly, Reder (1980) regards reading comprehension as having its basis in past experience of the reader; moreover, subsequent reading experiences add more information to the reader's memory, forming an ever-spiraling body of knowledge and information which becomes the basis for further comprehension. He proposes an elaboration theory for drawing inferences: elaborations occur at many levels, and are represented as "embellishments" (p. 146) of physical descriptions and qualities of character, and attribution of the author's intentions within his work. The extent to which elaborations occur is dependent upon the reader's previous
Figure 1

(F. Smith, 1975, p. 169)
experience, interest, understanding, time available, level of concentration, and "general tendency to elaborate" (p. 146).

In his promotion of the language experience approach to teaching reading, Matteoni (1973) describes a hierarchy of reading subabilities which proceeds from the mechanics of reading (sound-symbols) through thinking and comprehension skills, decoding of words (sight vocabulary and phonics), and study skills. His hierarchy implies that decoding skills are secondary to the global meanings of language experience because readers are then able to generalize the decoding process in a contextual framework. Furthermore, the higher level skills of classification, analogy, and evaluation are natural consequences of the reader's spoken and written experience with language.

Gray's (1978) four components of reading form a progression of skills in which the lowest level is word perception or recognition; the higher levels are comprehension and interpretation, reaction on the part of the reader, and assimilation of the concepts presented. He differentiates between traditional reading approaches which have a code emphasis (phonics, sight vocabulary), and those which have a meaning emphasis (combining phonics, syntax, semantics, concepts).

Barrett's (1976) Taxonomy of Reading Comprehension breaks comprehension into a set of hierarchical components:
literal, inference, evaluation, and appreciation. His taxonomy is very similar to N. B. Smith's (1963) four levels of reading comprehension, in which the literal level is described as the identification of main idea and supporting details. The second level is interpretive, constituting such elements as inferences, prediction of outcomes, interpretation of pictorial matter, discrimination of contrasting ideas, summarizing, and paraphrasing. The critical level involves identification of the author's theme, purposes, assumptions, inconsistencies, analysis of the author's impact, and evaluation of the author's style and bias. The highest level is creative, in which the reader synthesizes the presented ideas with others, relates them to personal experiences, and appreciates the connotations and denotations of the author's words.

Similarly, the *Taxonomy of Educational Objectives* (Krathwohl, Bloom, and Masia, 1964) describes comprehension as the second of six levels of cognitive learning, composed of interpretation and extrapolation. However, the complete taxonomy forms a framework which parallels Smith's (1963) levels, and is composed of knowledge, comprehension, application, analysis, synthesis, and evaluation. This hierarchy of cognitive skills can be applied to any method or branch of educational delivery.

**Research on reading comprehension.** An examination of recent literature pertaining to research of reading
comprehension yields several divergent points of view. The controversy appears to revolve around two assumptions: that comprehension is either a complexity of individual skills or that comprehension is a unitary skill. In the realms of both theory and assessment of reading comprehension, there is considerable evidence to support either viewpoint. It may be possible, under certain conditions, to accept both viewpoints. This may be done by taking into account all the facets of comprehension, without losing its globality, which is the focal point of the development of language skills.

Schell and Hanna (1981) criticize commercially published reading inventories because of their failure to objectively classify types of comprehension questions or to differentiate among levels of subskill difficulty. Flood and Lapp (1978) contend that comprehension may be literal or inferential, and suggest that inferential comprehension is composed of several skills which have qualitative differences. Therefore, reading tests which refer to inference as a single skill are not accounting for these different components of inference.

On the other hand, Drahozel and Hanna (1978) conducted research which indicates that reading comprehension subtests duplicate one another. Their conclusions are based upon the high intercorrelations among reading subtests and their analysis of student responses to questions
purported to measure literal, translation, and higher level tasks. Because of these results, they consider reading comprehension as a unitary trait. Lexier (1978) supports their position, asserting that since specific reading skills are not necessarily measured by subtests, remedial reading programs based upon isolated subskills may be faulty. He also contends that poor comprehension is unlikely to be corrected by skills materials because comprehension is more related to constant exposure to spoken language.

In an extensive study of children identified as good and poor comprehenders, Golinkoff (1976) makes a number of comparisons of their skills in decoding (pronouncing and recognizing words), lexical access (word meaning), and text organization (larger unit meaning). Children identified as good comprehenders decode quickly and automatically, adapting their pattern of reading to the purposes and content of the reading material. Since they read in the largest unit (phrase, sentence) possible, processing is efficient, and confined to the information they find most useful.

Because children identified as poor comprehenders read one word at a time in their attempt to decode reading materials, their processing is slower and results in less integration of the meanings of larger units. Their oral reading errors do not conform to the meaning of the passage, regardless of whether or not they have been given advance information.
In both groups, getting the meaning ascribed to single words is an almost automatic process. For children identified as good comprehenders, visual presentation of reading material produces better comprehension than aural presentation. Since the reverse is true of children identified as poor comprehenders, Golinkoff concludes that poor comprehension is not generalizable.

Weinberg's (1979) study of fourth grade children reveals that children identified as poor comprehenders recall less information than do those identified as good comprehenders. They are also less successful in comprehending causal relationships and logical consequences. Weinberg suggests that the incomplete decoding of children identified as poor comprehenders may be due to their attempts to "keep pace with the demands of new incoming stimuli" (p. 347), or to the fact that their slow decoding causes them to pass over some information. He concludes that in any case, there is a direct relationship between completeness and accuracy, and memory.

Lahey (1979) contends that mere repetition can improve comprehension. His experiment had children listen several times to a passage, then read orally as they listened. The process was repeated until they could reread the story fluently. The results indicate that comprehension is consistently and significantly greater when the material is presented a number of times.
Stauffer (1975) reports that setting a purpose for reading not only improves reading comprehension, but also encourages the reader's active involvement with the reading material. His conclusion is shared by Kirkley (1981), who considers purposeful reading not only important, but of absolute necessity, particularly in the content areas. As an adjunct to purposeful reading, interest has been shown to have an influence on reading comprehension. Neville and Hoffman's (1981) study indicates that "personalized" stories, possibly because of their obvious relevance, have a positive effect on the reading comprehension of seventh graders with poor reading skills. Vaughan (1975) found that interest has a greater effect on the comprehension of children identified as poor readers than on those identified as good and average readers. However, his results also indicate that as the grade level increases, the effect of interest on the comprehension of all readers tends to decrease. His findings may have some implications for publishers of "high interest, low reading level" books.

Walden and Akural (1978) report that reading research is currently focusing upon psycholinguistics, wherein psychologists and linguists are cooperating to discover the specific relationships among the acquisition, comprehension, and use of language. A striking trend is the increase in formal reading instruction in secondary English curricula. The authors report that more and more school
systems are adopting the psycholinguistic position that the teaching of language arts should be an integrated process which combines oral language acquisition, reading, and writing. Tuinman (1974) considers the interaction of thought and language to be an important component of psycholinguistic research. Both he and Haggard (1978) have conducted research on creative and critical thinking activities in elementary school language arts programs. They have observed results which indicate that such activities tend to improve children’s reading comprehension.

While research in reading is abundant, there seem to be few strategies for increasing the comprehension of children with reading disabilities over the long term. It would appear that the problem has so many variables that there has not yet been developed a single approach that can claim universal effectiveness.

**Visual Literacy**

People take for granted that what they see is reality. However, Debes (1970) considers the distinction between seeing and visual literacy to lie in the concept of intent: when people do not intend to learn about their environment, their view of reality is their simple perception of it; when they have a purpose in observing their environment, they are involved in a process of thinking, inferring, evaluating, and generalizing, the result of which is a more accurate perception of reality. This is the goal of visual literacy.
One of the infant's first contacts with his environment is through vision which, in conjunction with sensorimotor activity, allows him to discover and identify the people and objects around him. He develops a visual vocabulary which begins the process of conceptualization, the precursor of language use. The act of seeing is not a unitary action: according to Dondis (1973), it is a synthesis of perceiving, looking, watching, observing, recognizing, discovering, visualizing, examining, understanding, and reading. Vision is the door through which a large percentage of information enters the mind; the memory stores the information for later retrieval as images which are affected by both emotional and cognitive factors.

**Theory of visual literacy.** In 1969, at the First National Conference on Visual Literacy, J. L. Debes proposed a definition of visual literacy which has been adopted by the Association for Educational Communications Technology:

**Visual literacy:** A group of vision competencies a human being can develop by seeing at the same time he has and integrates other experiences. The development of these competencies is fundamental to normal human learning. When developed, they enable the 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 comprehend and enjoy the masterworks of visual communication (p. 14).

Traditionally, literacy has been regarded as the ability to function in a verbal medium, usually the message of print. More recently, educators have begun to stress oral language, not only as a skill in and of itself, but also as a prerequisite to learning to read. What has been less recognized is the importance of visual skills in the comprehension of information imparted by both print and non-print (e.g. electronic) media. Specifically, such skills involve the interpretation of visual stimuli in terms of an accurate comprehension of reality (Dondis, 1973).

In considering the value of visual literacy, Fillion (1973) suggests the following: first, visual intelligence is emerging as a primary skill for all people in terms of making most of their decisions about life; secondly, the ability to interpret visual messages on the television screen is crucial not only for the gleaning of information, but also for discriminating fact from opinion; and thirdly, the ability to read accurately, fluently, and with comprehension is crucial to the ability to function adequately, particularly in regard to computers, which are rapidly becoming integral to all branches of commerce and industry in today's world.
Ostwald (1970) proposes a model of visual literacy which is based upon a number of assumptions about human beings and the ways in which they communicate.

Insert Figure 2 about here

Reality in its simplest form is appraised by processing information which is gained from vision. This appraisal is evaluated with the assistance of other senses. The interpretation of this total perception of reality is greatly influenced by the previous experiences which are stored in the memory. The actions people take as a result of their interpretation of reality are governed by the rules inherent in their society. Finally, their resultant behavior is communicated to the people via their language and other symbol systems.

Visual and verbal literacy. Debes (1970) formulated a hierarchy of visual skills which corresponds to principles of child development in both cognition and language. In some ways, his hierarchy resembles Piaget's theory of cognitive development, from the sensorimotor stage through concrete manipulative, concrete operations and formal operations stages. He suggests that among the first skills a child learns are the abilities to distinguish and recognize light and dark, shapes, sizes, color, distance, height, depth, movement, and speed. The second level of skills
Figure 2

Ostwald's Model of Visual Literacy

Immediate Reality

Vision | Other Sensory Modalities

Appraisals and Evaluations

Accumulated Past Experience

Memory | Social Rules

Interpretative and Behavioral Responses

Language | Semiotic Systems

Future and Distant Events

Communication

(Ostwald, 1970, p. 33)
includes the accomplishment of visual closure, the perception and understanding of body language, object categorization and visual analogies, and fundamental sequences of size, color, and chronology. The third stage, which begins approximately at the time the child begins school, encompasses the ability to recognize, understand, and compose visual sequences of significant order, processes, and ideas. The final stage involves recognition, understanding, and composition of visual sequences of cause and effect in emotions, abstractions, logic, and analogy.

The progression of language acquisition, which involves naming of objects, and proceeds through qualitative and quantitative concepts to more complex ideas and abstractions, follows a similar pattern. Since a visual vocabulary precedes verbal vocabulary (Wendt, 1962), the importance can thus be seen of systematic development of visual processes in order to facilitate the development of language. As children learn to read visual sequences, they begin to conceptualize language, to understand the syntax of language.

Because photographs are symbolic abstractions of objects and events, Wendt (1962) analogizes pictures to verbal language: "Pictures are a language in themselves. They are not merely representations of reality operating within narrow limits of expression" (p. 176). Both impart and imply meaning which in turn is subject to interpretation by the receiver. While verbal language is governed by semantics
and syntax, it is largely a function of the writer/speaker's point of view; similarly, visual language composition involves the composer's point of view, and is accomplished primarily through manipulating the spatial relationships of the picture's components. As verbal language can be synthesized into a whole that may be completely different from the original components, so visual representations can change the meaning simply through rearrangement or blending of the objects in the picture. Syntax is evident in comparing short, simple sentences to short, dynamic scenes of motion pictures, and complex, compound sentences with longer scenes in which many complexities of plot, character, and setting are portrayed.

Verbal language must exhibit logical continuity from one word, idea, or sentence to the next. Visual language must do the same: the filming of a conversation between two people demands that the camera first establish their relative positions, then film the speaker over the shoulder of the listener. The achievement of paragraphing in visual language is through techniques such as fade-ins and fade-outs.

Visual intelligence. For most people, what they recognize, learn, desire, and buy is determined by what they see (Dondis, 1973). How they use the information gained from observations about their environment is directly related to the extent of critical judgment they use in the processing
of that information. Dondis claims that an intellectual ability to make and understand visual messages is becoming a vital necessity of life in the twentieth century. Arnheim (1971) observed that the ingredients of the cognitive process called thinking are essential to the process of visual perception: exploration, selection, grasping of essentials, simplification, abstraction, analysis and synthesis, completion, correction, comparison, problem solving, combining, separating, and putting into context.

Fransecky (1972) has developed a taxonomy of visual cognitive learning objectives which corresponds to Krathwohl, Bloom, and Masia's (1964) *Taxonomy of Educational Objectives*. They provide a framework for visual intelligence which can be used to develop methodology for teaching visual cognitive skills. His objectives are:

1. **Knowledge** involves recall and recognition of familiar elements in visual statements, including symbolic elements, sets, representation, and sequence.

2. **Comprehension**, or the translation from visual to verbal mode, is concerned with the interpretation of visual statements and the extrapolation of visual data to enable the prediction of outcomes, causes, and consequences.

3. **Application** can be the creation of pictures which demonstrate interrelationships and communicate visual messages.

4. **Analysis** involves the identification and classification of communication elements, in which relationships
among the elements are made explicit, and principles of structure and coherence are evident in the visual statements.

5. **Synthesis** is demonstrated in the creation of complete visual statements which show the organization of ideas in the formation of the whole.

6. **Evaluation** is evident when visual sentence order is related to verbal sentence order, with appropriate syntax (pp. 186-193). The creation of visual literacy on this model appears to have efficacy not only for the structured development of visual literacy, but also for the provision of alternate methods of developing verbal literacy in children who have not been able to learn to read or communicate effectively.

**Picture reading.** Because children today are growing up in a world that is primarily visual, they are becoming passively conditioned to "viewing much, but seeing little" (Stauffer, 1975, p. 228). Even when they do engage in purposeful observation, Stauffer (1975) observes that the same event will elicit diverse descriptions of what actually happened. But people can be trained to see better, and to remember what they see through methods which involve "purposeful seeing, meaningful association, repeated seeing, and using the information gained" (Stauffer, 1975, p. 229). He advocates the use of specific techniques to train children to see more effectively, with the ultimate
goal being to learn how to read. Learning to recognize similarities and differences among objects is the first step: sorting, arranging according to sequence or relationship, and organizing into specific categories. The second step is using geometric and letter-like forms to sharpen visual discrimination.

The picture is an alternate symbol system and can be used to help children "see" a concept. It represents experiences which become translated into words in the form of oral language. Haber (1970) notes that pictures are stored as images, and words take the images and recall them in language. His idea is supported by Kulhavy (1975), whose research indicates that elementary aged children remember more from a reading selection if they have formed mental images during their reading.

Debes (1970) notes a study which indicates that children today are more skilled in reading visual messages than adults who did not grow up with television. However, Neumann and Prowda's (1982) research that amount of television viewing and reading achievement are negatively correlated, suggests that the passive watching of television may cause a deterioration in verbal language usage and facility.

Visual materials have long been used to promote language development in people with hearing impairment or total deafness. Newby (1974) has developed
a wide range of instructional materials, called "patterned language materials", which promote language development through hundreds of illustrations of vocabulary and concepts. Fay and Quant (1971) report several studies which used visual materials to promote comprehension. One concluded that the use of colored illustrations improved the literal comprehension of second graders. Another reported a significant gain in reading comprehension at the primary level when filmstrips were used in conjunction with basal readers. Still another, using a language experience program based upon children's illustrations of stories, reported gains in reading comprehension. In Skabo's (1979) comparison of audiovisual aids with the use of a multifaceted remedial reading approach, there was an increase in elementary children's reading levels.

Musgrave (1977) describes a ten year old boy whose reading problem had been addressed by a variety of remedial reading techniques, with no appreciable effect. Discovering that the boy was proficient in art activities, he developed a program for him that was based on descriptions of his pictures. These descriptions were written and taped, and new vocabulary was used in other contexts. The boy's total reading achievement in both fluency and comprehension improved dramatically.

Visual literacy and reading. Fransecky (1972) stated that one of the first structured, vision-dominated
learning tasks in the education of young children. Of all the tasks that have been assigned to the education system, he considers the ability to read as the most important academic skill; indeed, the responsibility for teaching children to read rests wholly on the school. There is strong evidence that children benefit from visual skills training in preparation for reading; yet schools traditionally ignore those skills after the reading readiness program, and concentrate almost completely upon the verbal mode. Reading remediation programs continue to emphasize drill and practice, in the hope that sooner or later the children will "catch the thread" and become able to read fluently and with comprehension. All too often, the repetition of similar techniques destroys the interest of the problem reader, who consequently "turns off" reading entirely (Fransecky, 1972).

Williams (1970) observes that lack of success in reading at an early age can lead to "further deprivation by withdrawal from contact" with the reading problem "until a point is reached for the individual where he may never recover". This does not mean, however, that the non-reader lacks intelligence, or indeed must be relegated to a classification of people who can never learn to read. "Deprivation does not necessarily prevent normal development of intelligent behavior, but it appears to interfere with performance in vulnerable subjects" (Fuller, 1967, p. 1652).
What, then, can help children to avoid becoming statistics as functional illiterates? Debes (1970) cites studies which found that third grade reading problems were inversely proportional to three-dimensional capacity; that children with a balance of visual and verbal opportunities in first grade excelled not only at that level, but continued to excel academically four years later; and that almost half the children in an elementary reading program had visual-perceptual problems severe enough to handicap them in their approach to education. Strandberg and Griffith (1969) provide strong evidence that strengthening visual vocabulary increases the chance of enhanced verbal communication in children with language deficits.

The attention of the educational system should shift to the recognition of the predominance of the visual mode in a child's learning experience, and to the development of constructive methods of visual learning at all grade levels, but particularly in the elementary grades. As Pett (1978) states, "We need to know more about how children learn from pictures and how this relates to the various stages of their development. We need to find better ways to test and measure visual language abilities at a variety of age levels" (p. 14).

While it has been accepted by educators that maturational fills in developmental language gaps (Dondis, 1973), schools cannot afford to wait passively for this maturational to occur, simply because too many children
suffer permanent effects of repeated and prolonged lack of success in reading. Since reading skills are essential to adequate functioning in the modern world, it is incumbent upon the education system to promote visual literacy training as a method of teaching reading (Fillion, 1973).

The purpose of this study is to investigate the effectiveness of training in visual cognitive skills, as an alternative remedial technique for increasing the reading comprehension of children whose reading skills are considered to be lower than expected due to a learning disability. The null hypothesis: There is no significant difference in gains in reading comprehension scores between children who have received training in visual cognitive skills and those who have been taught reading skills by means other than the use of pictorial stimuli. The hypothesis of the study is: Children who have received training in visual cognitive skills will experience greater gains in reading comprehension scores than those who have been taught reading skills by means other than the use of pictorial stimuli.

Method

Subjects

The subjects of this study were 34 children from grades four, five, and six of a K - 6 elementary school. There were 18 males and 16 females, ranging in age from 9 years, 4 months to 13 years, 0 months, with a mean age
of 11 years, 3 months. The I.Q. levels as measured by the Cognitive Abilities Test (Thorndike and Hagen, 1971) ranged from 75 to 107, with a mean I.Q. of 95. After the pretest, the reading comprehension subtest of the Iowa Tests of Basic Skills (Hieronymus et al., 1979), given 1 month before the beginning of the study, the resultant grade equivalent scores ranged from 3.0 to 7.3, with a mean of 4.71.

The subjects had been assigned for remediation activities in language arts and mathematics, to 14 teacher education students from a learning disabilities methods practicum in special education. Using a random number generator, seven student teacher tutors were assigned to the control group, and seven to the experimental group. The subjects were distributed in an experimental group of nine males and nine females, and a control group of nine males and nine females. Although a random assignment should avoid systematic bias between the two groups, a t-test was performed on pretest scores, resulting in $t = 0.828$, which failed to note any significant differences between the two groups (see Table 1).

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Data Collection Procedure

The seven tutors in the experimental group were given a 1 hour training workshop in picture study, in which the rationale, theoretical framework, and methods of formulating questions were explained (see Appendix A). During a follow-up session of 1 hour, the tutors presented their own pictures and questions, and the components of comprehension contained in their lessons were discussed.

Over a period of 2 months, the subjects in the experimental group received 14 20-minute lessons in picture study. These lessons consisted of color pictures about which a number of questions were formulated by the tutors. The questions were designed to teach cognitive skills according to the taxonomy of educational objectives devised by Krathwohl, Bloom, and Masia (1964). During the same period, the subjects in the control group received 14 20-minute lessons in reading skills that did not involve the study of pictures, e.g. reading stories, word study, sentence construction, spelling.

The lessons, which constituted one-third of the daily reading program, were given in areas of vacant classrooms in the school. Each day, a picture was introduced to each subject in the experimental group. The tutor discussed the picture orally with the subject, who was then required to answer the printed questions in
written sentence form. The tutor then discussed the responses with the subject.

Toward the end of the 2-month period, the tutors in both experimental and control groups were trained to administer the Reading Comprehension subtest of the Iowa Tests of Basic Skills. The next day, all subjects were post-tested, using alternate forms of the pretest (see Table 1). Two male subjects from the experimental group were absent due to extended illness.

Statistical Procedure for Hypothesis Testing

The post test raw scores were converted to grade equivalents, as given in the administration manual of the Iowa Tests of Basic Skills, and gain scores were calculated for all subjects. Because the data generated appeared to be ordinal level rather than interval level data, gains were ranked from lowest gain (i.e., greatest loss) to highest gain (see Table 2).

Insert Table 2 about here

Results

The results showed a gain of .5125 year mean gain for the experimental group, and a .5313 year mean loss for the control group. The range of scores was 3.2 years, with a low figure of 1.5 year loss, and a high figure of 1.7
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year gain for the experimental group; and 3.5 years, with a low of 2.4 year loss and a high of 1.1 year gain for the control group.

A frequency distribution graph showed that the data were skewed negatively for the experimental group and positively for the control group. Consequently, the Mann-Whitney U test was performed, resulting in $U = 50.5$; since the alpha-value for $n_1 = 16$ and $n_2 = 16$ was 66 at the .02 level of significance (Mann and Whitney, 1974), the differences were significant in that they could not have occurred by chance more often than two times in 100. Thus the null hypothesis can be rejected.

Ancillary analyses were performed, assuming a zero mean gain and a 2-month gain, respectively, for the control group. Using the Mann-Whitney test in each case, such results would have been significant at the .02 level for a zero gain. However, a 2-month gain would have yielded significance only at a .10 level; therefore, for the purposes of this study, the mean gain scores of the experimental group would not have represented a significant difference had the control group exhibited a mean gain of 2 months, as might have been expected in a 2-month study.

Discussion

There appears to be support for the hypothesis that children who have received training in visual cognitive skills experience greater gains in reading comprehension
scores than those who have been taught reading skills by other means of remediation. In the present study, the null hypothesis would also have been rejected had the control group showed a zero mean gain; however, a mean gain of 2 months would have yielded no significant difference. All analyses were performed using the actual data drawn from the experimental group.

The contention by F. Smith (1975), Spiegel (1974), and Walker (1977) that common remedial reading programs which employ drill and practice in phonetic and structural decoding are not effective in increasing reading achievement appears to have been given support in this study; the activities engaged in by the tutors of the control group were predominantly concerned with word study and sentence construction. On the other hand, the emphasis by the experimental group upon cognitive skills using visual stimuli supported F. Smith's (1982) and Reder's (1980) contention that reading comprehension is dependent upon context and upon the knowledge and experience of the reader; Dondis' (1973), Ostwald's (1970), and Stauffer's (1975) contentions that visual literacy skills are transferrable to verbal literacy achievement; and Barley's (1969) contention that pictures constitute gestalts which correspond to a complete story in verbal form.

While there appears to be little doubt that picture study using Fransecky's (1970) adaptation of Krathwohl,
Bloom, and Masia's (1964) taxonomy of educational objectives has resulted in significant gains in reading comprehension test scores, the indication in the present study that children who do not receive such training have decreased reading comprehension scores is not only of concern, but would seem inconceivable to an informed observer. Thus an important consideration of this discussion is to attempt to explain the phenomenon. Several possibilities arise: a) the tutors in the control group were less competent than those in the experimental group; b) the subjects in the experimental group were of higher intelligence than those in the control group; c) the classroom teachers taught reading skills less assiduously during the period of the study than otherwise; d) the alternate forms of the Iowa Tests of Basic Skills (Hieronymus et al., 1979) are unreliable and/or invalid; e) the pretest reading scores were artificially inflated by virtue of the fact that the classroom teachers administered them; f) the control group received less instruction in reading comprehension than did the experimental group; g) a Hawthorne effect resulted from the knowledge of tutors, and possibly subjects, that the experimental group was receiving more attractive materials than was the control group; h) the predominance of traditional remedial reading techniques used with the control group produced an "overload" effect on that group, while the experimental group experienced a "relief" from such
instructional techniques; i) the format of the reading comprehension subtest benefitted the experimental group more than the control group.

On the question of comparative competence of tutors, both the practicum instructor and the graduate assistant assigned to provide supervision to the tutors gave independent ratings of the general competence of tutors. When compared with the gain-loss data, there was no apparent relationship between highly competent tutors and high gain scores; nor was there apparent relationship between less competent tutors and low gain scores. Since the tutors had been randomly assigned to the respective groups, there was little possibility that there would be a disproportionate number of highly competent tutors in either group.

The mean intelligence score, as measured by the Cognitive Abilities Test (Thorndike and Hagen, 1971) was 93.2 for the control group, and 90.6 for the experimental group. Since a t-test indicated no significant difference between the groups, the speculation that the experimental group was of higher intelligence than the control group was not supported by the data. Additionally, the random assignment would provide for equal distribution.

During the 2-month duration of the study, the usual classroom teachers taught reading to both experimental and control groups for 1 hour, 3 days per week. They
indicated that their reading lessons were carried out in normal fashion, with no conscious tendency to leave the instruction of reading to the tutors, who taught reading, mathematics, and language arts during two 1-hour sessions per week for 8 weeks.

The reliability of the alternate forms of the subtests of the Iowa Tests of Basic Skills ranges from .89 to .96 in internal consistency, and .97 to .98 in composite reliability for all grades. The question of validity is of lesser importance to the study, since it is based upon gain scores between alternate forms of the same test. In examining the number of items of the various types of skills objectives tested within the alternate forms, there were some differences noted: Form 8 contained more factual items and fewer inferential items in the sixth grade than Form 7; Form 8 contained fewer factual items and fewer generalization items in the fifth grade than Form 7; Form 8 contained more factual items and fewer generalization items in the fourth grade than Form 7. Given the relative equivalency of grade range between the control and experimental groups, however, the differences were distributed evenly, and should have constituted no significance; but they have probably contributed to some individual gains or losses within each group.
There is a possibility that the pretest reading scores were artificially inflated. According to the school principal, all children in the school were trained in test-taking prior to the administration of the entire battery of the Iowa Tests of Basic Skills, 1 month before the study began. The classroom teachers then administered all subtests, using standardized procedures. The results were machine scored by the publishing company. The post test was administered by the tutors, using standardized procedures, and hand-scored by the researcher; a 25 percent random sample was rechecked by independent disinterested university personnel. Reliability equalled 1.00. Since the subjects were distributed among six home-rooms, it is unlikely that the administration procedures varied more in either the experimental or the control group. However, the pretraining of all subjects prior to the pretest may have artificially inflated all pretest reading comprehension sub-scores.

The judgment of the supervisory personnel is that approximately half of the control group subjects received any instruction from their tutors in reading comprehension skills, while the other half was given regular instruction in phonetic and structural analysis, spelling, sentence construction, and related language arts activities. The time allocated for reading instruction in the
experimental group was totally and totally consistently devoted to picture study. Since the inference contained in the hypothesis of the study is that visual cognitive skills are related to comprehension skills in reading, it is entirely possible that the experimental group received more instruction in reading comprehension than the control group.

The issue of a Hawthorne effect was considered to be minimal prior to the beginning of the study, by virtue of the fact that the tutors were not only randomly assigned, but also were considered to be equally anxious to deliver high quality instruction to their respective students. However, they may have been unintentionally affected psychologically be a sense of importance i.e. the tutors in the experimental group may have felt that they were conducting more significant lessons than the tutors in the control group. Similarly, the subjects in the experimental group may have been more motivated to perform well because their assignments were different and more attractive than those of the control group. Such perceptions would tend to partially account for the significant gains in scores of the experimental group; however, they should not account for the net decrease in scores of the control group. In addition, the observations of the practicum supervisors indicated that the overall enthusiasm of the tutors in both groups was equivalent.
If it is true that the use of traditional remedial reading techniques in the control group produced an "overload" effect, while picture study produced a sense of relief in the experimental group, there may be an implication for teachers involved in the remediation of reading problems. The brevity of the study, plus the fact that only 40 minutes per week were devoted to an activity that seemed unrelated to reading, gives rise to the speculation that perhaps learning activities which are designed to promote thinking skills may be as effective as, or even more effective, than activities that are overtly related to reading skills development.

It is possible that the format of the post test favored the experimental group over the control group. The test consisted of individual reading passages, boxed by lines, below which were questions with multiple choice responses that tested the subjects' ability to recall facts, find the main idea, make inferences and generalizations, draw conclusions, and understand the connotations of words and phrases. The picture study lessons used with the experimental group consisted of a picture, below which were questions which required similar critical thinking skills. Since the control group received instruction in a wide variety of formats, there was no parallel to be drawn with the test format. Because the hypothesis of the study infers that both pictures and
reading passages are gestalts, picture study probably enables children to comprehend print materials with greater facility.

This study appears to have generated more questions than it answered. Future research should examine the efficacy of picture study with respect to a number of considerations:

1. Variables such as sex, age, grade placement, socioeconomic status, and I.Q. should be subjected to a multiple regression analysis with gain scores and treatment as independent variables;

2. Both pretest and post test should be conducted by the same administrator, with no preteaching;

3. The control group should specifically be taught skills in reading comprehension for an amount of time equal to that spent on picture study in the experimental group;

4. The materials used in the control group should be as attractive as those used in the experimental group;

5. The materials used in both groups should be unrelated to the regular reading program in the school. The control of such factors should result in more conclusive data, particularly from the control group.

The tentative conclusions which can be drawn from the present study are as follows: the use of pictures as instructional media is a powerful motivator for children to learn; a picture can be taught in the same manner
as a story is taught; reading comprehension can be taught effectively without the use of reading materials; the skills involved in critical thinking are similar to those involved in reading comprehension; and the teaching of comprehension and critical thinking skills through the use of pictures contributes to improvement in reading comprehension skills using print media.

While it is important that further research be conducted on the relationship between visual cognitive skills and reading comprehension, the high mean gain (6 months) by the experimental group using picture study for a total of only 5 hours over 2 months, indicates that such a method indeed may have value for teachers of reading. Research examining if the procedure can provide a relief for children who have "turned off" to reading, or provide increased comprehension of what children observe and deduce about the world, needs to be conducted. Finally, research examining the procedure's efficacy for use in other subject areas should be begun. The procedure, while certainly not a "cure-all," may prove, through the research, to be a simple means by which to help children learn to comprehend in a more thorough fashion.
References


(ERIC Document Reproduction Service No. ED 155 681)


Mann, H. B., & Whitney, D. R. On a test of whether one of two random variables is stochastically larger than the other. *Annals of Mathematical Statistics, 1974, 18*, 50-60.


Skabo, K. W. Will primary grade Title I students demonstrate greater achievement in reading with the use of audio-visual aids than those who haven't utilized them? (M. A. Thesis, Kean College of New Jersey, 1979.) (ERIC Document Reproduction Service No. ED 169 509)


Walker, J. L. Comprehension is comprehension is ...


Appendix A: Workshop for Student Tutors

**Picture Reading**
*(Visual Literacy)*

**Purposes**

1. To promote abstract thinking through the use of semi-concrete materials.
2. To interpret the environment by using visual thinking processes.
3. To consolidate concepts from previous learning.
4. To improve reading comprehension skills.

**Formulating Questions**

1. Observe - determine theme, main idea of picture *("what")*
   - determine setting *("where", "when")*
   - determine human involvement *("who")*
2. Examine details.
3. Analyze information.
4. Make inferences *("why", "how").*
5. Hypothesize and speculate.
7. Extend to other situations.
8. Apply concepts from other subject areas.
1. Where are these men?
2. What two things give you an idea of where they are?
3. How do you think they earn their living?
4. What two things give you an idea of how they earn a living?
5. What is a commuter?
6. Is the man in the foreground left-handed or right-handed?
7. How can you tell?
Barrett's Taxonomy of Reading Comprehension

1. Literal - main idea and supportive details
   - predicting outcomes, interpreting pictorial matter
   - discrimination of facts and opinions, relevant and irrelevant facts

2. Interpretive - inferring sequence, cause-effect, compare-contrast
   - predicting outcomes, interpreting pictorial matter
   - discrimination of facts and opinions, relevant and irrelevant facts

3. Critical - identify author's purpose, authority
   - identify inconsistencies
   - examine assumptions, generalizations
   - read for problem solving
   - evaluate author's style, bias

4. Creative - synthesize ideas with others
   - personal reaction
   - appreciate connotation, denotation of words
   - relate personal experience

Krathwohl, Bloom, and Masia

Taxonomy of Educational Objectives

1. Knowledge - recall and recognition
   - recognition of symbolic elements
   - recognition of sequence

2. Comprehension - translation of visual to verbal
   - interpretation of visual statements
   - extrapolation - predict outcomes, distinguish cause and consequence

3. Application - identifying interrelationships
4. Analysis - identification and classification
   - explanation of relationships among elements
   - recognition of principles of structure and coherence in visual statements

5. Synthesis - organization of ideas in formation of the whole

6. Evaluation - relating visual sentence order to verbal sentence order with appropriate syntax

(Adapted by R. Fransecky, 1972)
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