THE EFFECTS OF IMAGERY STRATEGY TRAINING AND IMAGERY STRATEGY USE ON READING COMPREHENSION

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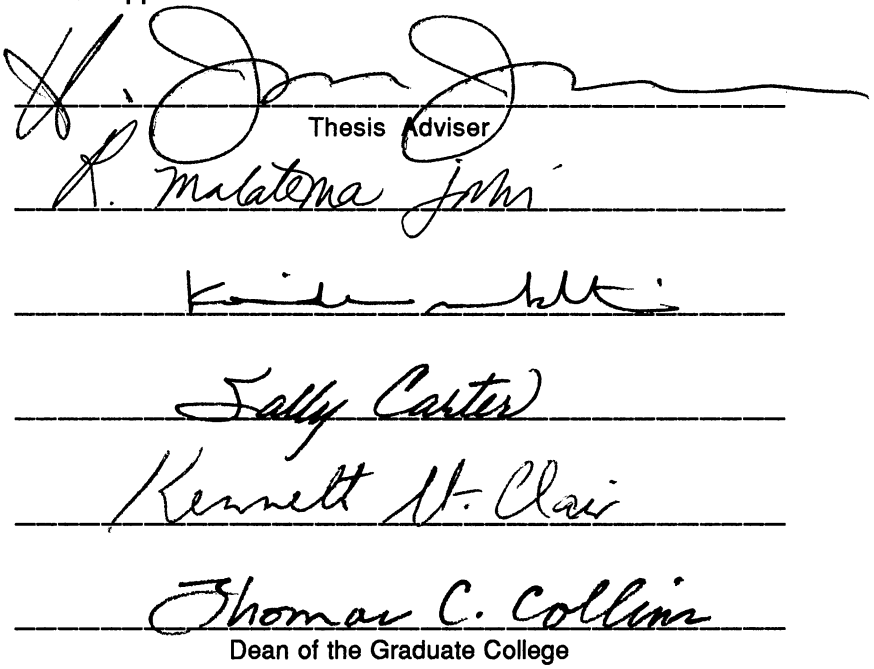

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CHAPTER I

PRESENTATION OF THE PROBLEM

Introduction

Both images and words are symbolic systems that mentally represent external entities. Each designates an object with its particular perceptual details and its concrete figural characteristics (Piaget & Inhelder, 1971). Harris and Hodges (1981) define imagery as mental pictures formed while hearing or reading a story by using language to create sensory impressions. In recent years, researchers have investigated the use of mental imagery as a metacognitive strategy to improve reading comprehension. While many studies have reported a positive correlation between the use of imagery while reading and comprehension of written discourse, others have found no significant relationship.

Several possible explanations for these discrepancies exist. For example, many researchers decontextualize their studies, using neither the materials nor specific instructions as an integral part of the regular class routine. With few exceptions, experimenters have not only provided the training to individual subjects or small groups, but also produced the materials used. Alvermann and Moore (1991) reviewed seven recent studies examining the relationship between imagery and reading comprehension. Three of the seven studies included training subjects to use imagery as a metacognitive

strategy, with only two reporting positive results. In the other four studies reviewed, experimenters simply told subjects to visualize, and reported no significant effects. Of these seven studies, none incorporated training in a classroom routine, none employed a classroom teacher in the intervention, and none involved reading materials students normally read (i.e., state adopted text-books). However, research has demonstrated that instruction provided by a regular classroom teacher in a natural classroom setting is more beneficial than instruction provided by an outside experimenter using experimenter-produced materials in a separate session from the regular classroom (Alvermann & Moore, 1991; Duffy, Roehler, Swan, Rackliffe, Book, Meloth, Vavrus, Wesselman, Putnam, & Bassiri, 1987).

Weinstein (1982) found that length of training correlated highly with effectiveness, but only a few studies (Lesgold, McCormick, & Golinkoff, 1975; Miccinati, 1982; Weinstein, 1982) assess the effect of imagery instruction over an extended length of time. A further limitation of imagery and reading comprehension research concerns the task diversity required of subjects. Some researchers (Kulhavy & Swenson, 1975; Lesgold, et al., 1975; Rasco, Tennyson, & Boutwell, 1975; Sadoski, 1985) have assessed comprehension by having subjects simply recall the story. Although some researchers do ask questions (Anderson & Kulhavy, 1972; Gambrell & Bales, 1987a; Steingart & Glock, 1979), most researchers do not report specific types of comprehension questions asked. Consequently, discrepancies found in previous research may be attributed to a wide variety of tasks required of subjects.

Discrepancies may also occur because students do not benefit equally from training. One possible explanation for this unequal benefit lies within theories of the developmental nature of imagery. Researchers offer two conflicting theories (Akin, 1989). The first theory suggests that imagery use increases with age, and is accompanied by self-generating visual elaboration by older children (Daehler & Bukato, 1985; Piaget & Inhelder, 1971; Rohwer, 1970). According to an opposing theory, young children initially use imagery, but develop a greater reliance on prior knowledge and a decreased use of imaginal support with increasing age (Kosslyn, 1980).

Learning strategy research offers another explanation for differences in imagery research findings. Spontaneous imagery, (i.e., mental images occurring without explicit prompting) is a natural cognitive phenomenon (Lesgold, Curtis, DeGood, Golinkoff, McCormick & Shimron, 1974; Long, Winograd & Bridge, 1989; Miccinati, 1982; Sadoski, 1983, 1985; Sadoski, Goetz, Olivarez, Lee, & Roberts, 1990; Sadoski, Paivio, & Goetz, 1991). Although students experience spontaneous imagery, they may not use imagery as a metacognitive strategy to enhance comprehension. Students select and use those strategies that they feel are personally most effective. The effectiveness of the strategy instruction depends on several factors: (a) the method employed, (b) adequate time and practice to master the strategy, (c) support provided to use the strategy, and (d) appropriate gradual fading of external support (Chan, Cole, & Morris, 1990; Irvin, 1991). The primary determinant in strategy

effectiveness, nonetheless, is the students' willingness to use a strategy once they have received instruction to do so.

Statement of the Problem

Research results on the effectiveness of explicit imagery training as a learning strategy to improve comprehension are inconclusive. A review of previous studies indicates this may be a strategy intrinsically available to all readers. Although several researchers have found significant comprehension differences as a result of imagery instructions, others have found little or no effect. Explanations for the variety include the lack of classroom teacher involvement in training, lack of naturally occurring reading material (those materials usually read by students), and the lack of the integration of training in a natural classroom setting. Another likely explanation for this disparity concerns imagery development. Additionally, discrepancies may reflect the diversity of task demands placed on subjects under the broad term, "comprehension." Also, training protocol variables and student choice of strategy may influence results. Researchers must take these possible confounding factors into consideration when investigating the practicality and appropriateness of teaching students to use this strategy. Furthermore, it is important to identify various comprehension tasks most facilitated by imagery strategy use.

Purpose of the Study

This study examined both imagery training and imagery use. First, this study investigated the effect of instructing middle school students to use imagery as a metacognitive strategy. Consequences of this training on six specific reading comprehension tasks: (a) identification of main idea, (b) recognition of sequence, (c) recall of details, (d) inference of implicit information, (e) word identification of unfamiliar vocabulary, and (f) recognition of cause and effect relationships, as measured by criterion referenced tests were assessed. Also, the efficacy of this training on students' norm referenced scores was analyzed. Secondly, this study explored the relationship between self-reported strategy use and the six specific reading tasks identified above. This study was conducted under conditions to control for confounding factors that may have produced incongruent findings in previous research.

Hypotheses

This study investigated the following null hypotheses:

1. Regardless of ability, imagery training has no effect on subjects' scores on six specific comprehension tasks as measured by criterion referenced tests.
2. Regardless of ability, imagery training has no effect on subjects' comprehension as assessed by the reading portion of a norm referenced test.
3. Regardless of ability or training, imagery strategy use has

no effect on subjects' scores on six specific comprehension tasks as measured by criterion referenced tests.

Definition of Terms

For this study, these terms are operationally defined as follows:

Imagery: spontaneous or induced mental or visual images.

Experimental classes: those classes in which subjects receive specific training (described in Appendix A).

Control classes: those classes in which subjects (a) receive the same instruction, except training, (b) read the same selections, and (c) take the same criterion referenced and norm referenced tests as the experimental class.

High ability classes: those classes identified by the classroom teacher based on previous criterion referenced measures, mid-term grades, and classroom achievement as performing at or above grade level.

Low ability classes: those classes identified by the classroom teacher based on previous criterion referenced measures, mid-term grades, and classroom achievement as performing below grade level.

Comprehension: student performance on two types of measures: the reading portion of a norm referenced achievement test and criterion referenced tests on selected short stories. Comprehension on the criterion referenced tests refers to the understanding necessary to respond correctly to questions requiring: (a) main idea identification, (b) recognition of sequence, (c) recall of details, (d) inference of implicit information, (e) word

identification of unfamiliar vocabulary, and (f) recognition of cause and effect relationships.

Self-reports: students' responses to a multiple-choice question on the criterion referenced tests taken. This question asked students to identify which strategy they used to help them understand and remember the story. Answer options included rereading, listening carefully to class discussions, using imagery, taking notes, or other.

Limitations

The main focus of this study was to investigate the effect of training students within the context of their own class to use imagery as a metacognitive strategy, with instruction provided by a classroom teacher. Therefore, random assignment of subjects to treatment was not possible. Subjects for this study were drawn from a population representative of a single inner-city school district, limiting the generalization of findings. Further, this study analyzed subjects' comprehension of narrative material only. Therefore, results cannot be generalized to expository materials.

The lack of a truly quantitative assessment tool to measure an abstract cognitive process limits all experimental imagery studies. Although self-reports are subjective, they are currently the most appropriate means for investigating cognitive processes that cannot be objectively measured. Ericsson and Simon (1981) conclude verbal reports provide valuable information about cognitive processes used

in reading comprehension. Nevertheless, the subjective nature of self-reports also limits the generalization of the findings.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This study explored the effect of imagery strategy use on comprehension, and examined the effectiveness of training seventh grade students to use this strategy to increase reading comprehension. In the following chapter, a brief historical overview of imagery research is presented. A review of imagery theories and a survey of literature on the relationship between imagery and learning are adduced. The chapter concludes with a thorough discussion of studies involving three specific types of imagery and reading comprehension. While a wealth of imagery research literature is available, and many references are cited, only those studies particularly pertinent to the present study are reviewed in depth.

Historical Overview

Since the beginning of time, man has pondered mental imagery's existence and importance and its connection to language, cognition, and memory. An early reference to this association can be found in the words of the Greek poet, Simodes, who wrote in 500 B.C., "Words are the images of things" (in Cramer, 1980, p. 136).

Aristotle defined memory as "the permanent possession of a sensuous picture..." (in Carey, 1915, p. 454). Descartes was among the first to suggest that the brain forms visual images (in Blakemore, 1990). Early psychologists assumed memory consisted of images of experiences (Carey, 1915; Rasinski, 1985).

Around turn of the twentieth century, investigations exploring the relationship between mental imagery and learning began. Early examples include Fernald's 1912 published summary entitled "Diagnosis of Mental Imagery," and Town's 1914 study, published in the *Illinois Medical Journal*, which examined mental imagery differences between seeing and blind high school students (in Wheatley, Maddox, Antony, & Coe, 1987). In another pioneering study, Carey (1915) investigated imagery and verbal memory. He concluded visual images are more effective than auditory images in remembering verbal information. Galton, Titchner, and other early twentieth century psychologists believed images were primary to thought (Cramer, 1980).

Despite imagery's importance in early psychological research, imagery was not always considered a topic worthy of scholarly investigation. Behaviorism shifted the focus of psychological inquiry, which "purged itself of imagery, attention, states of consciousness and other mentalistic concepts" (Kessel, 1972). J. B. Watson, an early 1900s behaviorist, proclaimed mental imagery mere "mentalistic baggage" too subjective for empirical measurement (in Cramer, 1980). Studies on mental imagery virtually ceased for over forty years. By the mid 1950s, interest in imagery research again gained favor. Piaget considered imagery an

effective education methodology (in Wheatley, et al., 1987). Imagery once again became an important consideration in cognitive theory (Cramer, 1980). In recent years, imagery has become a pedagogical topic, with investigations focusing on the interrelationship between imagery, written language, learning, and hence, reading comprehension.

Pivotal in the resurgence of imagery research are Paivio's classic paired associate studies. The term "conceptual peg" first appeared in Lambert and Paivio (1956). Paivio hypothesized that nouns act as pegs for modifiers, because nouns elicit images which mediate the recall of the associated adjectives. In one early paired associate study (Paivio, 1965), subjects completed alternative learning trials (auditory reception of pairs) and recall trails (stimuli reception) on materials composed of concrete and abstract noun pairs. Paivio assumed that concrete nouns elicit sensory images better than abstract nouns. He believed imagery mediates the formation of associative connections between pair members. Confirming the prediction that concrete noun stimuli would elicit more correct associations, the analysis of recall scores indicated that subjects recalled concrete-concrete pairs more easily, with concrete-abstract, abstract-concrete, and abstract-abstract recalled in that order. Other research (e.g., Akin, 1989; Begg, 1972; Marschark & Hunt, 1985) support the conceptual peg hypothesis, an ingredient in Paivio's dual coding theory.

Imagery Theories

Dual Coding Theory

The most widely accepted theory explaining the relationship between imagery and language is Paivio's dual coding theory. Paivio (1971) hypothesizes there are two distinct coding systems for perception, memory, language, and thought. Each encodes, organizes, transforms, stores, and retrieves information (Paivio & Begg, 1981). The verbal system processes sequential, auditory-motor information. The visual imagery system operates as a parallel processing system, adapted for storage and symbolic manipulation of information concerning spatially organized events and objects. "Language and other cognitive tasks are mediated by [these two systems] that are specialized for dealing with verbal and nonverbal information. The systems can function independently or they can interact. ...The developmental onset of the nonverbal systems precedes that of the verbal system, which depends initially on the already established nonverbal base" (Paivio, 1983, p. 206). A major assumption of this theory is that imagery may also be abstract and schematic and can serve abstract functions, although usually only in interaction with verbal processes (Paivio, 1971, 1983).

Developmental Theories

Evidence suggesting the ability to use visual imagery is better at some ages than others generated two theories explaining the developmental nature of imagery and its role in learning. One theory

suggests there is an increasing use of imagery strategies with age (Piaget & Inhelder, 1971; Pressley, 1976, 1977). Piaget & Inhelder (1971) believe children do generate some forms of imaginal representation, but only older children and adults have the ability to generate and use abstract images. Research findings (Daehler & Bukato, 1985; Lesgold, et al., 1974; Rasinski, 1985; Wolff & Levin, 1972) have endorsed this theory. The findings of these studies indicate that children below eight or nine years are unable to construct useful images without help, while children between the ages of five and eight develop imagery but are unable to use it with a variety of materials until approximately age eleven.

Pressley (1976) found that imagery is better at some age levels than at others. Eight-year-old subjects practiced constructing mental images of progressively longer prose passages (sentences, paragraphs, short stories) and the experimenter showed the subjects imposed images (illustrations). Control subjects read the same story segments and received instructions to do whatever they felt necessary to remember the story. Pressley found that the experimental subjects answered significantly more short-answer questions about the story than controls did. Gambrell (1981) found similar results for third graders, but found no significant differences in experimental and control groups of first graders.

An alternative developmental view theorizes that initial use of imagery decreases as prior knowledge increases (Kosslyn, 1980, 1981). Kosslyn's theory does not discount the use of imagery as a cognitive form of representation nor its importance in cognitive development, but hypothesizes that younger children rely

predominantly on imagery to access information in memory. With age and experience, they become increasingly dependent on abstract, verbal representation (Akin, 1989; Kosslyn & Bower, 1974; Kosslyn, Roth, & Mordkowitz, 1986). Kosslyn (1983) suggests people may use imagery to answer unfamiliar questions, or when they have insufficient or poorly encoded information. Imagery is a tool used when retrieval of information is either too difficult or when few attributes have been encoded implicitly. However, this theory hypothesizes that with increasing age (around age 10), more abstract verbal representations are possible, and there is a decreased need for imagery (Kosslyn & Bower, 1974). Both theories agree there are individual differences between imagery use in mediating learning. These differences may also contribute to the disparity in research findings.

Imagery and Learning

The generation of an image is an active process in which the learner organizes new information into relationships and draws inferences. Imagery is a way "to represent connections between what they know and what they are trying to learn, or to create some kind of structure, organization, or set of relationships with the material they are trying to learn..." (Weinstein in Barker, 1987, p. 76). Prior knowledge may be retrieved from memory as mental pictures, words, or an integration of both (Barker, 1987). Long, et al. (1989) suggest several ways the reading process may involve imagery. First, imagery may increase the capacity of working

memory during reading by assimilating information into chunks for storage and later retrieval. The learner may then use imagery to make comparisons or analogies, permitting the synthesis of schematic and textual information. Also, imagery may function as an organizational tool for coding and storing meaning gained from reading. Imagery may also help to increase enjoyment and interest (Long, 1986).

A reader comprehends and constructs knowledge when he or she incorporates new information into a familiar frameworks, or revises existing conceptual frameworks to accommodate new information which is incompatible with preconceptions (Wittrock, 1986). Images may facilitate reading comprehension by providing an interactive means to associate new ideas and words presented in passages with personal experiences. "Students who can transform text book information into personally meaningful and conceptually rich visual imagery have a distinct advantage in mastering and comprehending many kinds of information" (Barker, 1987, p. 110). This is not a new idea, for as early as 1915, Carey proposed that learning requires the synthesis of present perception with images of previous experiences.

Types of Imagery

Since the pioneering work of Paivio's (1965, 1969) word pair associate studies, investigations have progressed from the study of imagery's effect on learning word-pairs to the learning of phrases

(Begg, 1972), sentences (Anderson & Hidde, 1971; Richardson, 1980), and longer connected discourse (Anderson & Kulhavy, 1972; Barker, 1987; Long, et al., 1989; Sadoski, 1983). Although imagery has been classified in a myriad of ways, for the purpose of this review, three basic types of visual imagery are identified: induced, imposed, and spontaneous. Levin (1976) defines imposed imagery as those illustrations or external images presented to the learner. Spontaneous imagery are those mental images which occurs naturally without explicit prompting or specific instruction. Mental pictures that the learner is instructed to generate and use are categorized as induced imagery (Levin, 1976). The next section of this chapter examines these three types of imagery and reviews particular studies relating each to comprehension of connected discourse.

Imposed Imagery

Illustrations that accompany written language are imposed images. A large body of research on imposed imagery's impact on reading achievement has been conducted. As this study deals primarily with induced and spontaneous imagery, this chapter does not include a lengthy review of imposed imagery. However, a brief review of research relating imposed and induced imagery is provided.

Guttman, Levin, and Pressley (1977) predicted that younger children would benefit more from illustrations than from induced imagery, and that older children would benefit from both. In the

first of a series of experiments, kindergartners, second graders, and third graders were assigned to one of four treatments: complete pictures, partial pictures, imagery instructions, or control. Their findings affirmed the prediction. Kindergarten subjects' comprehension was only facilitated by complete pictures. With the second graders, subjects in the complete picture group performed significantly better, with partial and imagery having some effect. Third grade control subjects scored lower than those in all three picture variation groups. The authors concluded that there are developmental differences in the ability to use an induced imagery strategy.

Imposed imagery used with induced imagery also facilitated the comprehension of fourth-grade students (Jawitz, 1989). One hundred twenty subjects were divided into four groups: (a) induced imagery with illustrations, (b) imagery training without illustrations, (c) general recall with illustrations, or (d) general recall without illustrations. Those students receiving both induced and imposed imagery recalled significantly more explicit and implicit information than subjects in the other groups.
Jawitz concluded that imposed imagery may be an effective way for young students lacking prior knowledge to compensate, and that this compensation may be a separate strategy from the use of induced imagery.

However, imposed imagery may not be as helpful for adults. In a study of college students, imposed images facilitated comprehension more than simply reading the text, but induced images produced better results than using illustrations (Rasco,

Tennyson & Boutwell, 1975). These studies support Piaget and Inhelder's theory of the developmental nature of imagery.

Spontaneous Imagery

Spontaneous imagery occurs naturally without explicit prompting or specific instruction. In a series of studies, Sadoski (1983, 1984, 1985, Sadoski, et al., 1990) has studied the effects of spontaneous untrained imagery on reading comprehension. He has found that subjects of various ages report imagery without hesitation or confusion, and that they give the impression that images were psychologically real to them. In his 1983 study, fifth grade subjects usually reported original story images with same degree of vividness as images related to illustrations. Further, they seldom made distinctions between their own and illustrations. Third and fourth grade subjects who reported images outscored those who did not report images on measures of story retelling or climax recall (Sadoski, 1984, 1985). Undergraduates reporting imagery also scored better on delayed recall (Sadoski, et al., 1990).

Long, et al., (1989) explored the interactions of reader characteristics and text characteristics on readers' spontaneous production of mental imagery, both during and after reading. Twenty-six fifth-grade students read both narrative and expository texts orally, stopping at designated points to think about and report what strategies they were using. Subjects answered questions about their mental imagery and interests and completed a ten item multiple choice test. All subjects reported spontaneous imagery during and after reading all four texts, but those reports differed in

relation to text genre and to text features. Long, et al., concluded that mental imagery is more complexly connected to reading comprehension than previously believed.

Winzenz (1988) also examined the role of spontaneous mental imagery in facilitating college students' understanding of lengthy narrative prose. All subjects (n = 40) reported experiencing mental imagery, although they received no instructions to generate images about the reading material. Winzenz found that good comprehenders use their images to reason inferentially, draw conclusions, and make appropriate judgments. Good comprehenders reported more images, particularly abstract, inferential, and objective images than did poor comprehenders, who tended to report concrete, literal, and subjective images. These findings led Winzenz to conclude that the quality of mental images and the use of images contribute to the understanding of written and spoken words.

Induced Imagery

Induced imagery differs from spontaneous imagery only in the stimulus which triggers the image and in the use of the image once generated. These images can be induced by written or spoken instructions to generate such images, or by systematic training in the use of such images to improve comprehension. The advantage of induced mental imagery over imposed imagery (illustrations) is that these images may be idiosyncratic, personal, and bizarre (Alesandri, 1982). Induced imagery studies can be divided into three categories: (a) those simply that request subjects to visualize, (b) those that require subjects to draw their images, and (c) those that explicitly

train subjects in using their own mental images as a strategy. A review of specific studies in each of these three categories follows. Each study includes other variables of interest to reading researchers, such as text characteristics, length of training, subjects' individual differences, and task requirements. Most of the studies reviewed here reported ameliorable effects for imagery use. As discussed in Chapter One, however, not all studies investigating the relationship between imagery and comprehension have found positive effects.

Simple Instructions. Simple instruction studies ask subjects to generate images during or after reading. In one example, college students, asked to form images while reading a 2300 word narrative story, answered significantly more concrete-explicit, contradictory, and spatial questions than did a control group asked merely to read carefully (Giesen & Peeck, 1984). Although these subjects also answered more inference questions than did controls, the difference was not significant.

Steingart and Glock (1979) conducted two experiments to explore the effects of imagery and text organization on learning. Subjects read three different concrete narrative passages, each containing a different form of sentence organization. Half of the subjects were asked to visualize the passage information. The others were told to repeat the passage to themselves. Comprehension was assessed by multiple choice questions (experiment one), and by written recall (experiment two). The researchers found imagery was more beneficial than repetition

regardless of text organization. Imagery also resulted in a significantly higher level of inferencing.

Gambrell and Bales (1987a) investigated the effects of mental imagery upon the comprehension-monitoring performance of fourth and fifth grade poor readers. Subjects silently read two passages, one containing an explicit inconsistency and one containing an implicit inconsistency. They then answered questions to determine if they were aware of the inconsistencies in the text. Subjects told to use imagery while reading identified both explicit and implicit text inconsistencies significantly more often than did control subjects. This finding substantiates the idea of imagery as a viable metacognitive strategy and suggests that mental imagery may assist poor readers in identifying and possibly resolving comprehension difficulties.

Gambrell, Koskinen, and Cole (1980) investigated the effects of induced mental imagery upon the comprehension of both oral and written discourse for above and below average readers. Sixty-three sixth graders met individually with the experimenter for twenty-five minutes. Subjects received instructions to "make pictures in your head" (p. 5) while they read or listened to two expository passages. Both passages were written at the third grade level. Subjects were assigned to one of two treatment conditions, read-listen, or listen-read. Immediately afterward, the experimenters interviewed subjects to assess whether they were able to induce images when instructed to do so. More below average readers reported an inability to generate images than above average readers. On literal recall and paraphrase questions for each passage,

instructions to induce mental imagery was equally effective for both listening and reading conditions. Other simple instruction studies include Anderson and Kulhavy (1972), Gambrell and Bales (1987b), Jawitz (1989), Kosslyn (1976), and Kulhavy and Swenson (1975).

Drawing Requests. Some researchers require subjects draw their images. It is believed that these drawings not only serve to encourage the formation of vivid images (Irvin, 1991), but also serve as evidence that subjects are producing images (Bartlett, 1920; Tirre, Manelis & Leicht, 1979).

Third and fourth grade inner-city multiracial students participated in a study conducted by Lesgold, et al. (1975). Subjects in a cartoon-training group read short passages, and then drew original illustrations for eleven sessions. In the twelfth session, subjects were simply instructed to image. Control subjects read the same passages, and answered multiple choice questions about the passages throughout all twelve sessions. On a delayed recall tests, experimental subjects scored significantly higher than their control counterparts, but only when prompted to use their images. On a standardized norm referenced test, no significant differences between experimental and control groups were found. In a second experiment, experimental subjects significantly outscored control subjects on measures of delayed recall, but again only when prompted to recall their images. The investigators concluded that improved performance was jointly dependent on training and on prompting students to use imagery at the time of reading and

testing.

Linden and Wittrock (1981) taught experimental subjects to draw stick drawings to illustrate the main theme of a story. Fifty-eight fifth grade students were placed in one of four treatments: (a) imaginal to verbal generations, (b) verbal to imaginal generations, (c) no instruction to generate, and (d) classroom teacher taught control group. Directions for the imaginal to verbal group gradually shifted from drawing images to only forming mental images, and verbalizing metaphors and analogies about the story. Reversed procedures were used for the verbal to imaginal group, who drew pictures on the last day of treatment. Two measures produced by the experimenter, a multiple choice test and a completion test, evaluated students' comprehension. Subjects in the imaginal to verbal and the verbal to imaginal groups scored as much as 50 percent higher than did the control groups.

Strategy Training

Wade, Trathen, and Schraw (1990) define a learning strategy as a study tactic purposefully used to accomplish a particular learning task. A tactic becomes strategy only when students consciously use it. Effective comprehension strategies enable a reader to determine task demands, gather important facts, and monitor his or her own comprehension (Jawitz, 1989). Before a reader can employ an appropriate strategy, he or she must first be aware of the strategy and its use (Brown, Campione, & Day, 1981). A primary value of imagery as a strategy is that since images are

uniquely individual, the strategy, once learned, is available for immediate and independent use.

Hess (1985) stresses that the impact of imagery strategy training is limited by four factors: (a) concreteness or abstractness of passage; (b) whether subjects actually follow directions; (c) whether subjects find strategy worthwhile for learning, and (d) whether retrieval instructions parallel the encoding instructions. Additionally, support and time to master the strategy are necessary for specific training to be effectual.

Length of Training. Length of training may be a variable in previous non-significant results. Tirre, et al. (1979) had adult subjects read textbook passages from several fields, but found no significant effect on prose comprehension after only two days of training. In a six-week induced imagery study (Miccinati, 1982), seventy-five third graders and seventy-five sixth graders received training and practice in imaging, illustrating descriptions of images, and responding to recall tasks. Training, presented by the experimenter, occurred outside the regular classroom. While induced imagery did not significantly effect standardized achievement test scores, both third and sixth grader reading level and performance on criterion referenced post-tests correlated with imagery training tasks.

In one of the longest studies, Weinstein (1982) provided a seven-week imaginal and verbal elaboration strategy training program to seventy-five ninth graders. Small group of three to seven students met with the experimenter in forty-five minute

sessions, once a week for seven weeks. Subjects were told to create series of elaborations or mediation aids to help learn information from both narrative and expository texts. Initially, the experimenter provided directions in the use of imaginal and verbal elaborations they could use to help learn material. Eventually, subjects created their own elaborations or learning aids. One month later, subjects took delayed post-tests. On a standardized reading comprehension test, no significant differences between experimental and control groups or between control and post-test only were found. However, there was a significant difference between experimental and post-test only group. On a measure of free recall, the experimental group performed significantly better than the control group and the post-test only group. These results suggest that training length positively correlates with effectiveness.

Individual Differences. Subjects' individual differences, particularly reading ability, has been a factor in many imagery studies. Favorable findings have led some researchers to conclude that the ability to use imagery is central factor differentiating good from poor readers (Finch, cited in Winzenz, 1988).

Oakhill and Patel's (1991) findings support this conclusion. Fourth grade subjects read nine short stories written by the experimenters. Training and testing were conducted in small groups of four to five students by the experimenters. Immediate comprehension assessment included three types of questions: (a) factual questions of explicit information, (b) inferential questions of implicit information (c) descriptive questions of explicit details.

Oakhill and Patel found poor comprehenders given specific imagery training significantly performed better on all types of questions than a comparable control group. No significant differences among good comprehenders was found. They concluded that induced imagery enables poor comprehenders to integrate information as good comprehenders do. Additional studies (Oakhill, 1982; Oakhill, Yuill, & Parkin, 1986) corroborate these findings.

Learning disabled subjects have been taught to use imagery as a strategy, with significant results. Chan, et al. (1990) investigated the benefits of imposed and induced imagery with reading disabled students. Subjects were randomly assigned to one of three training conditions: visual imagery instructions (VI), visual imagery instructions plus illustrations (VI+P), and rereading (RR). Subjects attended four sessions, with varying procedures. Instructions for the VI and RR groups remained the same during the first three sessions, but the VI+P group received only partial pictures in session three. In the fourth session, subjects received neither pictures nor training. All subjects were told to use their own best means of remembering the story. Chan and her associates found that subjects in VI+P condition demonstrated significantly superior comprehension to those in VI condition, except for session four, where subjects in the VI condition achieved higher mean scores than those in VI+P group. Both VI and VI+P groups out scored the subjects in the read/reread group (RR).

Comprehension difficulties which cannot be attributed to decoding skills often are related to student's failure to participate actively and strategically in reading process (Baker & Brown, 1980).

Some children appear to have an inherent comprehension or memory deficit, but may, in fact, simply fail to activate or organize the background knowledge necessary to comprehend. If so, induced imagery may help poor readers focus their attention and organize information. Levin (1973) hypothesized that by using imagery poor readers could develop the organizational strategies they lack. Levin separated poor readers into two categories: (a) difference poor readers, those whose comprehension problems result from lack of prerequisite decoding skills, and (b) deficit poor readers, those who possess the necessary skills but experience problems because they lack organizational skills. He found that visual imagery was more helpful for difference poor readers than for deficit poor readers. In his study of fourth graders, difference poor readers remembered 26% more with imagery, but deficit poor readers remembered *2% less* with imagery instruction.

Clark, Deshler, Schumaker, Alley, and Warner (1984) presented two learning strategies, visual imagery and self-questioning, to six learning disabled students. Subjects read and created visual images representing the content. Students also formed questions about the passage while they read to maintain interest and to enhance recall. Results, as evidenced by gain scores, indicate that learning disabled students not only can learn strategies, but can apply them to both reading ability level material and grade level material.

Task Requirements. Induced imagery studies do not measure comprehension in the same way. Some experimenters simply require subjects to recall the story (Jawitz, 1989; Lesgold, et al., 1975; Sadoski, 1985), while others ask questions (Chan, et al., 1990; Clark,

et al., 1984; Levin, 1973; Miccinati, 1982; Weinstein, 1982). Few studies have specified the type of questions used to assess comprehension. Notable exceptions include Oakhill and Patel (1991) and Lutz (1980). Lutz investigated the relationship between visual imagery ability and eight specific tasks: reading for information, reading for relationships, reading for interpretation, reading for appreciation, literal comprehension, creative comprehension, general comprehension, and basic reading vocabulary. Lutz found mixed results in training effectiveness.

Conclusion

Successful comprehension of written discourse occurs when readers integrate the information presented in the text with their personal storehouse of prior knowledge. Imagery may provide assistance in the integration of new information. It is important to remember that imagery alone is not sufficient for comprehension to occur (Begg, 1983). However, the evidence clearly shows that imagery may assist or improve the probability that comprehension will occur. If indeed imagery use facilitates comprehension, it is important to investigate specific training protocols that will enable more students to become aware of this intrinsically available strategy. While previous research has been flawed by various confounding factors, enough positive findings exist to justify further research into this field.

CHAPTER III

METHODOLOGY

Introduction

Research indicates the use of imagery as a metacognitive strategy enhances reading comprehension. However, as illustrated in the review of literature, conflicting results on the effectiveness of imagery strategy training have been reported. These discrepancies in findings may result from a variety of factors, including setting, time, training source, materials, and individual differences. One purpose of this study, therefore, is to investigate the effects of training students to use imagery as a metacognitive strategy within a regular classroom setting, utilizing state adopted texts, with training provided by a regular classroom teacher. By eliminating possible confounding factors, this study can provide pertinent data on the practical use of imagery training for a middle school population. Furthermore, this study examines the effects the imagery strategy use as revealed by students' self-reports.

Subjects

Ninety-five seventh grade students enrolled in four regular language arts classes participated in this study. These students attended a large inner-city midwestern middle school. Forty-one

percent of the subjects were males, and fifty-nine percent were females. Blacks made up sixty-seven percent of the sample, and whites constituted thirty-three percent. Due to excessive absences resulting in numerous missed tests, ten students were eliminated from the sample, leaving a total of eighty-five subjects. In addition, unequal numbers reported in Chapter IV are also a result of missing data due to absences.

Instruments and Materials

Subjects took standardized norm referenced achievement tests before and after the study. Students took the *Iowa Test of Basic Skills,* Form G *(ITBS, G)* (1985) four months before the study. The *ITBS, G* has a reliability coefficient of .902. Subjects took the *Iowa Test of Basic Skills,* Form H *(ITBS, H)* at the end of the study. The reliability coefficient for Form H is .942. Equivalent forms reliability analysis for Forms G and H equals .83. Scores on the reading portions of both tests were used in the analysis.

The shortened form of the *Questionnaire of Mental Imagery* (*QMI*) (Sheehan, 1967) was administered to determine whether all subjects were aware of their own spontaneous imagery (see Appendix B). This thirty-five item group administered questionnaire assess seven basic sensory modalities for imagery vividness. Subjects responded to a seven point scale ranging from no image to a clear vivid image. The *QMI* has a split-half reliability between .95 and .99 (Juhasz, 1972), and a test-retest reliability of .91 (Evans & Kamemoto, 1973). Self-reports, which include questionnaires, are

the most commonly used measures to assess imagery use (Tower, 1981).

Students read four narrative passages from their literature books, *Prentice Hall Literature - Bronze* (1991). Readabilities performed on all selections read during the study were determined by computer analysis using *RightWriter®, Macintosh Version 3.20* (Rosenblum, Gansler, Frank, & Houle, 1992). Readability information is presented in Table I.

TABLE I

READABILITIES OF SHORT STORIES

Title	Flesch-Kincaid Readability Index
Caleb's Brother by James Baldwin	6.20
Stolen Day by Sherwood Anderson	3.31
Zoo by Edward Hoch	6.37
Last Cover by Paul Annixter	5.35

All subjects took criterion-referenced tests provided by the publishing company on each narrative selection. Each test item was coded by the experimenter and teacher as one of the six comprehension tasks under investigation in this study. Items that did not fit into a specified task category were excluded from

analysis. In addition to questions on the story, each criterion referenced tests also included a question regarding strategy use. Students responded to a multiple choice question by identifying which strategy they had used to help them understand or remember the story. Answer choices included rereading, listening carefully to class discussion, using imagery, taking notes, or other.

Procedures

This study examined the effects of imagery training in a regular classroom setting, using state-adopted texts, with training provided by a regular classroom teacher. Further, it investigated the effect of strategy use identified by self-reports on reading comprehension. Four intact language arts classes participated in the study. Parents were informed of the classes' participation in the study, and asked to sign a refusal slip if they did not wish their child's scores to be included in the analysis. One refusal slip was returned. Norm referenced scores on the reading portion of the *ITBS, G* were analyzed to determine if classes, as measured by standardized test scores, differed significantly prior to treatment. *QMI* results were analyzed to determine whether all subjects self-reported imagery as a personal cognitive process.

Although no significant difference on the *ITBS, G* were found (see page 38), students' ability cannot be determined by one test score alone. For the purposes of analysis and assignment to treatment, the classroom teacher identified high and low ability classes. This determination was based upon teacher expertise, class

averages on previous criterion referenced tests, and first semester grades. Of the four classes participating in the study, two were designated high ability and two were identified as low ability. One high ability group and one low ability group were randomly selected as the experimental classes. The other two groups served as the control classes.

The experimenter met with the classroom teacher for two one-hour sessions before the study began. These sessions provided the teacher with specific instructions for training experimental classes in using imagery as a metacognitive strategy. The training procedure (see Appendix A), adapted from Alley and Deshler (1979) and Clark, et al. (1984), included the following steps: (a) testing current level of functioning, (b) describing steps of the strategy, (c) providing a rationale for each step, (d) modeling the strategy, (e) verbally rehearsing steps, (f) providing practice with controlled material, (g) providing positive and/or corrective feedback, (h) encouraging independent practice and retrospection, and (i) post-testing (at grade level).

The classroom teacher administered the *QMI* to both experimental and control classes. During the first week of the study, the teacher provided imagery strategy instruction to the two experimental classes. Throughout the remaining five weeks, experimental students received daily reminders to use imagery to enhancing comprehension. Students were encouraged to draw pictures to record their images.

Once a week experimental classes discussed whether imagery was helpful in remembering what they had read. Control subjects

read and discussed the same stories, but did not receive training nor discuss imagery use. All students took the same criterion referenced tests which included all six specified comprehension tasks. The classroom teacher did not introduce other strategies during the experiment.

Design and Data Analysis

Preliminary Data

The experimenter analyzed pre-test data from the reading portion of the *ITBS, G* to determine whether classes were significantly different before treatment. Class (experimental and control) served as the independent variable, and subjects' reading scores were the dependent variable for a one-way analysis of variance (ANOVA). The results of this and other preliminary analyses are reported in Chapter IV.

QMI scores were averaged by subject and by class. A one-way analysis of variance (ANOVA) was conducted to determine whether significant differences existed between classes with regard to imagery awareness. Because spontaneous imagery does not ensure that subjects utilize imagery as a metacognitive strategy, significant differences in comprehension between classes can be more readily attributed to *training* if all subjects indicated awareness of imagery prior to treatment.

Hypothesis One

To investigate imagery training effects on comprehension as measured by criterion-referenced tests, a 2 class (experimental and control) x 2 abilities (high and low) x 6 scores on comprehension tasks (main idea, inference, sequence, detail, cause/effect, and vocabulary) design was employed. A multivariate analysis of variance (MANOVA) was performed to analyze training effects on the six comprehension tasks. Class and ability served as the independent variables. Students' scores on the six comprehension tasks were dependent variables.

Hypothesis Two

To measure the effects of training on norm referenced reading test scores, a 2 class (experimental and control) by 2 ability (high and low) design was used. In a two-way analysis of variance (ANOVA), independent variables were class and ability. *ITBS, H* reading scores served as the dependent variable.

Hypothesis Three

Students were asked to respond to a strategy usage multiple-choice question on the criterion referenced tests. Responses were coded "1" for imagery self-report, and "0" for self-report of any other strategy (rereading, listening carefully, taking notes, or other). A multivariate analysis of variance (MANOVA) was utilized to analyze the effects of imagery strategy use on the six

comprehension tasks. Strategy self-report served as the independent variable, and criterion referenced scores served as the dependent variables. To further compare the relationship between strategy report and each specific comprehension task, individual t-tests were conducted.

Summary

Preliminary analyses were conducted to ensure homogeneity of classes prior to treatment. A multivariate analysis of variance (MANOVA) was used to investigate Hypothesis One. Class and ability served as the independent variables. Scores on the six comprehension tasks as measured by four criterion referenced tests served as the dependent variables. Scores on the *ITBS, H* served as the dependent variable in the two-way ANOVA used to investigate Hypothesis Two. A MANOVA was computed to determine strategy use effect on students' comprehension. Strategy self-report served as the independent variable. Scores on the six comprehension tasks served as the dependent variables. Individual t-tests were used to examine the effect of strategy use on each specific task. Results of all analyses are reported in Chapter IV.

CHAPTER IV

ANALYSES OF DATA

Introduction

This study investigated the effectiveness of training seventh grade middle school students within the regular classroom to use imagery as a metacognitive strategy to enhance comprehension of narrative texts. Further, the study analyzed the effect of self-reported strategy use on reading comprehension. All statistical calculations and analyses were performed using *Systat 5* © (Wilkinson, Mullin, Bjerknes, & McHale, 1990), a computer program. This chapter presents analysis of preliminary data and results of analysis to examine each null hypothesis. Three null hypotheses were tested:

1. Imagery training will have no effect on subjects' scores of six specific comprehension tasks as measured by criterion referenced tests.
2. Imagery training will have no effect on subjects' comprehension as assessed by the reading comprehension portion of a norm referenced test.
3. Imagery strategy use will have no effect on subjects' scores on six specific comprehension tasks as measured by criterion referenced tests.

Treatment of the Data

ITBS, G Analysis

Reading scores from the *ITBS, G* were analyzed to ensure no significant differences existed between the four classes as measured by a standardized test prior to treatment. Group percentile means and standard deviations are presented in Table II. A one-way ANOVA was calculated. Students' scores were the dependent variable, and individual class (group) was the independent variable. As illustrated in Table III, the analysis revealed no significant differences, $F(3, 69) = 0.53$, $p > .05$.

TABLE II

MEANS AND STANDARD DEVIATIONS FOR *ITBS, G*

Group	N*	Mean	Standard Deviation
1	15	37.00	19.34
2	15	27.60	20.46
3	22	31.18	22.33
4	21	33.62	22.03

* N = 73. *ITBS, G* scores not available for all subjects.

TABLE III

SUMMARY OF RESULTS OF ANALYSIS OF VARIANCE

Source	Sum of Squares	DF	Mean Square	F	Probability
Between	726.61	3	242.20	0.53	NS
Within	31269.83	69	453.19		
Total	31996.44	72	444.39		

QMI Analysis

Students ranked from one to seven the thirty-five items on the *QMI*. A rating of one indicated the ability to form a clear and vivid image of the item, while a rating of seven meant no image of the item was formed. Group means and standard deviations are presented in Table IV. Group means ranged from 2.6 (as vivid as the actual experience) to 3.45 (moderately clear and vivid images). As indicated in Table V, a one-way ANOVA revealed $F(3, 69)= 1.06$, $p > .05$, indicating no significant difference between groups.

TABLE IV

MEANS AND STANDARD DEVIATIONS FOR *QMI*

Group	N	Mean	Standard Deviation
1	17	3.45	1.73
2	18	2.69	1.49
3	18	2.97	1.43
4	20	2.60	1.61

* N = 73. QMI scores not available for all subjects.

TABLE V

SUMMARY OF RESULTS OF ANALYSIS OF VARIANCE, *QMI*

Source	Sum of Squares	DF	Mean Square	F	Probability
Between	7.77	3	2.59	1.06	NS
Within	169.06	69	2.45		
Total	176.83	72	2.46		

Hypotheses

Hypothesis One. Criterion referenced test items were identified as fitting one of six specific comprehension task categories: main idea, sequence, vocabulary, detail, inference, or cause and effect. Group means, standard deviations, and grand means for each of the six categories were computed, and are presented in Table VII (see page 41).

To investigate the effects of training on the six comprehension tasks, a 2 (ability) x 2 (class) x 6 (task) design was used. A multivariate analysis of variance was performed using the SYSTAT (Wilkinson, et al., 1992) computer program which automatically adjusted group means for any missing data. Findings are presented in Table VI. The MANOVA showed a significant main effect for ability, with $F(1, 81) = 22.71$, $p < .01$. No significant effect was found for class (experimental and control), $F(1, 81) = .18$, $p > .05$. There was no significant interaction for class x ability, $F(1, 81) = 0.08$, $p > .05$. The null hypothesis was not rejected.

TABLE VI

SUMMARY OF RESULTS OF MULTIVARIATE ANALYSIS OF VARIANCE

Effect	Sum of Squares	DF	Mean Square	F	Probability
Ability	21739.33	1	21739.33	22.71	0.01
	77550.55	81	957.41		
Class	176.65	1	176.65	0.18	NS
	77550.55	81	957.41		
Ability x Class	80.65	1	80.65	0.08	NS
	77550.55	81	957.41		

TABLE VII

MEANS AND STANDARD DEVIATIONS FOR TASK SCORES

Group	Class/ Ability*		Main Idea	Sequence	Vocabulary	Detail	Inference	Cause/Effect
1	E	$\bar{X}$	70.52	57.10	43.67	78.19	78.90	73.43
n = 21	H	SD	19.65	33.26	21.73	13.56	14.30	20.52
2	E	$\bar{X}$	54.22	47.17	38.89	66.00	65.06	58.50
n = 18	L	SD	27.24	22.51	21.39	16.38	19.62	26.69
3	C	$\bar{X}$	68.17	54.17	56.25	77.38	82.17	77.58
n = 24	H	SD	20.21	28.90	18.43	14.92	13.96	18.60
4	C	$\bar{X}$	53.82	39.41	43.55	72.64	64.91	57.82
n = 22	L	SD	21.57	33.25	24.40	17.70	13.30	27.06
N = 85		$\bar{X}\bar{X}$	62.60	49.59	46.22	74.01	73.35	67.69

* E = experimental; C = control; H = high ability; L= low

Hypothesis Two. Scores on the reading portion of the *ITBS, H* were used to analyze the effect of imagery training on reading comprehension as measured by a norm referenced test. Group means and standard deviations are presented in Table VIII.

A two-way ANOVA was conducted to determine whether training, ability, or an interaction of the two had a significant effect on a standardized norm referenced test. Class (experimental and control) and ability (high and low) served as the independent variables, and scores on the *ITBS, H* were the dependent variable. Findings are shown in Table IX.

TABLE VIII

MEANS AND STANDARD DEVIATION FOR *ITBS, H*

Group	N*	Class	Mean	Standard Deviation
1	19	EH	49.05	25.31
2	16	EL	34.00	22.72
3	23	CH	44.96	22.66
4	22	CL	41.95	14.46

* *ITBS, H* scores not available for all subjects.

TABLE IX

SUMMARY OF RESULTS OF ANALYSIS OF VARIANCE, *ITBS, H*

Source	Sum of Squares	DF	Mean Square	F	Probability
Ability	1597.38	1	1597.38	3.47	NS
Class	72.96	1	72.96	0.16	NS
Ability x Class	711.63	1	711.63	1.55	NS
Within	34954.86	76	459.93		
Total	37336.83	79			

The ANOVA revealed no main effect for ability, $F(1, 76) = 3.47$, $p > .05$. Furthermore, neither the effect for class, $F(1,76) = 0.16$, $p > .05$, nor for ability x class interaction, $F(1, 76) = 1.55$, $p > .05$, were found to be significant. The null hypothesis was confirmed.

Hypothesis Three. Subjects answered a multiple choice question as part of the criterion referenced measures concerning the strategy they employed while reading the four short stories. Self-reports were tabulated and coded. Group means and standard deviations are shown in Table X.

TABLE X

MEANS AND STANDARD DEVIATIONS FOR SELF-REPORTS

Task	Strategy*	N	Mean	SD
Main Idea	0	60	57.13	23.75
	1	25	73.96	16.09
Sequence	0	60	43.28	29.08
	1	25	64.72	28.29
Vocabulary	0	60	44.58	23.27
	1	25	50.00	19.09
Detail	0	60	72.47	16.96
	1	25	77.48	13.49
Inference	0	60	70.62	17.52
	1	25	79.64	13.87
Cause/Effect	0	60	64.82	25.36
	1	25	75.28	21.66

*0 = self report of some other strategy
1 = self report of imagery strategy

In the experimental classes, 47% percent of the high ability readers and 27% of the low ability readers reported using imagery as a strategy. Control subjects also reported the use of imagery; 25% of the high ability readers and 18% of the low ability readers reported using imagery to assist them with recalling information from the stories. To analyze the effect of strategy use on comprehension, a multivariate analysis of variance (MANOVA) was conducted. Self-reported strategy use was the independent variable, and scores on the six tasks were the dependent variables. Analysis showed the effect of strategy to be highly significant, $F(1, 83) = 13.16$, $p < .01$, as shown in Table XI.

TABLE XI

SUMMARY OF RESULTS OF MULTIVARIATE ANALYSIS OF VARIANCE

Source	Sum of Squares	DF	Mean Square	F	Probability
Between	13672.10	1	13672.10	13.16	0.01
Within	86209.54	83	1038.67		
Total	99881.64	84	1189.07		

As illustrated in Figure 1 (see page 45), students who reported using imagery as a strategy scored higher on all six tasks than those who reported using another strategy. To determine which of the tasks were most facilitated by imagery strategy use, individual t-tests were conducted for each of the tasks. Results indicate that imagery strategy improves students' ability to identify main idea ($t = 3.24$, $p < .01$), recognize sequence ($t = 3.12$, $p < .01$), and draw inferences($t = 2.29$, $p < .05$). Other t-tests revealed non-significant

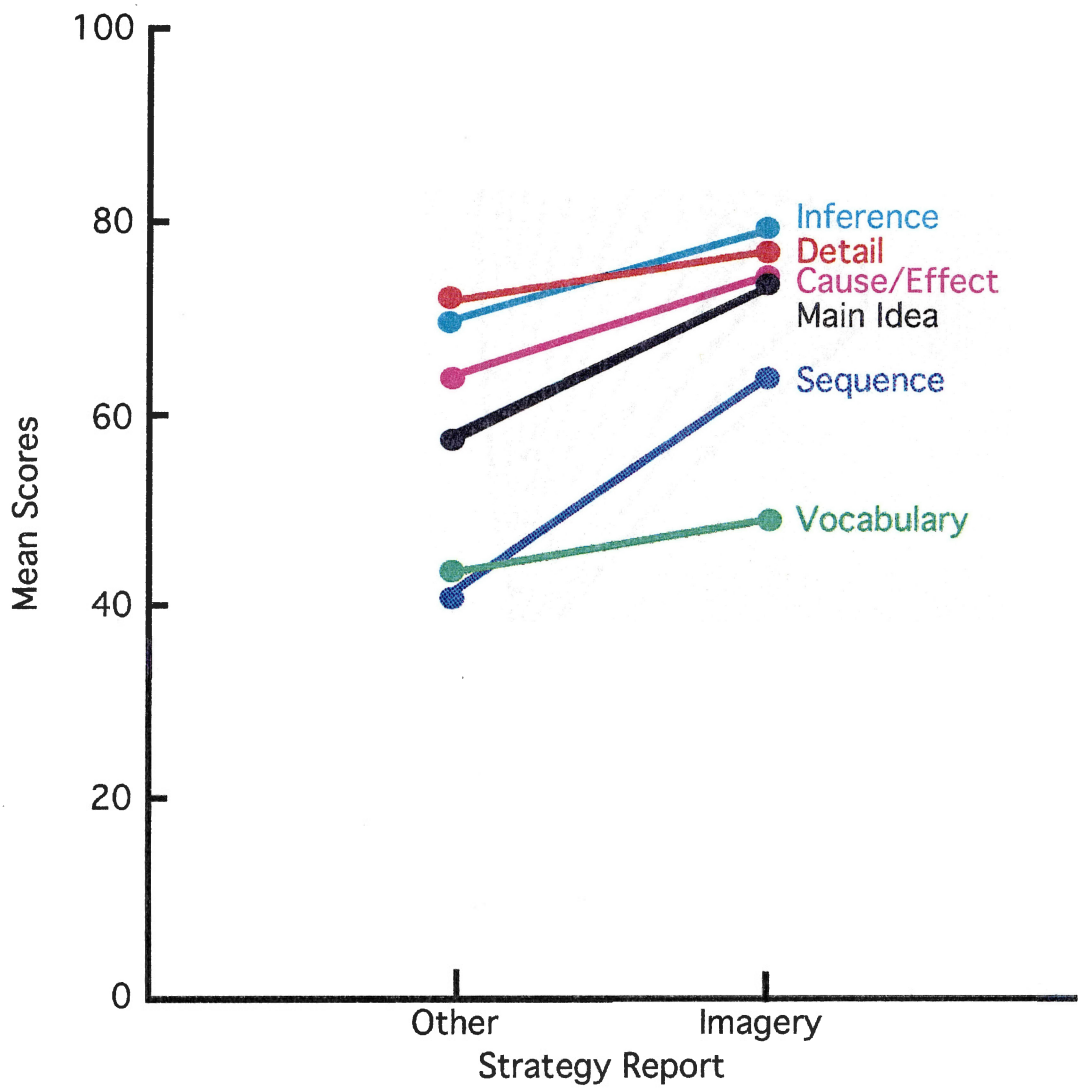

Figure 1. Strategy effect on six comprehension tasks.

differences for students' scores on recalling explicit details ($t = 1.31$, $p > .05$), identifying new vocabulary ($t = 1.03$, $p > .05$), and recognizing cause and effect relationships ($t = 1.81$, $p > .05$).

Summary

Analysis of preliminary data indicated all four groups involved in the study were homogeneous with regard to reading scores on a standardized norm referenced test *(ITBS, G)*. Classroom performance differed, however, and based on teacher recommendation, high and low ability groups were identified. Subjects responding to the *QMI* indicated awareness of their own imagery with varying degrees of vividness.

The first null hypothesis was confirmed. Ability proved to be the only main effect on criterion referenced scores of the six comprehension tasks under investigation. A multivariate analysis of variance revealed no significant effects for treatment (class) or for an interaction between treatment and ability on students' performance on the six comprehension tasks. The second null hypothesis was not rejected. A two-way analysis of variance of norm referenced scores revealed no significant differences between students' scores based on class or ability.

Imagery strategy use, as evidenced by subjects' self-reports, significantly affected comprehension scores on criterion referenced tests. Therefore, the third null hypothesis was rejected. Furthermore, imagery use significantly enhanced subjects' scores on main idea, sequence, and inference questions.

CHAPTER V

CONCLUSION

Introduction

The usefulness of educational research can only be measured by the practicability of treatments and the applicability of findings in classroom settings. While it is possible to generate remarkable and highly significant findings under experimental conditions, it is important to know whether similar findings can be found under normal circumstances. Classroom conditions include the use of the classroom teacher as the source of instruction, the reading of texts that are regularly read in that class, and the use of measures of comprehension that are normally used to measure student performance. This study attempted to take the investigation of imagery training and reading comprehension out of the laboratory setting, and place it in the natural middle school setting. Doing so was an attempt to control for the variety of factors that this researcher and others (Alvermann & Moore, 1991) feel have confounded previous studies and resulted in conflicting results.

The study attempted to discern the effectiveness of training seventh grade students to use imagery as a metacognitive strategy to enhance their comprehension. Further, the study examined the relationship between students' scores on the six comprehension

tasks and self-reported imagery strategy use to identify those tasks most facilitated by imagery strategy use.

Interpretation of Results

This study addressed three null hypotheses. The first hypothesis stated that imagery training would have no effect on reading comprehension as measured by students' scores on six specific comprehension tasks. A 2 class (experimental and control) x 2 reading ability (high and low) x 6 task (main idea, inference, sequence, detail, cause and effect, and vocabulary) design was employed to test this hypothesis. The null hypothesis was confirmed, as no significant differences between experimental and control groups of either high or low ability readers were found. As reported in the previous chapter, the main effect for each of the six tasks was ability, with high ability readers scoring significantly better than low ability readers. No significant effect for training was found, and no significant interaction between independent variables was evident.

The effect for ability is noteworthy, for students' performance in the four classes was not significantly different on a norm referenced pretest. However, the classes were identified as high and low ability readers by the classroom teacher, based on her expertise and knowledge of the students involved. Students thus identified as high ability readers significantly outperformed those identified as low ability readers, in both experimental and control groups, confirming the teacher's identification.

No main effect was found for training. Although scores were not statistically different, small differences on each of the six tasks were found. Mean scores on each task are illustrated in Figure 4 (see page 50). When comparing high experimental to high control students, experimental students scored slightly better on main idea, and sequence. Experimental low students also outscored their control counterpart on main idea and sequence, as well as inference, and cause and effect questions.

These differences correspond with previous findings. Johnson (in Winzenz, 1988) and Bell (1991) both found imagery to facilitate the recall of main ideas. The sequence finding is particularly interesting. While other studies (Chan, et al., 1990; Oakhill & Patel, 1991; Ryan, et al., 1987) included sequential drawings (imposed imagery) presented to readers, none of the studies reviewed by this researcher investigated the effect of imagery training on students' ability to recall sequence of events.

The differences seen between the low ability readers are of particular interest. Identification of main idea, recognition of sequence, inferencing implicit information, and recognition of cause and effect relationships are four higher level comprehension skills. Although the experimental class's scores were not significantly higher, these small differences indicate that imagery appears to help with tasks requiring higher level thinking, to a small degree.

The second null hypothesis was confirmed as well. A 2 class (experimental and control) x 2 ability (high and low) design was used to determine if treatment had any effect on norm referenced test

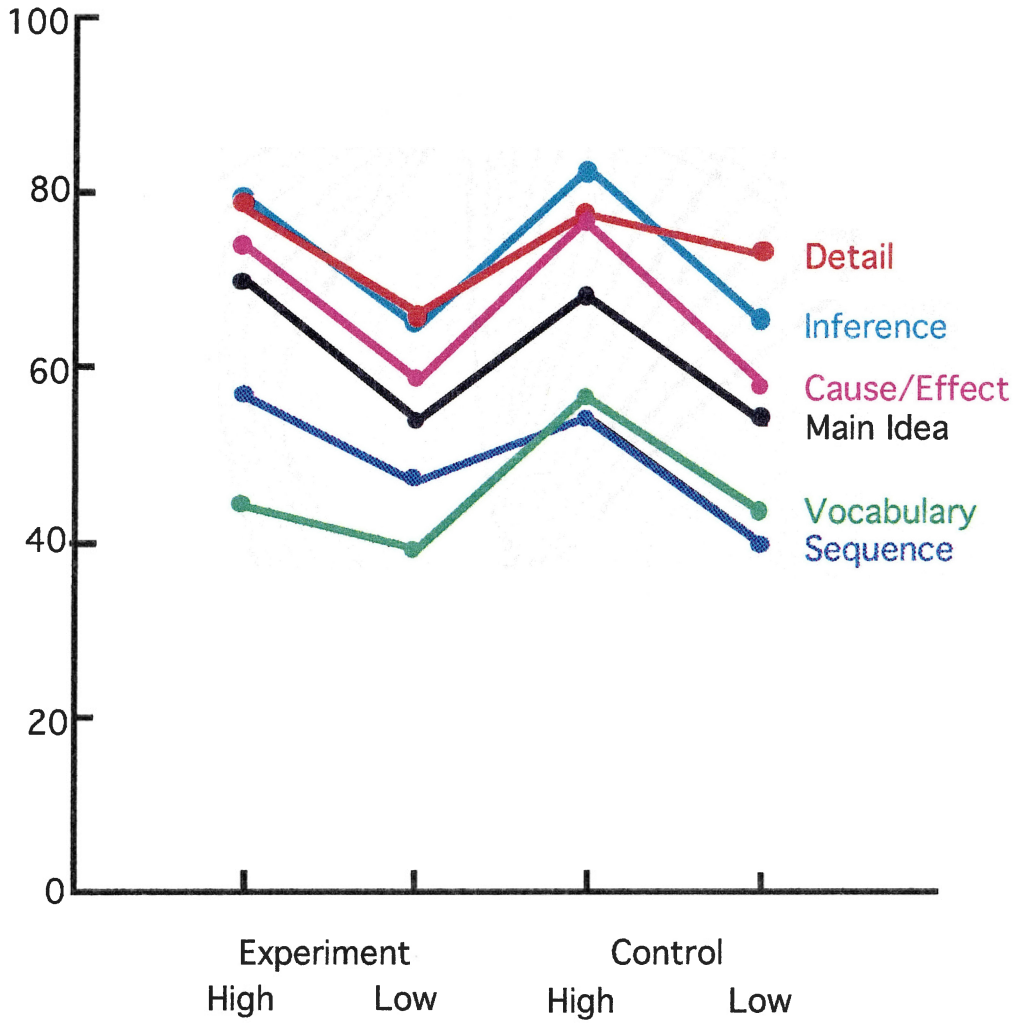

Figure 2. Mean scores on six tasks by individual classes

scores of reading comprehension. Imagery training appeared to have no effect on the reading portion of the *Iowa Test of Basic Skills, Form H.* These findings confirm previous outcomes as well. Many researchers (Cramer, 1980; Lesgold, et al., 1975; Long, 1986; Lutz, 1980; Miccinati, 1982) have found imagery training has no effect on norm referenced measures of reading comprehension.

Researchers (Barker, 1987; Levin, 1973; Pressley, 1977) speculate that low ability readers benefit most from imagery training. This study does not support this hypothesis. However, the findings of this study do corroborate results found in other training studies. For example, Miccinati (1982) found that training produced no significant difference between good and poor readers. Other studies (Lesgold, et al., 1975; Weinstein, 1982) did find differences on immediate free recall, but not on delayed multiple choice post-tests. Pressley (1976) also found no interaction between ability and treatment, although, as with this study, small differences between experimental and control groups were found.

The first two null hypotheses of this study dealt specifically with training students to use imagery as a strategy to enhance comprehension. While the results of this study indicate that specific training appears to have no effect, other data confirm that imagery plays an important role in comprehension. This study also attempted to determine what types of comprehension tasks are most facilitated by the use of imagery. Important data were revealed while investigating the third hypothesis. This null hypothesis was rejected, as imagery strategy use did affect students' scores on the six comprehension tasks. Both experimental and control subjects

identified the strategies they employed while reading the four short stories. Thirty percent of all the subjects in the study reported using imagery as a strategy. In the experimental classes, 47 % of the high ability readers and 27% of the low ability readers reported using imagery as a strategy. Additionally, 25% of the high ability readers and 18% of the low ability readers in the control classes also reported using imagery to assist them with recalling information from the stories. Students in this study who reported the use of imagery as a strategy, regardless of ability or treatment, scored significantly higher overall than those who reported the use of some other strategy. These results are important in the field of imagery research, and support previous findings concerning the relationship between imagery strategy use and reading comprehension (Bednar, 1987; Cramer, 1980; Oliver, 1982).

Further analysis of self-report data revealed that imagery strategy use is particularly effective for sequence, main idea, and inference tasks. It is interesting to note that these findings correspond to the small differences found between groups in Hypothesis One, and support this author's theory that imagery facilitates comprehension requiring higher levels of thinking. If these results can be confirmed by subsequent research, finding appropriate training protocols to develop imagery use in those readers who do not employ imagery as a strategy becomes even more important.

Conclusions and Implications for Further Research

When conducting classroom research, the researcher gives up some control over variables which may affect the results of such experimentation. For example, an experimenter who provides training directly to individual subjects can be relatively sure that he or she does so with some uniformity. An experimenter that trains someone else to train subjects, as was done in this study, can never be perfectly sure that such uniformity existed. An experimental situation can be controlled to eliminate interruptions which may interfere with the performance of the subjects. In a regular classroom, such interruptions are frequent: fire drills, assemblies, announcements, absences, student transfers in and out of the experimental class, etc. Therefore, many variables that do not threaten experimental conditions may play a major role in classroom research. These variables may have contributed to the lack of evidence that explicit imagery training is effective.

In addition to the setting variables, student variables must also be taken into consideration. The subjects in this study attended a large inner-city middle school located in a neighborhood that in recent months has been plagued with incidents of violence, drugs, and crime. Many students in these classrooms, according to their classroom teacher, have decided that school has little to offer them, and attend simply because the law requires that they do so. Many expressed a lack of desire to learn, and lack of interest in reading. While these student variables were not a part of this particular

research, interest and attitude have been shown to play a major role in student performance (Irvin, 1991; Moore & Kirby, 1988). Failure to consider these variables also limits the ability to generalize these results.

Several studies (Barker, 1987; Levin, 1973; Pressley, 1977) have found that imagery training benefits low ability readers, but these findings were not supported by this research. In fact, of the low ability experimental students, only 25 percent reported using imagery as a strategy although they received explicit instructions to do so. The training protocol provided in this study was not effective for this particular sample. Further research into training protocols is necessary to find a procedure that is effective for a particular groups of students.

The specific training time used in this study may not have been sufficient to ensure the adoption of a new strategy. The actual training took place over five days (see Appendix A), with sessions lasting approximately 15 to 30 minutes. Training was imbedded in regular instruction, and after the first week, students were simply reminded to make use of the strategy. Future research studies into various training times should be undertaken to investigate the length of training time that produces the most beneficial results.

It has been speculated that periodic questioning reinforces strategy use (Wade & Trathen, 1989). Although no other strategies were introduced during this study, questions about strategy use other than imagery (e.g., rereading, listening carefully, taking notes, or other strategies) may have reinforced the use of those other strategies.

While the null hypotheses concerning training investigated in this study were not rejected, important data concerning the relationship between imagery use as a strategy and reading comprehension were uncovered. It is important that these results be taken under consideration in future imagery studies. It appears that while *training* had little effect, many of the seventh graders involved in this study were already aware of imagery and employed it as a means of enhancing their comprehension. Subjects in this study who reported using imagery as a strategy, regardless of ability or treatment, performed significantly better than subjects reporting the use of some other strategy. In particular, imagery enhanced students' abilities to identify main ideas, recall sequence, and make inferences. Additional research is needed to confirm these findings, and to determine if these results can be generalized to a larger population. Further, student choice of strategies should also be investigated. Since the relationship between self-reports of imagery use and reading comprehension is strongly supported by this study, specific training models need to be tested to find the most effective means of teaching other students how to employ imagery as a strategy.

REFERENCES

Akin, C. E. (1989). The developmental use of imagery. (Doctoral dissertation, University of Georgia, 1989). *Dissertation Abstracts International, 51,* 1017.

Alesandri, K. L. (1982). Imagery eliciting strategy and meaningful learning. *Journal of Mental Imagery, 6*, 125-141.

Alley, G. R. & Deshler, D. D. (1979). *Teaching and learning disabled adolescents: Strategies and methods.* Denver: Love Publishing.

Alvermann, D. E. & Moore, D. W. (1991). Secondary school reading. In R. Barr, M. L. Kamil, P. B. Mosenthal and P. D. Pearson (Eds.), *Handbook of reading research, Vol. II.* (pp. 951-983). New York: Longman.

Anderson, R. C. & Hidde, J. L. (1971). Imagery and sentence learning. *Journal of Educational Psychology, 62*, 526-530.

Anderson, R. C. & Kulhavy, R. W. (1972). Imagery and prose learning. *Journal of Educational Psychology, 63*, 242-243.

Baker, L. & Brown, A. L. (1980). *Metacognitive skills and reading.* (Tech. Rep. No. 188). Urbana-Champaign: University of Illinois.

Barker, J. C. (1987). *Integrating visual and verbal elaboration learning into the elementary school curriculum: A model of basic constructs.* (Doctoral dissertation, University of Nevada,, Reno, 1987). *Dissertation Abstracts International, 48*, 4809A.

Bartlett, F. C. (1920). The function of images. *British Journal of Psychology, 2*, 320-337.

Bednar, M. P. (1987). Reader reported awareness and utilization of comprehension strategies: An examination of reader metacognitive awareness, self-regulatory mechanism, and comprehension. (Doctoral dissertation, Temple University, 1987). *Dissertation Abstracts International, 48,* 885.

Begg, I. (1972). Recall of meaningful phrases. *Journal of Verbal Learning and Verbal Behavior, 11*, 431-439.

Begg, I. (1983). Memory and language. In A. A. Sheikh (Ed.), *Imagery: Current theory, research, and application.* (pp. 288-309). New York: John Wiley and Sons.

Bell, N. (1991). Gestalt imagery: A critical factor in language comprehension. *Annals of Dyslexia, 41*, 246-260.

Blakemore, C. (1990). Understanding images in the brain. In H. Barlow, C. Blakemore, and M. Weston-Smith (Eds.), *Images and understanding.* (pp. 275-287). Cambridge: Cambridge University Press.

Brown, A., Campione, J., & Day, R. (1981). Learning to learn: On training students to learn from text. *Educational Researcher, 10*, 14-21.

Carey, N. (1915). Factors in the mental processes of school children. I. Visual and auditory imagery. *British Journal of Psychology, 7*, 452-490.

Chan, L. K. S., Cole, P. G., & Morris, J. N. (1990). Effects of instruction in the use of a visual-imagery strategy on the reading comprehension competence of disabled and average readers. *Learning Disability Quarterly, 13*, 2-11.

Clark, F. L., Deshler, D. D., Schumaker, J. B., Alley, G. R., & Warner, M. M. (1984). Visual imagery and self-questioning: Strategies to improve comprehension of written material. *Journal of Learning Disabilities, 7*, 145-149.

Cramer, E. H. (1980). Mental imagery, reading attitude, and comprehension. *Reading Improvement, 17*, 135-139.

Daehler, M. W. & Bukato, D. (1985). *Cognitive development.* New York: Alfred A. Knopf.

Duffy, G., Roehler, L. R., Swan, E., Rackliffe, G., Book, C., Meloth, M. S., Vavrus, L. G., Wesselman, R., Putnam, J., & Bassiri, D. (1987). Effects of explaining the reasoning associated with using reading strategies. *Reading Research Quarterly, 22*, 347-368.

Ericsson, K. A. & Simon, H. A. (1981). Source of evidence on cognition: A Historical Overview. In T. V. Merluzzi, C. R. Glass, and M. Genest (Eds.), *Cognitive Assessment.* (pp. 16-51). New York: Guilford Press.

Evans, I. M. & Kamemoto, W. S. (1973). Reliability of the short form of Bett's Questionnaire Upon Mental Imagery: Replication. *Psychological Reports, 33*, 281-282.

Gambrell, L. B. (1981). Induced mental imagery and the text prediction performance of first and third graders. In J. A. Niles and L. A. Harris (Eds.), *New inquiries in reading research and instruction. Thirty-first yearbook of the National Reading Conference* (pp. 131-135). Rochester, NY: National Reading Conference.

Gambrell, L. B. & Bales, R. J. (1987a). Mental imagery and the comprehension monitoring performance of fourth and fifth grade poor readers. *Reading Research Quarterly, 21*, 454-464.

Gambrell, L. & Bales, R. (1987b). Visual imagery: A strategy for enhancing listening, reading, and writing. *Australian Journal of Reading, 10*, 147-153.

Gambrell, L. B., Koskinen, P. S., & Cole, J. N. (1980). *The effects of induced mental imagery upon comprehension: A comparison of written versus oral presentations.* Paper presented at the Annual Meeting of the National Reading Conference. (ERIC Document Reproduction Service No. ED 198503).

Giesen, C. & Peeck, J. (1984). Effects of imagery instruction on reading and retaining a literary text. *Journal of Mental Imagery, 8* , 79-90.

Guttman, J., Levin, J. R., & Pressley, G. M. (1977). Pictures, partial pictures, and young children's oral prose learning. *Journal of Educational Psychology, 69,* 473-480.

Harris, T. L. & Hodges, R. E. (Eds.). (1981). *A Dictionary of Reading.* Newark, DE: International Reading Association.

Hess, R. K. (1985). The relationship of passage imagery, imaging ability, reading strategy instruction, and reading comprehension. (Doctoral dissertation, University of South Carolina, 1985). *Dissertations Abstracts International, 46/10A*, 2981.

Iowa Test of Basic Skills. (1985). Chicago: Riverside Publishing Company.

Irvin, J. (1991). *Teaching Reading Comprehension Processes.* Englewood Cliffs, NJ: Prentice Hall.

Jawitz, P. B. (1989). The effects of mental imagery and text relevant illustrations on fourth grade reading comprehension performance. (Doctoral dissertation, University of Maryland, 1989). *Dissertations Abstracts International, 51*, 1968.

Juhasz, J. B. (1972). On the reliability of two measures of imagery. *Perceptual and Motor Skills, 35*, 874.

Kessel, F. S. (1972). Imagery: A dimension of mind rediscovered. *British Journal of Psychology, 63*, 149-162.

Kosslyn, S. M. (1976). Using imagery to retrieve semantic information: A developmental study. *Child Development, 47*, 434-444.

Kosslyn, S. M. (1980). *Image and mind.* Cambridge: Harvard University Press.

Kosslyn, S. M. (1981). Research on mental imagery: Some goals and directions. *Cognition, 10*, 173-179.

Kosslyn, S. M. (1983). *Ghosts in the Mind's Machine.* New York: W. W. Norton & Co.

Kosslyn, S. M. & Bower, G. H. (1974). The role of imagery in sentence memory: A developmental study. *Child Development, 45*, 30-38.

Kosslyn, S. M., Roth, J. D., & Mordkowitz, E. (1986). Computational theories of imagery generation. In D. F. Marks (Ed.), *Theories of imagery foundations.* (pp. 37-52). New York: Random House.

Kulhavy, R. W. & Swenson, I. (1975). Imagery instruction and the comprehension of text. *British Journal of Educational Psychology, 45*, 47-51.

Lambert, W. E., & Paivio, A. (1956). The influence of noun-adjective order on learning. *Canadian Journal of Psychology, 19*, 9-12.

Lesgold, A. M., Curtis, M. E., DeGood, H., Golinkoff, R. , McCormick, C., & Shimron, C. (1974). *The role of mental imagery in text comprehension: Preliminary studies.* Pittsburg, PA: University of Pittsburg. (ERIC Document Reproductive Service No. ED 094317).

Lesgold, A. M., McCormick, C., & Golinkoff, R. M. (1975). Imagery training and children's prose learning. *Journal of Educational Psychology, 67*, 663-667.

Levin, J. R. (1973). Inducing comprehension in poor readers. A test of a recent model. *Journal of Educational Psychology, 65*, 19-24.

Levin, J. R. (1976). What have we learned about maximizing what children learn? In J. R. Levin & V. L Allen (Eds.), *Cognitive learning in children: Theories and strategies.* (pp. 105-134). New York: Academic Press.

Linden, M. & Wittrock, M. C. (1981). The teaching of reading comprehension according to the model of generative learning. *Reading Research Quarterly, 17*, 44-57.

Long, S. A. (1986). The effects of reader and text characteristics on reports of imagery during reading. (Doctoral dissertation, University of Kentucky, 1986). *Dissertation Abstracts International, 47/11A*, 4038.

Long, S. A., Winograd, P. N., & Bridge, C. A. (1989). The effects of reader and text characteristics on imagery reports during and after reading. *Reading Research Quarterly, 24,* 353-372.

Lutz, B. L. (1980). A study of the relationship between visual imagery and reading comprehension of third and sixth grader children. (Doctoral dissertation, Oklahoma State University, 1980). *Dissertation Abstract International, 41*, 3492.

Marschark, M. and Hunt, R. R. (1985). A reexamination of the role of imagery in learning and memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 15*, 710-720.

Miccinati, J. (1982). The influence of a six-week imagery training program on children's reading comprehension. *Journal of Reading Behavior, 14,* 197-203.

Moore, P. J. and Kirby, J. R. (1988). Comprehension training and reading performance. *Reading, 22*, 126-136.

Oakhill, J. V. (1982). Constructive processes in skilled and less-skilled comprehenders' memory for sentences. *British Journal of Psychology, 73*, 13-20.

Oakhill, J. & Patel, S. (1991). Can imagery training help children who have comprehension problems? *Journal of Research in Reading, 4*, 106-115.

Oakhill, J. V., Yuill, N. M. & Parkin, A. (1986). On the nature of the difference between skilled and less-skilled comprehenders. *Journal of Research in Reading, 9*, 80-91.

Oliver, M. E. (1982). *Improving comprehension with mental imagery.* Paper presented at meeting of Washington Organization for Reading Development of the IRA. Seattle, Washington: IRA. (ERIC Document Reproduction Service. No. ED 220818).

Paivio, A. (1965). Abstractness, imagery, and meaningfulness in paired associate learning. *Journal of Verbal Learning and Verbal Behavior, 4,* 32-38.

Paivio, A. (1969). Mental imagery in associative learning and memory. *Psychological Review, 76*, 241-263.

Paivio, A. (1971). *Imagery and Verbal Processes.* New York: Holt, Rinehart, and Winston, Inc.

Paivio, A. (1983). The empirical case for dual coding. In J. C. Yuille (Ed.), *Imagery, memory, and cognition.* (pp. 307-333). Hillsdale, NJ: Lawrence Erlbaum Associates.

Paivio, A. & Begg, I. (1981). *Psychology of Language.* Englewood Cliffs, NJ: Prentice Hall.

Peters, E. E. & Levin, J. R. (1986). Effects of a mnemonic imagery strategy upon the comprehension process. *Reading Research Quarterly, 11*, 87-111.

Piaget, J. & Inhelder, B. (1971). *Mental Imagery in the Child.* New York: Basic Books, Inc.

Prentice Hall Literature- Bronze. (1991). Englewood Cliffs, NJ: Prentice-Hall, Inc.

Pressley, G. M. (1976). Mental imagery helps eight-year-olds remember what they read. *Journal of Educational Psychology, 68,* 355-359.

Pressley, G. M. (1977). Imagery and children's learning: Putting the picture in developmental perspective. *Review of Educational Research, 47*, 585-622.

Rasco, R. W., Tennyson, R. D., & Boutwell, R. C. (1975). Imagery instruction and drawing in learning prose. *Journal of Educational Psychology, 67*, 188-192.

Rasinski, T. V. (1985). Picture this: Using imagery as a reading comprehension strategy. *Reading Horizons, 25*, 280-288.

Richardson, A. (1969). *Mental imagery.* London: Routledge & Kegan Paul.

Richardson, J. T. E. (1980). *Mental imagery and human memory.* New York: St. Martin's Press.

Rohwer, W. D. (1970). Images and pictures in children's learning: Research results and educational implications. *Psychological Bulletin, 73* (6), 393-403.

Rosenblum, B., Gansler, R., Frank, R., & Houle, M. (1992). *Rightwriter, Version 3.20* [Computer program]. Carmel, IN: Que Software.

Ryan, E. B., Ledger, G. W. & Weed, K. A. (1987). Acquisition and transfer of an integrative imagery strategy by young children. *Child Development, 58*, 443-452.

Sadoski, M. (1983). An exploratory study of the relationship between reported imagery and the comprehension and recall of a story. *Reading Research Quarterly, 19*, 110-123.

Sadoski, M. (1984). Text structure, imagery, and affect in the recall of a story by children. In J. A. Niles & L. A. Harris (Eds.), *Changing perspectives in research in reading/ language processing and instruction. Thirty-third Yearbook of the National Reading Conference* (pp. 48-53). Washington D. C.: National Reading Conference.

Sadoski, M. (1985). The natural use of imagery in story comprehension and recall: Replication and extension. *Reading Research Quarterly, 20*, 658-667.

Sadoski, M., Goetz, E. T., Olivarez, J., Lee, S., & Roberts, N. M. (1990). Imagination in story reading: The role of imagery, verbal recall, story analysis, and processing levels. *Journal of Reading Behavior, 22*, 55-70.

Sadoski, M., Paivio, A., & Goetz, E. T. (1991). A critique of schema theory in reading and a dual coding alternative. *Reading Research Quarterly, 24,* 463-485.

Sheehan, P. W. (1967). *Betts Questionnaire Upon Mental Imagery.* (Library of Congress Photoduplication Service No. ADI 9147). Washington DC: Library of Congress Auxiliary Publications Project.

Steingart, S. K. & Glock, M. D. (1979). Imagery and the recall of connected discourse. *Reading Research Quarterly, 15*, 66-83.

Tirre, W. C., Manelis, L. & Leicht, K. L. (1979). The effects of imaginal and verbal strategies on prose comprehension by adults. *Journal of Reading Behavior, 11*, 99-106.

Tower, R. B. (1981). Imagery measurements in clinical settings. In E. Klinger (Ed.), *Imagery. Volume 2: Concepts, Results, and Applications.* (pp. 222-251). New York: Plenum Press.

Wade, S. E. & Trathen, W. (1989). Effects of self-selected study methods on learning. *Journal of Educational Psychology, 81*, 40-47.

Wade, S. E., Trathen, W. & Schraw, G. (1990). An analysis of spontaneous study strategies. *Reading Research Quarterly, 25*, 147-166.

Weinstein, C. E. (1982). Training students to use elaboration learning strategies. *Contemporary Educational Psychology, 7*, 301-311.

Wheatley, W., Maddox, E. N., Antony, W., and Coe, F. (1987). Enhancing education through the use of mental imagery. *Reading Improvement, 24,* 150-159.

Wilkinson, L., Mullin, G., Bjerknes, M., & McHale, T. (1990). *Systat 5* [Computer program]. Evanston, IL: Systat, Incorporated.

Winzenz, N. A. (1988). Comprehension of extended narrative text: The role of spontaneous mental imagery while reading or listening. (Doctoral dissertation, University of the Pacific, Stockton, CA, 1988). *Dissertation Abstracts International, 49*, 07A.

Wittrock, M. C. (1986). Students' thought process. In M. C. Wittrock (Ed.), *Handbook of research on teaching. Third edition.* (pp. 297-341). New York: Macmillan.

Wolff, P. & Levin, J. R. (1972). The role of overt activity in children's imagery production. *Child Development, 43*, 537-547.

APPENDICES

APPENDIX A

IMAGERY TRAINING PROTOCOL

IMAGERY TRAINING PROTOCOL

Prior to training: Testing

All subjects will take the Betts QMI. Directions will be read aloud to each class, and no discussion of why the test is being given will be offered. No other mention of imagery will be made prior to the beginning of training.

Introduction and Training

Experimental Group

Day 1--Discuss thinking about how we think (metacognition) and ways to improve thinking. Discuss the concept of thinking strategies and how they can help us learn and remember. Elicit comments on strategies they think they are currently using. Discuss specifically the use of imagery as an elaboration strategy or an organizational strategy. Explain that for the next few weeks, the class will try to use imagery as a means of improving comprehension of the stories read. Since images occur inside the mind, tell them that they will use several procedures to ensure that everyone is using imagery. These procedures include: (1) thinking aloud (protocol analysis); (2) discussing the images they used (retrospection); (3) stopping at specified points in the reading to allow time to form and use images and to record the images in a

written description (protocol analysis); and (4) drawing as a means of recording their images.

Have students listen to the following poem as it is read aloud. Tell them to create the images that the words of the poem bring to mind as they listen. Tell them they can close their eyes if it helps. After reading the poem, discuss images generated. What did they see? How vivid were the images? Instruct the students to take a piece of paper (provided) and draw a picture utilizing the image(s) generated.

Day 2 --Discuss how some words are easier to image than others. Give the following examples, and ask the students to determine the ease with which they can be imaged:

cat	jump
fire	swim
justice	yell
island	love
freedom	hit
computer	become
hatred	seem

Discuss how some nouns are easier to image (concrete) than others (abstract), and how some verbs (actions) are easier to image than others (state of being). Then ask students to image the following sentences:

The young boy kicked the football.

Susan appeared nervous when she stood in the front of the class.

Discuss the images generated by the sentences. Which words in the sentence made the image easy to generate? Which words would have been more difficult to image alone? (e.g., the word appeared-- would it have been easy to image the word in isolation; was it easy to image the idea of someone appearing nervous.) Change the last sentence to:

"Susan appeared confident when she stood in the front of the class."

Discuss how changing the predicate adjective changed the image. [The point of this illustrations is to discover how important each word, phrase, and sentence can be imaged, and how the image created may depend upon the meaning of a single word in the sentence.] Have the class work in pairs, with each giving their partner a sentence to image (10 sentences provided). Using the rating scale from the Betts QMI (provided on an overhead transparency), rate the images generated. Discuss how each sentence was rated. Was there a consensus of opinion about the vividness of the images?

Day 3--Protocol Analysis: The students will read the first selection orally, stopping at the end of each paragraph to form images of the story events, characters, etc., up to that point. Then the class will discuss the images they have formed, comparing with others, and receiving feedback from the teacher on the appropriateness, clarity, etc. of the images discussed. Students will also rate their images using the scale from the Betts QMI. After

several "stops," the discussion should also include attempts to combine images, and thus use them as a way of organizing the events in the story.

Day 4-- Students will read a story silently, stopping at the end of each paragraph to form images. Then the subjects will be asked to write a list of descriptive words for the character, events, etc. Finally, students will determine if the images helped them select the adjectives and adverbs they used, or if the adjectives and adverbs used help to form images. Discuss how imagery can be used as an elaboration strategy, which helps us elaborate (define if needed) ideas, concepts, and descriptions of characters and events.

Day 5-- Retrospection: At the end of the week, give a surprise recall test to the students, asking them to either draw, write, or draw and write what they remember from the poem read at the beginning of the week. After they have completed the recall exercise, discuss what images they remember, and how the images helped them recall the setting, events, and/or characters in the poem. Explain to the students that for the next few weeks, you (classroom teacher) will remind them to use imagery as a means of elaborating or organizing the information learned from reading.

Control Group

Day 1-- Listen to the poem being read aloud. Discuss the meaning of the poem.

Day 2-- Have students complete an exercise on identification of nouns and verbs in complete sentences. Have the class generate ten sentences, identifying the nouns and verbs. Have the class work in pairs to identify fragments and rewrite to include the missing subject or predicate. Discuss how the missing element caused the "sentences" to be fragments.

Day 3-- Have the students read the first selection orally. Discuss the story as you usually do in class, following personal procedure.

Day 4-- Students will read selection silently. Discussion will proceed in the "usual" manner for the class concerning the story.

Day 5-- Give the same surprise recall test as given to the Experimental Group on the poem read earlier in the week (Day 2). Included in the test will be a question on how (what strategy or technique did you use?) in remembering the poem.

APPENDIX B

BETTS' QUESTIONNAIRE UPON

MENTAL IMAGERY

The Betts QMI Vividness of Imagery Scale

Instructions

The aim of this test is to determine the vividness of your imagery. The items of the test will bring certain images to your mind. You are to rate the vividness of each image by reference to the accompanying rating scale, which is shown at the bottom of the page. For example, if your image is "vague and dim" you give it a rating of 5. Record your answer in the brackets provided after each item. Just write the appropriate number after each item. Before you turn to the items on the next page. familiarize yourself with the different categories on the rating scale. Throughout the test, refer to the rating scale when judging the vividness of each item. A copy of the rating scale is printed at the bottom of each page. Please finish all the items on each page before going to the next page, and do not turn back to items completed.

Rating Scale

The image aroused by an item on this test may be:

[Rating 1]	Perfectly clear and as vivid as the actual experience
[Rating 2]	Very clear and comparable in vividness to the actual experience
[Rating 3]	Moderately clear and vivid
[Rating 4]	Not clear or vivid, but recognizable
[Rating 5]	Vague and dim
[Rating 6]	So vague and dim as to be hardly discernible(noticeable)
[Rating 7]	No image present at all, only "knowing" that you are thinking of the object

An example of an item on the test would be one which asked you to consider an image which comes to your mind of a red apple. If you visual image was moderately clear and vivid you would mark "3" in the brackets provided.

Ex. a red apple [3]

Now turn to the next page when you understand these instructions, and begin the test.

Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. Classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale. A copy of the scale is reproduced at the bottom of the page.

[ ] 1. The exact contour of face, head, shoulders and body

[ ] 2. Characteristic poses of head, attitudes of body, etc.

[ ] 3. The precise carriage, length of step, etc., in walking

[ ] 4. The different colors worn in some familiar outfit

Think of seeing the following, considering carefully the picture which comes before your mind's eye. Classify the images suggested by the following question as indicated by the degree of clearness and vividness specified on the Rating Scale.

[ ] 5. The sun as it is sinking below the horizon.

Think of each of the following sounds, considering carefully the image which comes to your mind's ear, and classify the iamges suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

[ ] 6. The whistle of a locomotive

[ ] 7. The honk of an automobile

[ ] 8. The meowing of a cat

[ ] 9. The sound of escaping steam

[ ] 10. The clapping of hands in applause

Rating Scale

The image aroused by an item on this test may be:

[Rating 1]	Perfectly clear and as vivid as the actual experience
[Rating 2]	Very clear and comparable in vividness to the actual experience
[Rating 3]	Moderately clear and vivid
[Rating 4]	Not clear or vivid, but recognizable
[Rating 5]	Vague and dim
[Rating 6]	So vague and dim as to be hardly discernible(noticeable)
[Rating 7]	No image present at all, only "knowing" that youare thinking of the object

Think of 'feeling' or touching each of the following, considering carefully the image which comes to your mind's touch, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

[ ] 11. Sand

[ ] 12. Linen

[ ] 13. Fur

[ ] 14. The prick of a pin

[ ] 15. The warmth of bathwater

Think of performing each of the following acts, considering carefully the image which comes to your mind. Classify the images suggested as indicated by the degree of clearness and vividness specified on the Rating Scale.

[ ] 16. Running upstairs

[ ] 17. Jumping across a ditch

[ ] 18. Drawing a circle on paper

[ ] 19. Reaching up to a high shelf

[ ] 20. Kicking something out of your way

Think of tasting each of the following, considering carefully the image which comes to your mind's mouth, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

[ ] 21. Salt

[ ] 22. White sugar

[ ] 23. Oranges

[ ] 24. Jelly

[ ] 25. Your favorite soup

Rating Scale

The image aroused by an item on this test may be:

[Rating 1] Perfectly clear and as vivid as the actual experience

[Rating 2] Very clear and comparable in vividness to the actual experience

[Rating 3] Moderately clear and vivid

[Rating 4] Not clear or vivid, but recognizable

[Rating 5] Vague and dim

[Rating 6] So vague and dim as to be hardly discernible(noticeable)

[Rating 7] No image present at all, only "knowing" that youare thinking of the object

Think of smelling each of the following, considering carefully the image which comes to your mind's nose, and classify the images suggested by each of the following questions as indicated by the degrees of clearness and vividness specified on the Rating Scale.

[ ] 26. An ill-ventilated room

[ ] 27. Cooking cabbage

[ ] 28. Roast beef

[ ] 29. Fresh paint

[ ] 30. New leather

Think of each of the following sensations, considering carefully the image which comes before your mind, and classify the images suggested as indicated by the degree of clearness and vividness specified on the Rating Scale.

[ ] 31. Fatigue (feeling tired)

[ ] 32. Hunger

[ ] 33. A sore throat

[ ] 34. Drowsiness (sleepiness)

[ ] 35. Fullness after a big meal

Rating Scale

The image aroused by an item on this test may be:

[Rating 1]	Perfectly clear and as vivid as the actual experience
[Rating 2]	Very clear and comparable in vividness to the actual experience
[Rating 3]	Moderately clear and vivid
[Rating 4]	Not clear or vivid, but recognizable
[Rating 5]	Vague and dim
[Rating 6]	So vague and dim as to be hardly discernible(noticeable)
[Rating 7]	No image present at all, only "knowing" that youare thinking of the object

VITA[α]

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