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EFFECTS OF A VISUAL ADVANCE ORGANIZER ON THE VISUAL-LEARNING DISCRIMINATION PERFORMANCE OF PERSONS OF VARYING CEREBRAL HEMISPHERIC FUNCTIONING

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By

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ABSTRACT

EFFECTS OF A VISUAL ADVANCE ORGANIZER ON THE VISUAL-LEARNING DISCRIMINATION PERFORMANCE OF PERSONS OF VARYING CEREBRAL HEMISPHERIC FUNCTIONING

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The purpose of this study was to investigate (1) the efficacy of a visual advance organizer compared to a verbal advance organizer, (2) the differential learning performance of persons who varied in vividness of imagery, and (3) the interaction of type of advance organizer and vividness of imagery on learning performance. The independent variables were type of organizer (visual, verbal, control) and level of imagery (high and low). The dependent variable was discrimination learning as measured by a learning stimulus posttest.

One hundred fifteen undergraduate and graduate students in various disciplines at Michigan State University participated in the study. Seventy-two subjects with complete sets of data were categorized as high and low imagers using Boutwell's Noun Test and Sheehan's QMI. Of these, eleven low-imagery and seventeen high imagery subjects were identified; forty-four subjects could not be categorized and were deleted.

Subjects were randomly assigned to one of three treatments: Visual advance organizer, verbal advance organizer or control group. The visual advance organizer consisted of a series of six photographs showing Art Nouveau objects in relation to other art objects. The

verbal advance organizer described the relationship of these objects. The control treatment was written material unrelated to Art Nouveau.

A learning stimulus using projected slides and controlled presentation rate was used. A learning stimulus posttest was designed that required subjects to visually identify examples of Art Nouveau.

The hypotheses tested were that scores on the posttest would (1) be greatest for subjects in the visual advance organizer treatment, (2) be greatest for high-imagery subjects, and (3) indicate an interaction between type of advance organizer and imagery level.

The procedure consisted of (1) administering Boutwell's Noun Test and Sheehan's QMI, (2) randomly assigning subjects to three treatment groups, administering (3) the treatments, (4) the learning stimulus slides, (5) the posttest, and (6) the Sherman-Kulhavy Laterality Test.

A 3 x 2 factorial design was used. The primary statistic was a two-way analysis of variance. Additional statistics included correlation and factor analysis. The statistical significance level was set at .05. Analysis of the data yielded these findings.

There were no significant differences in the posttest scores associated with (1) the three treatments: visual advance organizer, verbal advance organizer, and control group; (2) imagery level; (3) the interaction of treatment and imagery level.

In addition, correlation and factor analysis indicated that the three imagery instruments were nonoverlapping; the correlation between instruments was low and each instrument yielded strong and separate factors.

The hypotheses, therefore, were not supported.

Since the imagery scores correlated only to a small extent and resulted in separate and strong factors, the imagery measure had low construct validity in this study. Also, the instructional treatment, art-style slides, represented a sample of one; other treatments should be tested. Further, for the two-way analysis of variance the small cell size resulted in a situation where treatment differences of great magnitude would have been needed to make the advance organizers treatment variable statistically significant. Finally, the small differences in the dependent variable may have been due to the relatively small amount of learning that took place, or perhaps were a result of the short experimental treatment and learning stimulus.

Other studies, if warranted, should consider including such variables as instructional treatments, amount of learning, and length of treatment. Imagery measures should continue to be studied with the aim of increasing construct validity.

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CHAPTER I

IDENTIFICATION OF THE PROBLEM

Introduction

It is generally accepted by teachers and others in instructional settings that presenting material that is entirely new to students does not facilitate learning. Overviews, summaries, outlines, general remarks, and other means are often used to "bridge the gap" in introducing new material to students.

The research literature on preinstructional strategies extends back almost thirty years. As part of the Pennsylvania State College Instructional Film Research Program, Lathrop (1949) studied the effects of film introductions on learning from motion pictures. During the same program, Stein (1952) studied the effects of pre-film tests on learning from films. May and Lumsdaine (1958) found that the use of pre-film test questions increased certain aspects of learning. Interest in preinstructional strategies has continued in both films and other strategies, from these early studies to the present time. In a recent review of preinstructional strategies, Hartley and Davies (1976) concluded that the meaningful-reception (i.e., other than rote and discovery) learning situation is more likely to benefit from these strategies than other types of situations (p. 258).

Advance organizers have been a major component of preinstructional strategies since the early 1960s when Ausubel first defined and

studied the concept (Ausubel, 1960). Lawton and Wanska (1977, p. 234) describe advance organizers as consisting of ". . . concepts and propositions that are maximally stable and discriminable from the schematic arrangement of concepts and propositions existing in the learner's cognitive structure, and are presented in advance of new learning materials." Advance organizers are viewed as functioning to ". . . induce, through a particular form of learning, organizing and explanatory concepts, propositions, and principles" (Lawton and Wanska, 1977, p. 235). The organizer itself becomes a cognitive structure during the initial learning process.

Research in the use of advance organizers has concentrated almost completely on organizers in the verbal mode, either written or spoken. In their review, Barnes and Clawson (1975) cite only two studies using visual advance organizers. Considering the extensive use of visuals in the instructional process and the different functions that visuals serve, it would seem useful to attempt to extend knowledge of how advance organizers operate in visual instructional procedures.

Concurrently, a renewed interest has developed in mentalistic concepts that include imaging, verbal processes and cerebral hemispheric specialization. Recent work in this area indicates that the familiar notion of the transverse relationship between the hemispheres and the body (e.g., the left hemisphere controls the right side of the body) extends to perceptual processes as well, each hemisphere "specializing" in the processing of certain kinds of external stimuli. This work is especially valuable as researchers begin to assess the role of the right hemisphere in stimulus perception and processing.

Ornstein (1972) describes the basic nature of cerebral specialization:

> Both the structure and the function of these two "half-brains" in some part underlie the two modes of consciousness which simultaneously coexist within each one of us. Although each hemisphere shares the potential for many functions, and both sides participate in both activities, in the normal person the two hemispheres tend to specialize. The left hemisphere (connected to the right side of the body) is predominantly involved with analytic, logical thinking, especially in verbal and mathematical functions. Its mode of operation is primarily linear. This hemisphere seems to process information sequentially. This [linear] mode of operation of necessity must underlie logical thought, since logic depends on sequence and order. Language and mathematics, both left-hemispheric activities, also depend predominantly on linear time.
>
> If the left hemisphere is specialized for analysis, the right hemisphere, again, remember connected to the left side of the body seems specialized for holistic mentation. Its language ability is quite limited. This hemisphere is primarily responsible for our orientation in space, artistic endeavor, crafts, body image, recognition of faces. It processes information more diffusely than does the left hemisphere, and its responsibilities demand a ready integration of many inputs at once. If the left hemisphere can be termed predominately analytic and sequential in its operation, then the right hemisphere is more holistic and relational, and more simultaneous in its mode of operation (p. 51).

Studies of cerebral specialization have yielded results consistent with Ornstein's description. Kimura (1973) used a stereo tape system to play different material to subjects' right and left ears (each ear is connected predominantly to the opposite hemisphere). With simultaneous melodies, Kimura found a left ear/right hemisphere superiority in picking out tunes; she found a complementary right ear/left hemisphere superiority in processing certain human speech sounds. Considering the visual field, one-half of each eye's visual field is connected to the right hemisphere; the other half is connected to the left hemisphere. Using visual tachistoscopic tests, Kimura (1973)

found a left hemisphere dominance for the visual perception of letters and words. In a follow-up study to one of Kimura's earlier studies using dichotic listening materials (Kimura, 1964), Broadbent and Gregory (1964) used the same techniques but different stimulus materials and obtained the same results.

Considering the psychological constructs of visual and verbal processing, Paivio (1971) views each as having a separate type of coding system. Paivio associates visual imagery with parallel processing and verbal imagery with sequential processing (p. 9). Rather than the global concept of hemispheric dominance, the notion of imagery seems more amenable to measurement, and Paivio notes that the measurement of imaginal versus verbal abilities as individual differences constitutes a useful independent variable (p. 9).

Purpose

The present study was based on the two elements noted in the Introduction: advance organizers in a visual mode, and individual differences in hemispheric specialization as measured by imagery abilities.

Specifically, this study had two purposes. First, the effects of a verbal or visual advance organizer as a component of a learning task that is primarily visual were examined. Second, the extent that any differences in learning associated with each type of organizer are functions of subjects' degree of imagery capability was examined.

Importance

This study is important for several reasons. First, considering how many visuals are used in instruction, little is known about

their functional properties, especially when used as advance organizers. Second, it is important to extend the concept of advance organizers to modes other than verbal learning since few studies to date have been in other than verbal modes. Third, it is important to attempt to link what is known about cerebral hemisphere differences to classroom tasks. Rennels (1976) decries an educational system that emphasizes the linear processing associated with the left brain to the neglect of the capacity to imagine and visualize. He notes that schools have systematically eliminated these experiences, but they ". . . should become concerned with developing equal qualities of cerebral functioning in children" (p. 471).

Finally, it is important to attempt to consider individual differences in crucial learning variables, not necessarily in the sense of individualized instruction as an outcome of specific trait-treatment interactions, but as indicants of stimulus considerations in the instructional design process.

Generalizability

The results of this study are limited. First, the undergraduate and graduate subjects were drawn from available classes, not randomly sampled from the university population.

Second, although the literature reviewed does not limit the elements of visual imagery and cerebral specialization to projected slides only, the single medium used represents a restricted sample of one.

Hypotheses

The study is based on three hypotheses. First, it was hypothesized that test scores associated with a visual advance organizer would exceed those associated with a verbal advance organizer and a control group.

Second, it was hypothesized that the scores of high imaging subjects would exceed those of low imaging subjects.

Finally, a type of organizer by learner degree of imagery interaction was hypothesized.

CHAPTER II

REVIEW OF LITERATURE

Using a suggested classification by Hovland et al. (1949) regarding independent variables, this review will be organized along three dimensions. First, stimulus aspects of presentation materials will be considered, including categories of preinstructional materials generally, stimulus aspects of advance organizers, and general stimulus characteristics of visuals or pictures. Second, learner characteristics will be examined and related to advance organizers and some aspects of cerebral dominance will be discussed. Third, situation variables will be explored, such as the degree the learning content is structured and length of treatment.

Stimulus Aspects

Introduction

The general concept of a "before instruction," or preinstructional treatment has been examined for a long time. Even the current interest in visuals in preinstructional treatments can be traced back to media research done in the armed forces through the period of World War II. In a study of the effect of introduction to instructional films on learners, Lathrop (1949) found that, with respect to performance on a multiple-choice posttest of facts, high school

students' performance was not significantly different for two films, while for a third, the introduction had a highly significant adverse effect.

In a study from the same series (done at Pennsylvania State College), Northrop (1952) varied the prominence of the organizational outline within three kinds of instructional films sequences: discrete item, logical, and chronological (dramatic). He found that a highly prominent outline was most effective for the discrete item film.

Stein (1952) used a test of film learning in two conditions. First as a pre-film test, where learners received total knowledge of results. Then after the film, the same test was administered. Stein found that this procedure was more effective than showing the film only once, or showing it twice.

Although May (May and Lumsdaine, 1958, p. 91) obtained ambivalent results when he experimented with attention directing techniques using prefilm test questions, he did find indications that specific but open-ended short-answer questions coupled with verbal directions related to the content might be effective. May also concluded that the relative importance of material in the film might be a key variable. If all the material is of about equal importance, an overall pretest is indicated, but if certain elements are more important, a shorter pretest that focuses on these elements may highlight them.

Wulff and Kraeling (1961) compared two types of familiarization techniques as part of a motion picture learning experience dealing with the assembly of an automobile distributor. One group of subjects was familiarized prior to the film showing. The subjects were shown the various distributor parts, one at a time, in an irrelevant order. An

expert pointed out features of each part and handed each part to a subject who named the important features. This group was then shown the training film. A second group was exposed to familiarization techniques during the film. Filmed close-up inserts were prepared that included visual and aural pointers. These inserts dealt with aspects of the assembly process and were inserted just before the actual assembly of the part. A third group watched the film with no treatment. When the thirty-three subjects (eleven per group, aged 16-26 with little prior experience and mathced on the Minnesota Paper Form Board scores) performed the task after the film, time and error measurements were made. It was found that both familiarization procedures improved performance and that the within-film procedure was superior.

In addition to pretests, familiarization techniques and organizational emphasis, other preinstructional procedures have been studied, including behavioral objectives, overviews, and advance organizers. In a review of preinstructional strategy studies, Hartley and Davies (1976) define and differentiate these procedures. The authors, after examining instances of use for each strategy, concluded that ". . . pretests alert, behavioral objectives inform, overviews prepare, and advance organizers clarify" (1976, p. 246). Further, they categorized the strategies in relation to the instructional experience. Pretests and behavioral objectives were felt to have a list structure and were given in advance of the instruction. Overviews and advance organizers were described as more abstract prose formats, to be given immediately prior to instruction.

Hartley and Davies (1976) describe advance organizers as being more complex than overviews and having a unique function: to clarify the task ahead. Advance organizers provide a broad framework, a context, as differentiated from other preinstructional strategies.

Two types of advance organizers are described by Hartley and Davies. First, expository organizers are those generated and used when new material is completely unfamiliar. When this is the case, material familiar to the student is included in the organizer and it can be used to make the learning task more understandable, because relationships to existing knowledge is made clear.

When the material is familiar to some extent, the authors note that comparative organizers are appropriate. These organizers operate to differentiate the known and unknown information. This heightens the contrast between the two and the resulting clarity reduces confusion and some forgetting.

Hartley and Davies (1976) describe the functions of advance organizers as:

> (a) to provide ideational scaffolding for the more differentiated learning task, or
>
> (b) to increase the discriminability of the latter [learning task] from related ideas in existing cognitive structuring, or
>
> (c) to effect integrative reconciliation at a level of abstraction, generality and inclusiveness which is much higher than that of the learning material itself (p. 246).

The authors also suggest a reason for much of the difficulty with research using advance organizers: since there are no procedures for writing or creating advance organizers, it is very difficult to detect the presence of an organizer.

The research evidence regarding advance organizers is almost entirely related to the written or aural mode. These studies will be examined after which a few non-verbal studies will be reported. Attention will then shift to stimulus characteristics of visuals or pictures, and how these might relate to advance organizers.

Christie and Schumacher (1975) hypothesized that (1) subjects not provided an advance organizer would try to generate their own; (2) of these, older subjects would be more effective in creating organizers and so, would be able to recall more; and (3) organizers might have an effect on relevant versus irrelevant sentences. Presenting a one-sentence organizer and a learning passage to six- and nine-year olds aurally and analyzing audio-taped recall, they found that (1) age was a significant factor, younger subjects not provided an organizer apparently did not generate one; (2) subjects who did not receive an organizer recalled more relevant than irrelevant information, but subjects who did receive one recalled both relevant and irrelevant information; (3) older subjects did in fact generate organizers. Christie and Schumacher conclude that, while an advance organizer may have no overall effect, its use may change the mixture of relevant and irrelevant information learned.

Kennedy (1975) measured performance of learning and retention of metric concepts. His treatments were a written historical introduction that included various measurement concepts, a written advance organizer, and a no-treatment control group. Kennedy examined performance in terms of subject ability (grade-point average) and cognitive structure (the number of science and math courses completed). In addition to finding that high-ability students performed better and

that the cognitive strategy variable was not significant, Kennedy found that after a thirty-day delayed posttest, students with the advance organizer treatment performed significantly better.

In an examination of the advance organizer research over the past fifteen years, Hartley and Davies (1976) describe the results as confused. They do note a trend indicating that as studies become more recent and have been conducted without some of the earlier methodological limitations, the results in favor of advance organizers has diminished somewhat. They summarized the results as:

> 1. The majority of studies still indicate that advance organizers facilitate both learning and retention, although almost all the studies in this category were conducted with undergraduate students as subjects;
>
> 2. Other studies have been unable to conclude that advance organizers facilitate learning or retention;
>
> 3. The effects of organizers appear to be specific, not general;
>
> 4. The effectiveness of advance organizers varies with subject characteristics such as age and general ability, but these effects are not stable;
>
> 5. Expository organizers may be most useful with children who have low verbal and analytical ability;
>
> 6. Indications exist that formats other than continuous prose should be considered; and
>
> 7. Post organizers may sometimes have a greater effect than advance organizers.

In another review of research, Barnes and Clawson (1975) analyzed thirty-two advance organizer studies in terms of whether they facilitate learning. When these studies were examined in terms of frequency of significance, a pattern emerged that is similar to that noted by Hartley and Davies: the relative frequency of nonsignificant studies has increased in recent years.

As a final component of this section of the literature review dealing with advance organizers, two studies will be reported which used advance organizers in other than written form. Weisberg (1970) studied the effects of two visual advance organizers on eighth grade students as compared to a verbal passage (presented as an advance organizer) and a no-treatment group. One visual advance organizer consisted of a physiographic diagram of the North Atlantic Ocean floor. The second visual advance organizer was a topographic profile of the ocean floor. The verbal advance organizer was a five-hundred word passage that dealt with the same material as the visual organizers. The learning task was a 1,100-word passage dealing with continental drift. Weisberg concluded that (1) the visual organizer groups did better on the multiple-choice posttest than the written organizer or control groups; (2) the visual advance organizers were most effective with subjects who were in the middle level of prior knowledge (versus high or low).

In a study where the advance organizer was a fabricated model of a computer, Mayer (1976) examined the differences in performance requiring concept transfer. The model was a three-by-two-foot board with a small chalkboard, data cards, note pads, and index cards. In a model versus no-model comparison, the subjects exposed to the model also received a 150-word written explanation; the no-model subjects received the learning task (a 26-frame programmed text) directly. Mayer found that the subjects exposed to the model and text were more effective overall on a posttest, and also more effective in problems requiring transfer. In a second study, Mayer found that the model used as an advance organizer was more effective than as a post organizer.

Summary of Preinstructional and Advance Organizer Literature

The strength inherent in this area due to the many studies and period of time over which they were conducted is diffused when one considers the lack of consistency and recent trends in results. One reason may be the lack of an effort to operationalize the advance organizer especially with respect to stimulus characteristics. For example, in the Weisberg and Mayer studies, both of which used visual advance organizers, there was no attempt to specify the nature of the visualizations, thus no meaningful comparisons are possible. In both studies, other methodological problems notwithstanding, we are left with indications of positive effects of visual advance organizers, but also with no explanation of why this is so.

Concentrating on the stimulus aspects of organizers may provide a high "pay off." The stimulus characteristics of media such as pictures, motion or still, offer a degree of control and replication and as such, greatly facilitate successful research on instruction (Lumsdaine, 1963, p. 586). It should be noted that the term stimulus, as used here, embraces both characteristics of the medium itself, such as the color, amount of detail, degree of motion or implied motion, etc. and characteristics of the content of the medium, such as complexity, level of abstraction, shape, size, and so on.

While not paralyzing research in this area, the lack of a consistent operational definition of advance organizers is a hindrance to systematic study of their effects. Attending to stimulus attributes may be partially effective but will not overcome the problem of definition.

Finally, the studies of advance organizers that use non-written organizers (e.g., the Weisberg and Mayer studies) are noteworthy even though not rigorous or consistent. They indicate that the basic notion of advance organizers is not specifically restricted to verbal learning modes.

Advance Organizers as Stimuli

Turning more directly to the stimulus aspects of advance organizers, literature will be examined regarding the nature and organization of the stimulus content of media. Studies related to sensory modality and realism versus abstraction will be discussed. Finally, material concerned with the relative concreteness of stimuli will be noted.

Several dimensions of the content of media are noted. Levie and Dicke (1973) discuss sign types--specifically iconic versus digital sign types. Digital sign types imply an arbitrariness, such as words or numbers. To understand a digital sign, one must "know the code," such as English letters, numbers, and so on. The elements of digital signs have a temporal sequence; they are linear. Iconic signs resemble the things they represent, to a greater or lesser degree, such as photographs, maps, sculptures, and so on; in each case, "critical" aspects of the real object are present. Iconic signs "picture" a complex object.

Levie and Dicke (1973) made the following contrast in the two sign types. Iconic signs can easily picture a complex object but are difficult to use to communicate an abstract concept, like "mammal." Iconic signs communicate knowledge of the world; digital signs

communicate knowledge about the world. Digital signs can be used to make statements; iconic signs can only say "it exists." The authors note Gropper's comment that pictures are poor for communicating generalizations and qualifications; they cannot communicate the concepts "all, many or most." Iconic signs, on the other hand, are related to divergent thinking, hypothesis formation, and creative activity.

In a chapter on human information, McCormick (1964) defines "loading" and "speed" as two elements of a visual display. Loading refers to the variety, in terms of type and number, of stimuli to which responses must be made. He defines speed as the number of stimuli per unit time or the time available per stimulus.

Gagné (1973) describes the components of the stimulus situation in learning. First he defines integral stimuli as task (the printing of an equation in a test) or context (the organization of a graph) as stimuli that are inherent to the medium used. Second, he describes activating stimuli as those that activate previously established processes or states. Examples of activating stimuli include (1) giving directions ("Look at the picture on the left"), (2) activating recall of previously learned capabilities, (3) activating a performance set, and (4) arousing a motivational state. A third component of Gagné's stimulus situation is stimuli from recall such as recalling cognitive strategies that may provide directions for the learning event. Gagné's structure may be useful in specifying or designing aspects of the stimuli used in advance organizers. He does associate one type of activating stimuli (activating recall) with advance organizers.

With regard to advance organizers, the stimulus characteristics specified by Levie and Dicke, McCormick, and Gagné can be organized

into a matrix that might differentiate verbal from visual advance organizers and differentiate advance organizers from non-advance organizers. Such a matrix is given in Figure 1.

ADVANCE ORGANIZER VERSUS NON-ADVANCE ORGANIZER			
Integral stimuli	Task		
	Context		
Activating stimuli	Giving directions		
	Activating recall	X_1	X_2
	Activating performance set		
	Arousing motivational set		
Stimuli from recall			
		Visual/ Iconic	Verbal/ Digital

TYPE OF ADVANCE ORGANIZER

Figure 1. Two Dimensional Stimulus Matrix.

In the matrix, the X's indicate the cells where advance organizers are specified. X_1 is a visual advance organizer and X_2 is a verbal advance organizer. Above or below these two cells, non-advance organizers are specified. Each entry in the matrix could be associated with a load factor and a speed factor

This matrix by no means specifies the stimulus stiuation completely; but it does, in two dimensions and two factor specifications, provide a potential method for creating or sorting organizers. An additional dimension will be added to the matrix below.

In addition to the stimulus characteristics just discussed, the sensory modality of advance organizers is an important characteristic. Sensory modality here refers to whether the stimulus is received by the eye or the ear, i.e., visual or aural. In addition to the issue of which, if either, mode is superior (and if so, under what conditions), the issue of simultaneous stimulus reception must be considered.

There is no clear trend in either case. Lumsdaine (1963) reviewed appropriate research and concluded that the situation is complex and the results inconsistent. Levie and Dicke (1973) report a study by Mowbray, who found that subjects could not pay attention to two sense modalities at the same time. Travers (1967) developed a model for information transmission by means of audiovisual materials, and used it to imply that multiple sensory inputs would be of value only when the rate of information input is very slow. This supports the notion, for example, of alternating print and pictures in an instructional sequence. May and Lumsdaine (1958, p. 167) also commented that combinations of modalities would be most effective for verbal learning.

The mixtures of sensory modalities best suited for groups, individuals or specific content sequences are not known, however. The study of such mixtures would be quite complex. For that reason, the advance organizers generated for the present study should each be restricted to a single sense modality.

In the visual mode, the degree of realism versus abstraction must be considered. Realism in pictorial media can be enhanced by the use of color, greater detail, use of motion, and so on. These variables will be discussed below.

Any visual advance organizer that is designed would include color or black-and-white stimuli, or a mixture of the two modes. Color could be an important design factor for visual advance organizers. The use of color in instructional media has been studied for decades. In a review of the literature in this area, Lumsdaine (1963, p. 635) noted that ". . . no really definitive studies have been made on specific ways in which color may contribute to learning from instructional media." Lumsdaine summarized the general status of the color versus black-and-white issue as one where the role of color has been perhaps overrated; the actual utility for color may be in cases where color cues are essential for learning. Levie and Dicke's conclusions were consistent; they reported "no significant difference" generally in studies of color versus black-and-white.

Winn used a multivariate approach to examine the relationships between the stimulus presentation mode (color or black-and-white) and cognitive structure, in this case the structure of resulting multiple free associations (Winn, 1976). Among the results, Winn found that color emerged as a crucial factor only when central to the concept in question. This supports Lumsdaine's earlier conclusion.

Katzman and Nyenhuis (1972) also tried to study something other than straightforward meaures of learning. After exposing subjects to color and black-and-white slides of posters of various content, when recall of materials in the posters was tested, the use of color was associated with an increased recall of peripheral, as opposed to central material. This increase in recall appeared to be limited to pictorial, not written, material.

It appears that color would be used as part of a visual advance organizer if (1) color were a key aspect of the conceptual content, or (2) if it were desired to increase the likelihood of responding to all parts of a visual organizer, instead of just the "central" parts.

The amount of detail or "quality" of material in pictures can easily be varied. In examining studies of pictorial quality, Lumsdaine reported that in several instances noted, rough, crude sketches of instructional materials were apparently as effective as "polished" versions using motion-picture photography of "real" people and objects. The studies examined included some methodological problems, but in any event, no clear case is made that "high quality high detail" materials are distinctly superior.

Levie and Dicke (1973), surveying studies in this area, found essentially the same results. They did note a study by Dwyer who found that low-detail materials were better for fixed-pace instruction but high-detail materials were more effective when the pace was learner controlled.

A final variable in this class of picture stimulus related considerations is motion versus still. In this area, Lumsdaine (1963) commented that the evidence does not demonstrate a clear general superiority for one mode over the other, but does indicate that the advantage of motion related to the nature of the task involved.

In summary, there appears to be no crucial set of types and modes of stimulus combinations in pictures that is consistently superior with learning tasks. This is consistent with Travers'

implication, with regard to his model for audiovisual information transmission, that the quest for realism is not useful.

In addition to the stimulus aspects of pictures that have just been discussed, the semantic content or meaning of advance organizers must be specified to the extent possible. In Imagery and Verbal Processes, Paivio (1971) developed an approach to images and verbal processes that conceptualizes alternative coding systems or modes of symbolic representation; these modes are linked to experiences with concrete objects and events, and language. This approach will be treated more fully in the second major division of this literature review, but it is pertinent that Paivio does define stimulus characteristics of the semantic content as major independent variables.

A major dimension of the content of pictures is one of abstractness versus concreteness. Paivio builds the relationships of concrete semantic meaning to visual imagery, and abstract semantic meaning to verbal imagery; "the more concrete or 'thinglike' the stimulus or task situation, the more likely it is to evoke memory images . . ." (1971, p. 9).

This abstract-concrete dimension, as incomplete conceptually as it is, may provide a third dimension for the matrix presented earlier. The expanded matrix is given in Figure 2.

As in the first version of the matrix, X_1 and X_2 represent the layer of advance organizers; all other layers are non-advance organizers. Each cell, then specifies a stimulus event or media presentation along three major dimensions:

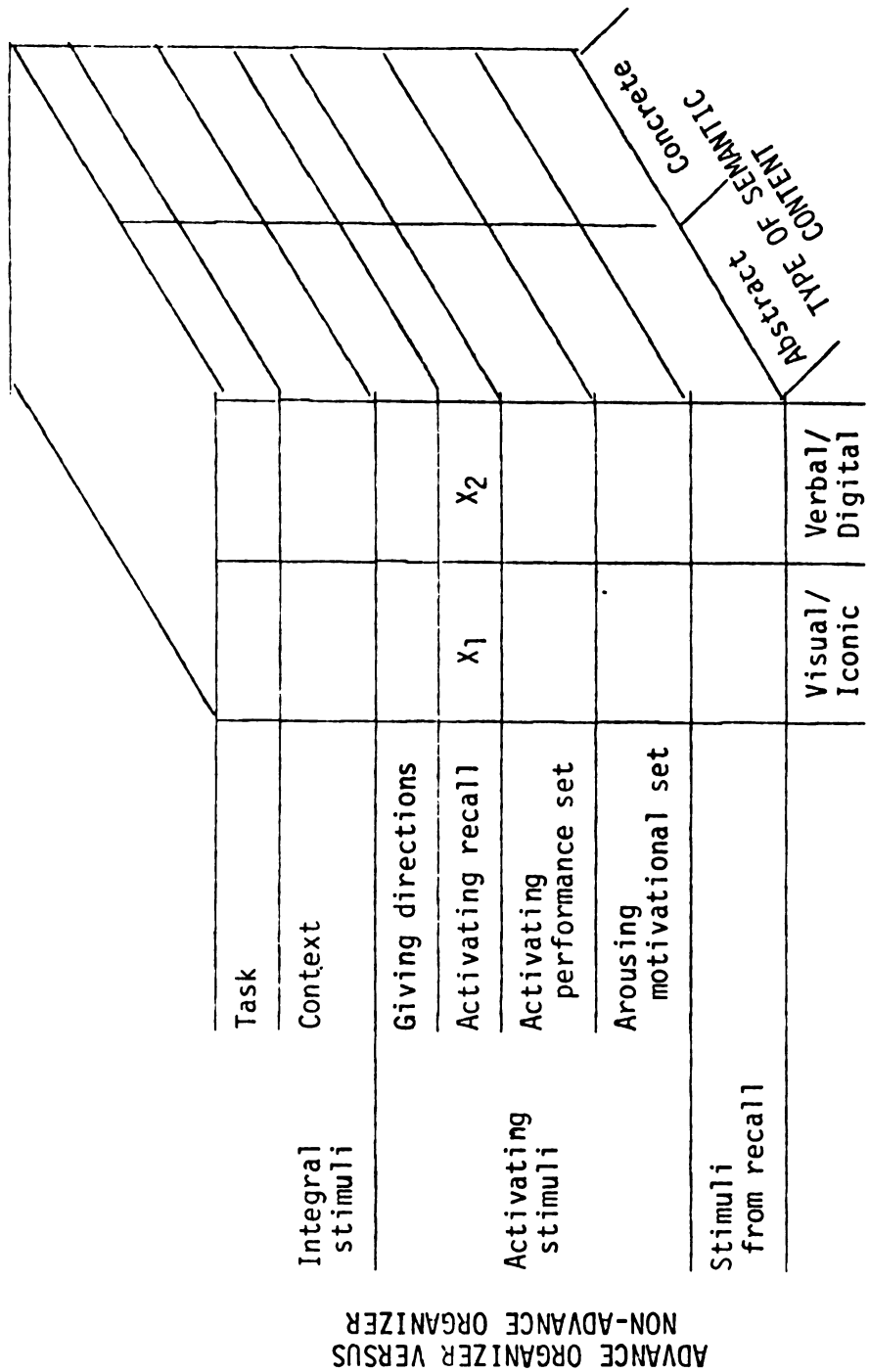

Figure 2. Three Dimensional Stimulus Matrix.

1. advance organizer vs. non-advance organizer;
2. type of advance organizers; and
3. type of semantic content.

In addition each stimulus event or media presentation is specified in such stimulus characteristics as:

1. speed;
2. load;
3. color;
4. quality/amount of detail; and
5. motion.

Summary of Stimulus Aspects of Advance Organizers and Pictures

The first major division of the literature review has been aimed at relating current research and thinking regarding stimulus characteristics of media, especially pictures, to stimulus aspects of advance organizers. The stimulus aspects of the physical media presentations have been differentiated from the semantic content differences of stimulus presentations. A matrix relating all these factors has been created which it is felt can be used to define stimulus characteristics of advance organizers.

Learner Characteristics

The second major division of this literature review focuses on learner characteristics. Studies will be reviewed that deal with learner characteristics and media and learner characteristics related to the use of advance organizers.

One of the most basic learner characteristics is intelligence or general ability. Hovland, Lumsdaine and Sheffield (1949), in a study of the effects of films on servicemen of different intellectual ability, found that, with regard to "factual knowledge," higher-ability men learned more from films, and that the degree of difficulty of the material did not seem to be a significant factor.

In a study cited earlier, Northrup (1952) varied the prominence of the organizational outline of three instructional films, and found that making the outline more pronounced had the greatest facilitating effect on groups of lower intelligence.

Countering these indications that general ability might be a factor in preinstructional strategies, Stein (1952) found that the improvement in scores on a post-film test due to the use of a pre-film test was not a function of intelligence. And in the same vein, Barnes and Clawson (1975), in a review of eighteen studies using advance organizers spanning 1966 to 1973, found five significant with respect to ability level, and thirteen nonsignificant. They conclude that no trends were identifiable. On the other hand, Hartley and Davies (1976) note that both university students in early studies and above-average school children have benefited from advanced organizers, while educable, mentally retarded adolescents and less able adolescent school children have not. They conclude that it is ". . . probably best . . . [if the learners involved are of] above-average ability, maturity and sophistication" (p. 260).

The present author's conclusion with respect to learner ability is that it would be best to involve persons with average or above-average general abilities.

A second learner characteristic to examine is age. The reviews cited earlier by Barnes and Clawson and Hartley and Davies also examined advance organizers in terms of differences with respect to age. In the Barnes and Clawson review, half (sixteen) of the studies used subjects who were at the post secondary level. Of these, eight reported significant effects in favor of advance organizers; this pattern did not hold at the lower levels, so no conclusions were made. In their review, Hartley and Davies note that the more recent studies of advance organizers, where the age range was greater, tended to be nonsignificant. They did not, however, factor out age per se as a factor.

The extent of prior knowledge is a relevant learner characteristic. May and Lumsdaine (1958) completed studies that indicate a greater relative increase in learning for persons who had had instruction prior to instructional films. They comment, ". . . to him that hath shall be given" (p. 119).

In the Weisberg study comparing visual and verbal advance organizers, subjects with a middle level of prior knowledge made the greatest gains in both treatments.

These two studies do not constitute trend. However, they do indicate that prior knowledge, if not a major variable in a study, should be accounted for.

The sex variable was included only in Weisberg's study. He found that, for the eighth graders in the study, the sex variable was nonsignificant.

The final learner characteristic to be considered is cerebral or lateral specialization. It has been hypothesized for some time

that the two halves of the brain are specialized to a considerable extent. Ornstein (1972), in a chapter titled "Two Sides of the Brain," describes the left hemisphere (which controls the right side of the body) as analytical, logical, verbal, linear and oriented to language, mathematics, and information processing. He describes the right hemisphere (which controls the left side of the body) as holistic, artistic, relational, simultaneous and oriented to crafts, body image, recognition of faces and integrating multiple inputs simultaneously. These characteristics, Ornstein notes, are "purest" for right-handed persons; left-handers are less consistent, reversed, or mixed in these characteristics.

Regarding the relationship of handedness to cerebral functioning, Harris (1975) describes the general population as being 90 to 98 percent right-handed. Of the right-handed people, about 99 percent have left hemisphere laterality for language, i.e., their language functions are primarily in the left hemisphere. In contrast he reports that only 53 to 65 percent of left-handed people have the same left hemisphere laterality, and concludes that left-handed persons are less well-lateralized, i.e., their lateralization is weaker than right-handed persons. Harris counsels knowing the handedness of subjects in experiments.

White, in a review of laterality differences (1969), notes that the criterion of handedness as a sole criterion of cerebral dominance may be too simplistic, and concludes that ". . . there is no clear-cut relationship between handedness . . . and cerebral dominance (which, again, is not always a matter of singular lateralization)"

(p. 399). White does, however, accept the idea that handedness is in some way related to lateral dominance.

Crinella et al. (1971) lament the notion that handedness is an indicant of some aspects of cerebral dominance, "Despite an overwhelming amount of evidence indicating that there is no absolute correspondence between these peripheral [such as handedness] measures and cerebral dominance, weak or inconsistent lateral preference is often said to be an indication of similarly inconsistent hemispheric organization" (p. 2035). They cite evidence that lateral preference is not genetically transmitted, but is randomly assigned and culturally modified in some left-handed individuals.

Calder notes that right handedness as the human norm ". . . is probably connected with the occurrence of the speech area in the left of the brain" (1970, p. 248). He describes the situation as complex and little understood.

Kimura, in a series of experiments with "normal" (as distinct from brain-damaged) persons (1973), investigated the extent that the aural and visual senses "cross," i.e., the extent that the left hemisphere responds to stimuli from the "opposite" side. Given that such crossing existed, she was especially interested in its nature. For the auditory system, she found evidence that the aural system is not completely crossed. She developed a dichotic listening task in which a headset played back two melodies simultaneously, one to each ear. When "normal" subjects were asked to pick out the two melodies from four presented to both ears, they were able to pick out the melody associated with the left ear better, indicating a dominant connection with the right hemisphere.

The crossing of the visual system is more complex. For each eye, each half of the visual field is connected to the opposite hemisphere. In the left eye, for example, the right visual field is connected to the right hemisphere. Thus, given visual activity and eye movements, each hemisphere receives stimuli from the general visual field of the person who is looking.

If a person fixates on a particular point, however, the visual input to each hemisphere can be stabilized (see Figure 3).*

When this fixation procedure was set up, Kimura found that words and letters (when presented tachistoscopicly) were reported more accurately from the right visual (left hemisphere) than from the left field (right hemisphere). She concluded that ". . . recognition of visual verbal material is more accurate when such material initially stimulates the left hemisphere" (p. 4). Using Levie and Dicke's terms, the left hemisphere may be more responsive to digital stimuli.

Does then, the right hemisphere respond more effectively to iconic stimuli? Kimura, working with Dunsford, created a device that: (1) fixated a subject's gaze; (2) provided for stereo-optical images; and (3) provided for tachistoscopic exposure of the three-dimensional material. They found that the right hemisphere was clearly superior in analyzing information about where objects are located in space. In related studies, Kimura found: (1) a small but consistent superiority for the right hemisphere in slope identification; and (2) absence of right hemisphere superiority in the perception of form. She concludes that portions of the right hemisphere are involved with direct analysis

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*Adapted from Kimura, p. 5.

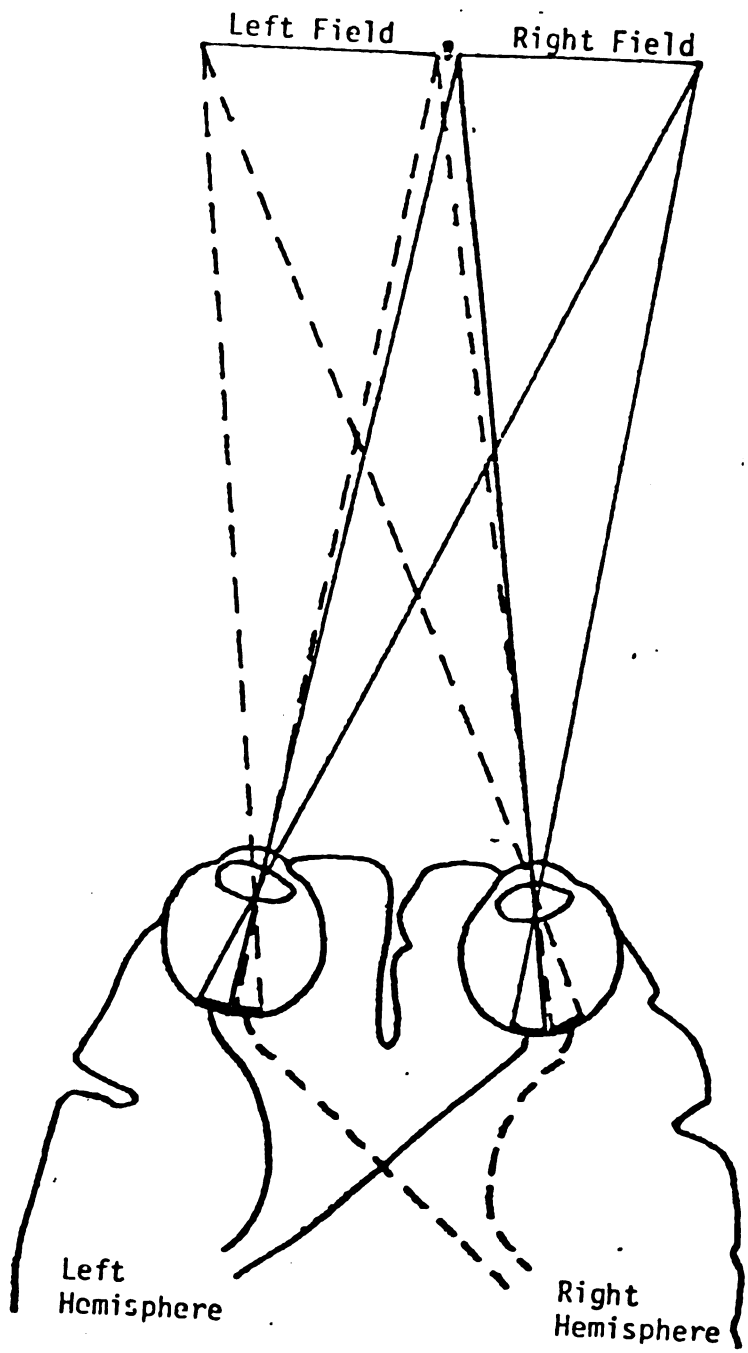


Figure 3. Visual Fields Related to Hemispheres.

of information about the external environment, spatial relations, and processing nonspatial stimuli such as melodic patterns and nonsense designs.

Kimura describes the interaction of the hemispheres, via the corpus callosum, as complex, with much to be learned about how transfer processing takes place. The effect of transfer can be explained; right hemisphere superiority in spatial perception can be demonstrated even though the subject gives a verbal response that is controlled by his left hemisphere. It may be that primary analysis takes places in the right hemisphere and the verbal response is secondary.

This hemisphere specialization has been studied by Gazzaniga (1967) using subjects who had "split brains," cerebral hemispheres in which the corpus callosum has been separated. Using a fixed-point tachistoscopic setup similar to Kimura's, Gazzaniga presented pictures of objects, a spoon for example. When these pictures were presented to the right visual field, the subjects, via their left hemisphere, had no trouble identifying them. When presented to the left visual field, however, the pictures failed to evoke appropriate responses; subjects either guessed or said or wrote nothing. Yet when the pictures were shown to the left visual field, a cigarette for example, patients could feel around with the left hand among objects screened from sight and select an ashtray, on being asked to choose the article most closely related to the picture.

Calder, cited above, also illustrated the functions of split-brained persons. He described a situation where such a person was presented a picture of a face: a woman's half-face was on the left and a girl's half-face on the right. When the person was shown

several other faces (including the woman's and the girl's) and was asked to say what was seen, will say "girl." But if asked to point (i.e., implying recognition), the person pointed to the woman's face. The left hemisphere controls speech, and so the person "says" what is seen on the right--the girl's face. But since the right hemisphere controls recognizing and guiding eyes and hands, the person points to what is "seen," the woman's half-face. Normally the cooperation of the hemispheres masks their separateness.

The emotional components of the individual hemispheres was studied by Dimond et al. (1976). They prepared two sets of special contact lenses for normal subjects. One set limited vision to the right hemifield, the other to the left. Thus, when subjects watched three motion picture films (each about three minutes long), some perceived images only in the right hemisphere (via the left hemifield) or the left hemisphere (via the right hemifield). The three films were: (1) a Tom and Jerry cartoon; (2) a medical operation; and (3) a travelogue. After each film, the twenty-one subjects (18-24 years old) rated it on four nine-point scales: (1) unknown, (2) unpleasant, (3) horrific, (4) pleasant. The results indicated that (1) the left hemisphere ratings were the same as a control group without contact lenses, (2) the right hemisphere ratings were significantly more unpleasant for all three films and more horrific for all films except the travelogue. The authors suggest that ". . . the two hemispheres of the brain of man possess an essentially different emotional vision of the world" (Dimond et al., p. 691). The right hemisphere adds an emotional dimension that perceives a thing as more unpleasant and

horrible. Each hemisphere makes a contribution to the whole, but the authors assume the left hemisphere predominates.

Ornstein has generalized the specializations of the hemispheres as two modes of consciousness. While avoiding the idea of binary classifications, he gave a table of right and left hemispheric characteristics (Table 1).

Table 1.--The Two Modes of Consciousness: A Tentative Dichotomy.*

Left Hemisphere	Right Hemisphere
Intellectual	Sensuous
Active	Receptive
Explicit	Tacit
Analytic	Gestalt
Lineal	Nonlineal
Sequential	Simultaneous
Focal	Diffuse
Time	Space
Verbal	Spatial
Intellectual	Intuitive
Argument	Experience

*Adapted from Ornstein, p. 67.

Ornstein also indicates that some persons habitually prefer, or at least operate, in one mode or the other. This raises the issue of concern of cerebral dominance, or preference and the general emphasis on one hemisphere at the expense of the other.

Grady, in an article that describes the school system as giving the right hemispheres of students minimal attention compared to the left, discusses using instructional strategies to educate both hemispheres (1976). He describes the first phase of instructional technology as media ". . . done to students . . ." (p. 48) and notes the move to the current, second phase, as one where the student has a more active, creative role, and so increases right-hemisphere use.

Samples, writing about science education, describes attempts to create classroom environments ". . . in which the intuitive-metaphoric functions of the right cerebral hemisphere were as legitimate as the left hemispheric function" (Samples, 1975, p. 23).

Rennels, cited above, has done laboratory research using electroencephalographic equipment and has concluded that differences do exist in cerebral dominance among adults. He notes that graduate students in art, for example, have lower GRE scores in the linear areas of studies, and infers that they have maintained a highly developed right-hemisphere dominance in spite of educational and sociological pressures. He concludes that education should concentrate on neurological symmetry.

Crinella, cited above, notes that ". . . there seems to be little doubt that our educational system is characterized by a heavily 'left-brained' (or 'right-winged') philosophy, valuing the acquisition and manipulation of language and symbols foremost, at the expense of self-awareness, spatial schemata, music and the fine arts" (p. 2050). Current social problems are associated with the demise of the culture that ". . . 'educated the hemisphere that wields the sword'" (p. 2050).

The right/left hemispheric specializations can be linked to constructs of internal processing. Paivio, cited earlier, describes visual imagery as parallel processing, storing and manipulating information about spatially organized objects and events; it is dynamic and can perform swift symbolic transformations. Verbal imagery is sequential, more static, and related to serial memory (p. 9). Both imaginal abd verbal processes interact with stimulus conditions to determine perceptual phenomena. Also, recognition is a function of percpetion interacting with long-term memory; thus there is an information processing component of recognition.

Although the visual and verbal processes Paivio describes are essentially learner characteristics, he does specify elements of stimulus meaning. These are: (1) familiarity; (2) verbal codability; and (3) word concreteness and meaningfulness. It appears that these three elements can be related to the three-dimensional stimulus matrix defined earlier.

Paivio also cites work by Brenda Milner and her associates at the Montreal Neurological Institute as providing some ". . . of the clearest evidence for the verbal-nonverbal functional distinction . . ." (Paivio, p. 522). In studies of patients with lesions in either right or left hemispheres, left hemisphere lesions were associated with behavioral deficits that were conceptualized as a loss in verbal symbolic abilities, and right hemisphere lesions produced selective deficits in patients' abilities to process concrete (nonverbal) information from memory. Paivio concludes that ". . . brain lesions apparently can produce individuals whose abilities correspond roughly

to the verbal and nonverbal imagery types of the post-Galton era" (p. 523).

Levie and Levie performed a series of experiments to obtain evidence regarding the dual-coding hypothesis (such as Paivio's) or the single-system hypothesis of human memory (1974). They conclude that: (1) there is indeed a separate visual iconic memory system, but the separateness may be preserved only when no verbal transactions are necessary; (2) retention of pictures will be good if the measure is recognition; and (3) loss of picture information will be high if tested by verbal report.

Paivio notes than Sheehan (1966) found accuracy of visual memory to be related to individual differences in imagery. Sheehan described poor imagers as being more dependent on symbolic coding (perhaps verbally) in order to remember them. Sheehan concludes that vivid imagers perceive literally, while poor imagers use coding devices (e.g., habit or ability) to organize their perceptions. Paivio also speculated that high imagers would perceive and retain incidental visual cues because there is no verbal coding, but with intentional cues, there may be no difference because low imagers code and store the cues verbally.

Other work links imagery and components of instructional procedures. Di-Vesta (1971) conducted a series of seven studies investigating interactions between imagery-ability and treatments related to instructional procedures. He tried to relate imagery-ability as an individual difference to stimulus aspects and to learner information processing components. Additionally, Di-Vesta compared subjective and objective reports of imagery ability. General findings included:

1. Imaginal and verbal processing are distinct. Imaginal processing was found to be more effective for concrete words and verbal processing was more effective for abstract words.

2. Imagery-ability was found to be a general indicant of ability to process information by verbal or imaginal strategies.

3. The acquisition by all subjects was facilitated more by pictorial than verbal presentations.

4. Picture-word order was more effective for learning, transfer and recall than word-picture order.

5. Verbal ability and imaginal-ability factors are orthogonal rather than bi-polar. Subjective reports of imagery contained a strong element of social desirability.

6. Paivio's two-stage model of associative learning (imaginal/verbal) was supported.

The implications of Di Vesta's studies for the present study are first, that with regard to verbal and visual organizers, imagery appears to be an adequate and relevant measure. Di Vesta's stimulus materials were isolated units--words and pictures as individual stimuli, in various combinations, sometimes as paired-associate sequences. In the present study, the stimuli are more complex; paragraphs and sequences of pictures would be used.

Second, Di Vesta's finding that the pictorial mode was generally more effective implies the hypothesis for the present study that the visual organizer should be significant, with the visual-organizer means being higher.

Third, the verbal organizer treatment could represent a word-picture treatment, which was one of Di Vesta's combinations, and so

should represent an ineffective combination. This should heighten the main effect noted above. Thus the conclusion is made for the present study that imagery is centrally related to the functioning of the right hemisphere, although the nature of the relationship is not completely understood.

Instruments to assess imagery for the present study include one based on Paivio's work and a second developed by Sheehan. Additionally an instrument designed by Sherman and Kulhavy was used.

Boutwell's test of visual imagery is based on one developed by Paivio et al. (1968). Paivio generated a list of 925 nouns that subjects scaled on (1) abstractness-concreteness, (2) imagery, and (3) meaningfulness, in terms of each word's capacity to arouse nonverbal images. The assumption was made that because of their consistent association with specific objects and events, concrete nouns were particularly effective stimuli for the arousal of sensory images. Paivio et al. hypothesized that stimulus-evoked images ". . . could function as mediators of response recall in paired-associate (PA) learning situations, much as they have long been assumed to do in mnemonic techniques that involve the use of imagery . . ." (Paivio et al., p. 2).

Paivio et al. further comment that "this heuristic theory has been supported by the findings that concrete nouns exceed abstract

nouns in imagery according to rating scales . . ., reaction time, . . . and physiological evidence . . ." (p. 2). The method of categorizing persons as high or low imagers in his work was the mean of subjects' ratings, on a seven-point scale, of the ease with which a word aroused sensory images.

There were thirty subjects in Paivio et al.'s studies all of whome were university students ranging in age from 17 to 46 years (median 19-20 yrs.). The resultant overall mean was 4.97 with a standard deviation of 1.93. The frequency distribution of the scaled attributes indicated that imagery was negatively skewed, with a high proportion of nouns falling within the range 6-7 (high imagery). The intergroup reliability was calculated to be 0.94. The imagery values also correlated 0.87 with scale values from Paivio's previous research. The Pearsonian correlation, indicating within-group stability, was 0.98.

Boutwell (1974) extracted fifty-four nouns from Paivio's original set of 925 for use in a study in differentiated imagery. Means of the 54 nouns correlated 0.98 to Paivio's list. The method Boutwell used to categorize subjects as High or Low imagers is described in a later section.

In a study that used both the noun test and Sheehan's QMI (described next), Boutwell administered the instruments to ninety-eight undergraduate students. The correlation of scores on the two tests led Boutwell to conclude that construct validity existed.

The second mental imagery instrument used in the present study was developed by Sheehan (1967a). Sheehan created a short form of Betts' questionnaire on mental imagery. In 1909 Betts developed a

150-item questionnaire to measure mental imagery that remains the most comprehensive test of imagery available. The questionnaire predicts a subject's capacity to image in a variety of sensory modalities, visual, auditory, cutaneous, etc. Sheehan used factor analysis and determined that a single factor (or component) was largely responsible for the variance of scores within each modality in the Betts' instrument. Seven modalities were included: visual, auditory, cutaneous, kinaesthetic, gustatory, olfactory, and organic. Sheehan selected five items from each modality, based on: (1) a high loading on the main component (around 0.69 and 0.70); (2) similar means and standard deviations, and (3) no appreciable differences in correlation for the two sexes.

Sheehan then administered this 35-item instrument to a sample of sixty college student subjects (32 female). The resulting data were factor analyzed and again, he found a single component to be largely responsible for the variance. He also obtained a correlation of 0.92 between the total scores based on the complete Betts scale and the shortened 35-item form. Sheehan concluded that the shortened instrument predicted subjects' overall imagery score about as well as Betts' complete questionnaire. He later replicated the study with a sample of teacher's college students and obtained a correlation of 0.98.

Finally, since the shortened QMI was developed in Australia, Sheehan reported a study to establish the reliability of the test and its suitability for testing with American college students (1967b). In a test-retest procedure spaced over a seven-month period, results were (1) individual differences were reliably shown, (2) the

test-retest of both the total and visual scales as measured by the Pearson correlation method, was 0.78, (3) there were no significant differences in the vividness ratings over the two samples (except for the organic modality: American reported higher imagery), and (4) there was no significant difference between the American and Australian samples in the average ratings.

The third and final mental imagery instrument was the Laterality Assessment Inventory developed by Sherman and Kulhavy (1976). This instrument was designed to determine "cerebral laterality," i.e., to discriminate between right- and left-dominant groups. The instrument assesses both fine and gross motor activities of the hands, arms, legs, and feet. Subjects respond on a five-point scale for each of the forty-five items. For each subject, the score generated is a continuous variable, extending from pure right- to pure left-handedness.

Sherman and Kulhavy began development of the instrument by reviewing four general techniques for determining right- or left-sidedness: (1) those focusing on morphological and morphofunctional characteristics, (2) batteries of manual tests of sidedness, (3) special techniques, and (4) questionnaires about sidedness. They concluded that the most practical and reliable methods involve questionnaires.

Then, currently-used questionnaires were criticized for: (1) not getting at the underlying structure of the laterality dimension, (2) splitting the laterality dimension into discrete left- and right-sections. The present instrument viewed laterality as a continuous variable, extending from pure right- to pure left-handedness.

Sherman and Kulhavy generated forty-five action descriptions, each requiring the use of hands. A five-point scale used varied from

"Right Always" to "Left Always." This instrument was given to one thousand undergraduate students (367 males, 633 females). For each subject, two scores were computed. First, a total "Right" score was obtained by summing the "Right Always" and "Right Mostly" responses. The same was done to obtain a "Left" score. The ratio of these two scores provided an estimate of the relative dominance of one side over the other.

For the second score, each response category was weighted from "Right Always" = 1, to "Left Always" = 5. The total number of responses for each category was multiplied by that category's weight. The five products were then summed, forming a composite laterality coefficient that ranged from 45 (all "Right Always" responses to 225 (all "Left Always" responses).

Analysis of the subject data yielded several findings. First, using the laterality coefficients, Sherman and Kulhavy found that the proportion of handedness across sex was not significant. The distribution of laterality coefficients revealed that most of the group was right-dominant. Only about 10 percent of the subjects were clearly left-dominant.

Second, Sherman and Kulhavy computed Cronbach's coefficient alpha for the composite instrument and obtained a value of 0.97. The split-half reliability was 0.98.

Third, Sherman and Kulhavy performed a factor analysis by intercorrelating the responses using Pearson product-moment correlation coefficients. Kaiser's Varimax rotation procedure was also used with normalization. Sherman and Kulhavy inferred from the structure a general laterality factor that accounted for 81.8 percent of the total variance.

Sherman and Kulhavy also obtained data from a separate group of 200 undergraduates to assess the overall predictability of a discriminant function, previously computed. Discriminant scores were computed for these individuals, based on the weights derived from the analysis of the original sample. Predictions of group membership based on this discriminant function were found to be 99 percent accurate, with only 2 cases classified incorrectly. Thus, this function appears to distinguish accurately between groups of right- and left (mixed)-dominant persons.

Finally, in an effort to obtain additional validity data, Sherman and Kulhavy, in a follow-up study, asked thirty subjects (fifteen right-handed, fifteen left-handed) to return two months after filling out the instrument. These subjects were then asked to perform a series of eighteen activities. These performances related to the three items loading heaviest on each of the six factors originally identified. Performances were scored 1 for right, 3 for both, and 5 for left responses. Pearson product-moment correlations were computed between original verbal report and actual manual performance. Except for one item, these correlations were all highly significant. Also, the overall correlation coefficient between verbal report and manual performance was .98, indicating that the instrument has a high degree of predictive validity.

Summary of Learner Characteristics Related to Advance Organizers and Pictures

The second major division of the literature review has been devoted to examining relevant learner characteristics related to advance organizers, especially in a visual mode. Learner characteristics were general ability, age, prior knowledge, sex and cerebral functioning. It appears that this set of variables can be controlled by population selection, or measured and accounted for in an experimental procedure. For cerebral functioning, a linkage has been made between: (1) hemispheric specialization and dominance, and (2) visual and verbal imagery. Finally, instruments to assess imagery have been described.

Situation Characteristics

The third and final major division of this literature review is related to situation characteristics of an instructional situation, especially when advance organizers are used.

At the conclusion of the Hartley and Davies review of pre-instructional strategies, cited earlier, they discuss when advance organizers should be used, and say that ". . . situations requiring some sort of conceptual framework that students can subsequently use to help clarify the task ahead" (p. 259) may be best. They add that the content should already possess a dominant structure that relates well to students' existing knowledge and that the learning tasks should be relatively short in length.

However, Barnes and Clawson, in their review, state that the length of treatment is not a critical variable. As a result of

several studies, they further conclude that there is no clear relationship between the effect of advance organizers and the content area of the instruction.

Regarding conditions then, the Hartley and Davies and Barnes and Clawson reviews indicate that (1) there should exist a "need" for a clarifying structure or framework for the learning task, and (2) the content of the learning task should have a strong, visible structure that is not completely novel to students. Finally, the visual learning task should not be predominantly analytic, i.e., a consideration of parts, but holistic, based on considerations of whole patterns.

Summary of Literature Review

The literature has been examined in terms of stimulus, learner and situation characteristics of an instructional task where advance organizers, especially visual advance organizers, might be used. The primary conclusions of the literature review can be stated as tentative assertions. First, the opportunities to specify key components of advance organizers may be enhanced by using a stimulus matrix such as has been described. For the present study, advance organizers may be generated that are characterized as activating recall, i.e., sensitizing leaners to earlier, relevant cognitive strategies. Additionally, advance organizers for the present study could be categorized as having concrete semantic content, having shape, texture and form as dominant stimulus aspects. Finally, such advance organizers could be either visual or verbal in nature.

Second, left and right hemispheric functioning, especially as expressed in individual differences, may be an important learner variable with respect to advance organizers.

Finally, the literature review indicates that both learner characteristics and situation variables can be specified.

CHAPTER III

DESIGN OF THE STUDY

Overview of the Chapter

This chapter contains description of: the research questions and hypotheses; definitions of important terms; the research design including descriptions of the instruments used; the learning stimulus and experimental treatments; and subjects used. Internal and external validity factors are discussed and the design over variables is given. Finally the statistical hypotheses are listed and the procedures used in the study are described.

Research Questions

The following research questions are drawn from the purpose of the study and review of the literature.

1. Given a visual discrimination learning task, is there a difference in the effectiveness of visual and verbal advance organizers?

2. Given a visual discrimination learning task, is there a difference in the performance of students with different cerebral hemispheric functioning?

3. Is differential hemispheric functioning a factor in performance differences associated with visual and verbal advance organizers?

From these research questions, the following specific research hypotheses are formulated.

Research Hypotheses for This Study

1. The mean score associated with the visual advance organizer will exceed those of the verbal organizer and a control group.

2. The mean scores associated with high imaging subjects will exceed those of low imaging subjects.

3. There will be a type of advance organizer by subject imagery-level interaction.

Definitions of Important Terms

1. Verbal Advance Organizer--A written paragraph or two given to a learner prior to an instructional task. ". . . organizers provide relevant ideational scaffolding, enhancing the discriminability of the new learning material from previously learned related ideas, and otherwise effect integrative reconciliation at a level of abstraction, generality, and inclusiveness which is much higher than that of the learning material itself" (Ausubel, 1963, p. 214).

2. Visual Advance Organizer--A series of photographs given to a learner prior to an instructional task. The nature of a visual advance organizer springs from Ausubel's writing, as does that of verbal organizers. Ausubel's organizers are generated for "didactic exposition," (Ausubel, 1963, p. 81), i.e., expository teaching. Organizers also are based on the principle of integrative reconciliation, i.e., by showing how previously learned, related ideas are similar or different from the new ideas to be presented (Ausubel, 1963, p. 82). The goal of an organizer is to specify clearly, precisely

and explicitly the important similarities and differences between the new ideas and related extant knowledge (Ausubel, 1963, p. 83).

A visual advance organizer is not a visual argument, but is expository, meaning ". . . to open up, to place out, to lay open, to unfold" (Friedman and McLaughlin, 1969, p. 54). Considering exposition, a visual advance organizer could include elements of illustration, comparison and contrast, and classification. Visual classification could include subsumption, i.e., the presentation of one class of objects as being part of a larger class. As exposition, the visual advance organizer would not include attempts of definition, analysis, or presenting chronological order.

Further, the visual would not be objective in the sense that it would analyze ". . . the object into its significant parts and discuss each in turn, following an order that reflects a principle of organization inherent in the object itself" (Kane and Peters, 1969, p. 155). Instead it would be subjective: the observer would be a visual participant.

The major goal of the visual advance organizer is relational. Both stimulus differentiation and generalization of the concepts would be used. Thus the organizer would have both parallel and sequential stimulus presentations. As part of the learning task, it would present simple wholes, starting the presentation process toward complex wholes.

3. Cerebral hemispheric functioning--The association of different modes of information processing with each of the cerebral hemispheres. The general association is one of verbal/logical processes related to the left hemisphere and pictorial/holistic processes related to the right hemisphere.

4. Imagery--The extent to which individuals have competence in or preference for clear and strong images in the various sensory modes: visual, aural, olfactory, etc. Measurement of the extent of imagery is used to infer the extent of right hemisphere specialization competence or preference.

5. Learners--College students who are subjects in the experiment. Learners are divided into two groups:

a. High Imagers--Those learners who have an extensive competence in or preference for imagery as measured by imagery tests. Right hemispheric competence or preference is associated with high images.

b. Low Imagers--Those learners who have a reduced competence in or preference for imagery as measured by imagery tests. A reduced right hemisphere competence or preference is associated with low imagers.

6. Visual discrimination learning task--An audiovisual presentation, such as a slide/tape program, where the primary instructional goal is to teach the visual discrimination of things or events in a holistic or patterned way.

Design of the Study

The overall design had several main elements.

1. Observations consisted of three instruments to assign subjects to a High or Low imagery group, and one instrument to assess the hypothesized differences in learning--the dependent variable.

2. The learning task consisted of a series of projected slides designed to teach the difference between art objects from the Art Nouveau period from objects of other periods.

3. Three treatments were administered, each to a subject group. First, a verbal advance organizer, in written form was generated. Second, a visual advance organizer, in pictorial form was generated. Finally, a control treatment was generated, in written form, that occupied a time equal to each of the other treatments.

4. Graduate and undergraduate students at MSU were recruited as subjects. Data from seventy-two subjects were analyzed.

5. The primary statistic used in the study was an analysis of variance. In addition, correlation and factor analyses were undertaken.

The overall procedure had the following sequence:

1. Administration of two of the three instruments to assess imagery.

2. Random assignment of treatments to subjects and administration of the treatments.

3. Administration of the learning task.

4. Administration of the learning task posttest.

5. Administration of the third instrument to assess imagery.

6. Limited debriefing.

The study took the form of random assignment of subjects to one of three treatments, and observations to assess degree of imagery and treatment effects. The design is illustrated below:

Treatment I $O_{1A}\ O_{1B}\ RX_1\ O_{1C}\ O_2$

Treatment II $O_{1A}\ O_{1B}\ RX_2\ O_{1C}\ O_2$

Treatment III $O_{1A}\ O_{1B}\ RX_3\ O_{1C}\ O_2$

O_{1A}, O_{1B}, and O_{1C} are instruments designed to assess vividness of imagery and handedness.

O_2 is a learning performance instrument.

X_1 used a visual (pictorial) advance organizer.

X_2 used a verbal (written) advance organizer.

X_3 (control group) used verbal (written) irrelevant material.

Instrumentation

Measures. Two measures were used in the study. First, each subject was assessed in terms of his/her mental imagery. This measurement was made in order to categorize each subject as either a High or Low imager. The rationale for the measure was that the degree of mental imagery could be used to infer the extent to which the subject's right hemisphere was dominant. The measure as utilized in this study had three individual-difference components: (1) the degree of imagery associated with each word in a set of nouns, (2) the degree of imagery vividness conjured up by short descriptions of various situations, and (3) the extent of left- or right-handedness. The three instruments that comprise this measure are described in the Instruments section below.

The second measure was related to the learning task in that it assessed the degree of learning that took place as a result of the treatments. This measure was constructed by the researcher to provide

data on the dependent variable. The rationale for the measure was that differences due to both the treatment and imagery category would be observed in the data associated with this measure. That is, effects due to different advance organizers could be seen as higher or lower scores, and effects due to imagery categories (high or low) could also be seen as higher or lower scores.

Instruments. As noted above, O_1 consisted of three instruments while O_2 consisted of a single instrument.

The three instruments used to assess mental imagery were (1) Boutwell's test of visual imagery, (2) Sheehan's short form of Betts' questionnaire on mental imagery, and (3) the Sherman-Kulhavy Laterality Assessment Inventory.

Boutwell's test consisted of fifty nouns, presented to subjects in the format of ten words per page. A computer system was used to randomly order and print the words, so that separate test orders were available to subjects. Each subject rated each of the fifty words on a seven-point scale from "High" to "Low" imagery, based on the extent that each noun aroused mental images for a subject.

Sheehan's QMI test consisted of thirty-five items. Subjects were asked to rate each descriptive situation on a seven-point scale, from "perfectly clear" to "no image present at all."

The Sherman-Kulhavy Laterality Assessment instrument consisted of forty-five items. For each item, subjects were asked to indicate whether they used their right or left hands, and their consistency of using that hand. A five-point scale was used, ranging from "Right always" to "Left always."

The final instrument was one designed by the researcher to measure the learning that took place as a result of the treatments. The instrument consisted of twelve items. Each item was made up of three projected slides. The first two slides were photographic copies of art objects. The third slide presented the scale to be used in responding and is illustrated in Figure 4.

1	2	3	4
First slide	Second slide	Both slides	Neither slide

Figure 4. Scale Used in Learning Stimulus Posttest.

For each of the twelve pairs of art-style slides, subjects were to decide which slide or slides were examples of Art Nouveau and mark their responses on answer sheets. The slides showing Art Nouveau objects are shown in Figure 5.

1. First	5. Both	9. Second
2. Second	6. Both	10. Second
3. First	7. First	11. Neither
4. Neither	8. Second	12. Neither

Figure 5. Art Style Picture Combinations.

After the frequency of each response was determined, the sequence of items was determined by use of a table of random numbers.

A copy of the audio-taped instructions and a short description of each of the test slides is included in Appendix A.

To test the instrument, it was given to four people who had not seen the learning stimuli and had no particular specialization in art. The mean score correct was 3.5; the maximum score correct was 4; and

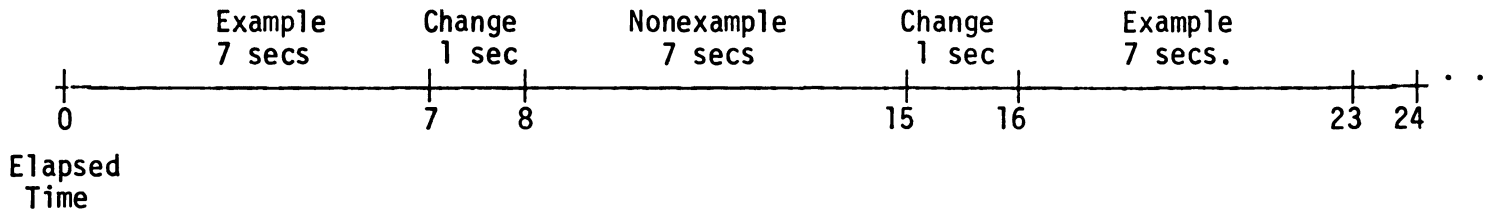
the minimum score correct was 3. Additionally, the instrument was administered to a faculty member in the MSU Art Department. This faculty, who was familiar with the art-styles involved, scored all twelve items correctly.

Learning Stimulus

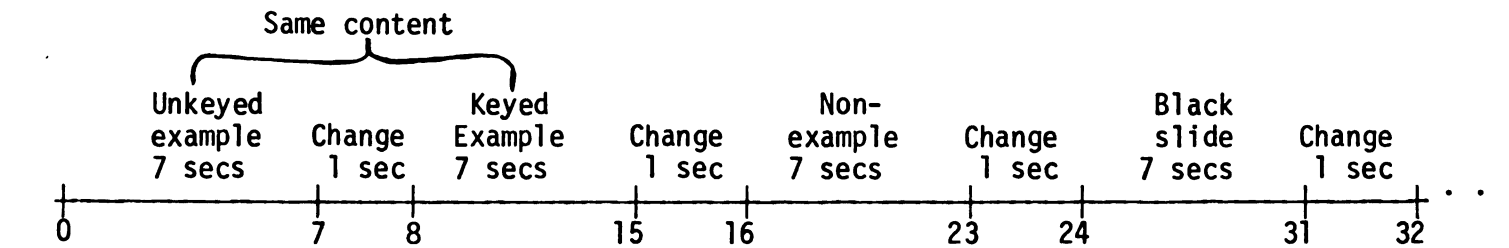
The basic task of the learning stimulus was to teach the differentiation of Art Nouveau from two other, somewhat temporally related, art-styles (Baroque and Art Deco). Thus, the learning task was basically visual discrimination. The stimulus materials were photographic copies of various art objects in art picture books. Slide-film was used and the resulting slides sequenced. The sequence had two components. The first component included examples and non-examples of Art Nouveau arranged sequentially; each example was keyed with a small hole punched in the upper right corner of the slide (occupying 1.0 percent of the picture area). The second component differed in that each example was first presented unkeyed (without the punched hole) and then followed by a second, keyed repetition. Thus, subjects had the opportunity to judge whether the slide was an example of Art Nouveau or not, and then to receive confirmation. Nonexample slides were followed by a black slide (blank screen).

Timing of the slide presentations for each of the two components is shown in Figure 6.

It can be seen that during the second sequence, where unkeyed examples were followed by keyed examples, the total exposure of the examples was twice that of the nonexamples. Each slide however, whether example (keyed or not), nonexample, or black slide, was



Timing for sequence of keyed examples and nonexamples.



Timing for sequence of unkeyed followed by keyed examples and nonexamples followed by black slides.

Figure 6. Timing of Projected Slides.

presented for seven seconds. Slide-change pulses were recorded on magnetic tape to effect these changes, and to increase the timing precision for each group of subjects.

The transition from the first sequence of slides to the second sequence was made by use of audio-taped instructions and an explanation; the screen was black during this explanation. Each slide in the instructional sequence was presented for seven seconds. The text of the audio comments is included in Appendix B, along with a short description of each slide and an indication of the sequence.

Experimental Treatments

Three experimental treatments were used, each followed by the learning stimulus, described above. The treatments were distributed randomly among subjects.

1. Visual Advance Organizers. The first treatment consisted of six photographs presented in sequence to each subject. An attempt was made to illustrate the relationships between Art Nouveau and other art styles, and between art styles and their general visual antecedents. The art objects pictured were photographically copied from art books. Descriptions of the six photographs making up the visual advance organizer are included in Appendix C.

2. Verbal Advance Organizer. The second treatment consisted of a verbal advance organizer, in written form. An attempt was made to describe the learning task at a high level of generality, and to link it with other, general knowledge. This treatment is included in Appendix D.

3. Control group. The control group treatment consisted of a paragraph of material about art masterpieces not related to the learning task or the posttest. This paragraph is included in Appendix E.

Subjects

Subjects were 115 graduate and undergraduate students at MSU. Two processes for selecting students were used. First, a set of instructors was solicited to permit the experimental procedure to occur during classtime, with all class members participating. Second, a procedure was used whereby individual student volunteers were solicited from various classes. These volunteers then met at a common time for the experimental procedure. Students who participated in this second procedure received extra course credit.

Subject Imagery Assignment Procedure

Considering imagery level, a procedure suggested by Boutwell* using scores obtained from Boutwell's Noun Test and Sheehan's QMI was modified and used. First, the Noun Test data were analyzed in such a way that the mean and standard deviation of responses for each word were computed. The words were then rank-ordered, from low mean to high mean. The researcher then examined the middle set of words, where the mean was near the middle of the seven-point scale and the standard deviations were greatest. Nine words were discarded leaving sixteen "Low" words and twenty-five "High" words. The words, with means and standard deviations, are presented in Appendix F. The mean of the "High" words and the mean of the "Low" words were then computed.

*Telephone conversation including Boutwell and Phelps.

The data were then analyzed subject by subject. For each subject, two means were computed, one for the "High" words and one for the "Low" words. Each subject's score was then computed using responses from Sheehan's QMI test. The overall QMI mean was also computed.

Categorization of each subject as a high- or low-imager was determined using three means: (1) the Noun Test "High" words, (2) the Noun Test "Low" words, and (3) the Sheehan QMI mean. A subject was categorized as a HIGH imager if: (1) his/her mean for the "High" words was higher than the overall "High" words mean; and (2) his/her mean for the "Low" words was higher than the overall "Low" words mean, and (3) his/her QMI mean was higher than the overall QMI mean. A subject was categorized as a LOW imager if: (1) his/her mean for the "High" words was lower than the overall "High" words mean, and (2) his/her mean for the "Low" words was lower than the overall "Low" words mean, and (3) his/her QMI mean was lower than the overall QMI mean. Subjects who did not fall into these categories were eliminated from further analysis.

Validity Concerns

As in all research, the internal and external validity of the study was affected by the design and events occurring during the course of the study. Validity will be discussed in terms of Campbell and Stanley's (1963) discussion.

Internal Validity. 1. Of 115 subjects initially tested, thirty-one completed the entire experimental process in one setting. The remaining eighty-four completed the process in two sessions,

spaced over a period of two to four days. For these subjects, Boutwell's Noun Test and Sheehan's QMI were administered during the first session, but the learning stimulus, posttest, and the Sherman-Kulhavy Test were given during the second session. Thus, the threat of effects due to history were minimized due to having a single setting for over one-fourth of the subjects, and keeping the delay for the remaining subjects to four days or less. Since the two instruments administered prior to the treatments and learning stimuli (Boutwell's Noun Test and Sheehan's QMI) were not related to the content of the learning stimuli (Art Nouveau and other art-styles), it is unlikely that any relevant learning took place due to these two instruments.

2. Statistical regression may have been a threat to internal validity because subjects were assigned to high- and low-imager groups on the basis of extreme scores (high and low) on the Noun Test and QMI instruments.

3. Internal validity was generally strengthened because of random assignment to treatments.

4. Experimental mortality did occur in the present study. Data from forty-three subjects had to be discarded because it was incomplete. All but three subjects in this category were ones in classes where the experimental procedure was in two sessions, as described earlier. Approximately half of these subjects did not appear for the second experimental session; in the remaining cases, control numbers on some of the response sheets were missing or incorrect. Although these subjects were evenly distributed among the classes that had two sessions, the experimental mortality does represent a threat to the internal validity of the study.

External Validity. Interaction effects of selection biases and the treatments represented a threat. Sampling from the population was not random, but consisted of blocks of volunteers (individual classes) and individual subject volunteers. This limits the generalizations that can be made from the study.

Further, the administration of the Noun Test and Sheehan's QMI may have increased the subjects' sensitivity to the treatments in some undetermined way other than "learning" as measured by the posttest instrument.

Finally, the subjects were aware they were part of an experiment.

Statistical Model of Analysis

The independent variables were (1) imagery level (High or Low) and (2) treatment group (visual advance organizer, verbal advance organizer, and control).

Since subjects were randomly assigned to one of three treatments (visual advance organizer, verbal advance organizer, or control group), there were three levels of the independent variable.

The dependent variable was the learning-stimulus posttest score for each of the subjects. The data were analyzed in terms of the number correct out of the total, twelve.

The variable matrix, showing the relationship of independent variables, is given below in Figure 7.

The hypotheses were tested via a two-way factorial analysis of variance at the $\alpha = 0.05$ level. Considering the variables defined above, it was assumed that the population sampled was normally

Imagery Level	Treatment Group		
	1 Visual Advance Organizer	2 Verbal Advance Organizer	3 Control
High			
Low			

Figure 7. Variable Matrix

distributed. No occurrences or events were observed by the researcher that tended to counter this assumption. Further, it was believed that the homogeneity of variances in the groups was the same due to random assignment. Finally, the dependent measures, learning stimulus posttest scores, were continuous data, and had equal intervals on the posttest scale. It was concluded by the researcher that the assumptions for the use of analysis of variance were met.

Statistical Hypotheses. Using the learning stimulus posttest scores as the dependent variable the following hypotheses were tested:

1. There will be no difference in the means of the three treatment groups.

2. There will be no difference in the means of the two imagery level groups.

3. There will be no treatment by imagery level interaction.

Procedures for the Study

Pilot Test

The experimental materials were pilot tested on a group of thirteen students. After the learning stimulus posttest, subjects were interviewed. This data and the posttest data revealed that the learning stimulus was inadequate. Subjects had expressed confusion regarding the task, and the data indicated that overall mean of correct responses was about 25 percent. Changes made based on these data included: (1) changing the pattern of the slides; (2) introducing the technique of delayed visual feedback, wherein subjects were asked to decided whether or not a slide was an example before a confirming slide was projected, and (3) revising the audio taped instructions. These changes resulted in substantially higher scores from subjects in a second pilot test. In this test, the mean was 6.46 with a standard deviation of 1.34 and an N of thirteen.

Experimental Procedures

Two procedures were followed; they differed in only one aspect. As noted earlier, 25 percent of the subjects received the Noun Test and Sheehan's QMI four days prior to the rest of the procedure. The description that follows will detail the procedures used for the other 75 percent.

The procedure was as follows:

1. The Noun Test and Sheehan's QMI were given to each subject, along with a treatment package (including the posttest), and the instrument on handedness. Subjects were told to read the instructions

for the Noun Test, complete it, and then read the instructions for Sheehan's QMI, and complete it.

2. After the subjects completed the two instruments, these data were collected. Subjects were then asked to listen to audio-taped instructions; these instructions were played. Subjects were asked to examine the treatment materials for a minute and a half.

3. After the ninety-second pause (the audio tape provided timing), taped instructions asked that the subjects stop their activity and direct their attention to a screen. The method of keying the concept to be learned was explained, and the learning stimulus slides sequence was shown, synchronized by the audio tape.

4. After the slide sequence, the taped instructions introduced the posttest and the response scale to be used. The tape was then stopped and the subjects asked if there were any questions (there were only two or three, with no pattern apparent). The tape was then restarted and the test slide sequence was shown, again synchronized by the tape.

5. At the end of the test sequence, the instrument on handedness was distributed. Subjects were asked to read the instructions and complete it.

6. When the handedness instrument was completed, the nature of the procedure was explained and subjects' questions were answered.

The procedure was repeated with subject groups ranging in size from five to forty. In two instances, the slide synchronization system partially failed and some of the slides during the learning stimulus slides were advanced by hand, using the sweep-second hand of a wrist watch for timing. Timing errors appeared not to exceed one second.

Chapter Summary

After presenting the research questions of the present study and listing definitions of terms, this chapter presented the design of the study. Finally, procedures of the study were described. Chapter IV will present the results of these procedures and will report the outcomes of hypotheses tests.

CHAPTER IV

ANALYSIS OF THE DATA

The data and their analyses are presented in this chapter. These results are then used to test the hypotheses of the study. Interpretation of these findings and conclusions will be presented in Chapter V.

The present study had two purposes. First, to examine the effects of verbal and visual advance organizers as components of a learning task. Second, to examine the effect of subjects' degree of imagery capability on differences in learning associated with verbal and visual advance organizers.

The hypotheses drawn from these purposes for testing after a review of relevant literature were:

1. Test scores associated with a visual advance organizer will exceed those associated with a verbal advance organizer and a control group.

2. Test scores of subjects categorized as high imagers will exceed those of subjects categorized as low imagers.

3. A type of organizer by learner degree of imagery interaction will be significant.

The primary statistic to test the hypotheses was a two-way factorial analysis of variance. Additional analyses included a correlation

procedure and factor analysis. For tests of significance of the findings, the alpha level was set at the .05 level on a two-tailed distribution.

Findings of the Study

One hundred fifteen subjects participated in the experimental procedure, in seven groups, ranging in size from six to forty. Data from forty-three of these subjects was discarded due to incompleteness. Thus, data from seventy-two subjects were entered into the high- and low-imagery categorization procedure.

Categorization of subjects as high- or low-imagers followed a specific sequence:

1. A mean scale rating for each of the fifty words in the Boutwell Noun Test was obtained. The fifty words were first placed in alphabetical order. Then the subjects' (N = 72) ratings of the first word were summed and the mean calculated. The same was done for the second word, and so on. The fifty means ranged from a low of 1.69 to a high of 6.61. Thus the means of the fifty words covered a range of 4.92 on the seven-point scale.

2. The means of the words were then used to rank the words themselves, from low-imagery words to high-imagery words. The words were thus distributed on an imagery continuum. "City" had the highest imagery rating; "impropriety" had the lowest.

3. The researcher then visually scanned the means of the words and eliminated a group of words in the center, thus creating a group of high-imagery words and a group of low imagery words. Nine words in the center were eliminated. The means of the high-imagery

words ranged from 6.61 to 4.60; the means of the low-imagery words ranged from 3.01 to 1.69. Twenty-five words were thus determined to be high-imagery words and sixteen determined to be low-imagery words.

4. The mean of the twenty-five high-imagery words was then calculated (5.602). In the same manner the mean of the sixteen low-imagery words was calculated (2.383).

5. These two means were then used as the first part of the high-imagery, low-imagery categorization process described below.

6. The mean score for all the subjects' ratings of Sheehan's QMI Test was then calculated. This mean was found to be 5.732.* This mean was used as the second part of the imagery categorization process.

7. The imagery categorization procedure itself had two steps and each subject was categorized individually. The complete categorization procedure is presented as a flowchart in Figure 8.

The first step was to compare each subject's high words mean and low words mean from the Boutwell Noun Test to the overall high words and low words means, previously calculated. Three outcomes were possible: (1) categorization of the subject (tentatively) as a high imager if both subject scores were higher than the overall means, (2) categorization as a low imager if both subject scores were lower than the overall means, and (3) discarding the data if the subject's high score was <u>higher</u> than the overall high mean but his/her low score was <u>lower</u> than the overall low mean, or if the subject's high score

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*In Boutwell's Noun Test, a scale-value of 7 indicated high-imagery, while the same scale value in Sheehan's QMI Test indicated low-imagery. For consistency in reporting results, the QMI scores are transformed by the equation 8-R = S, where R = subject rating and S = scale value used in reporting.

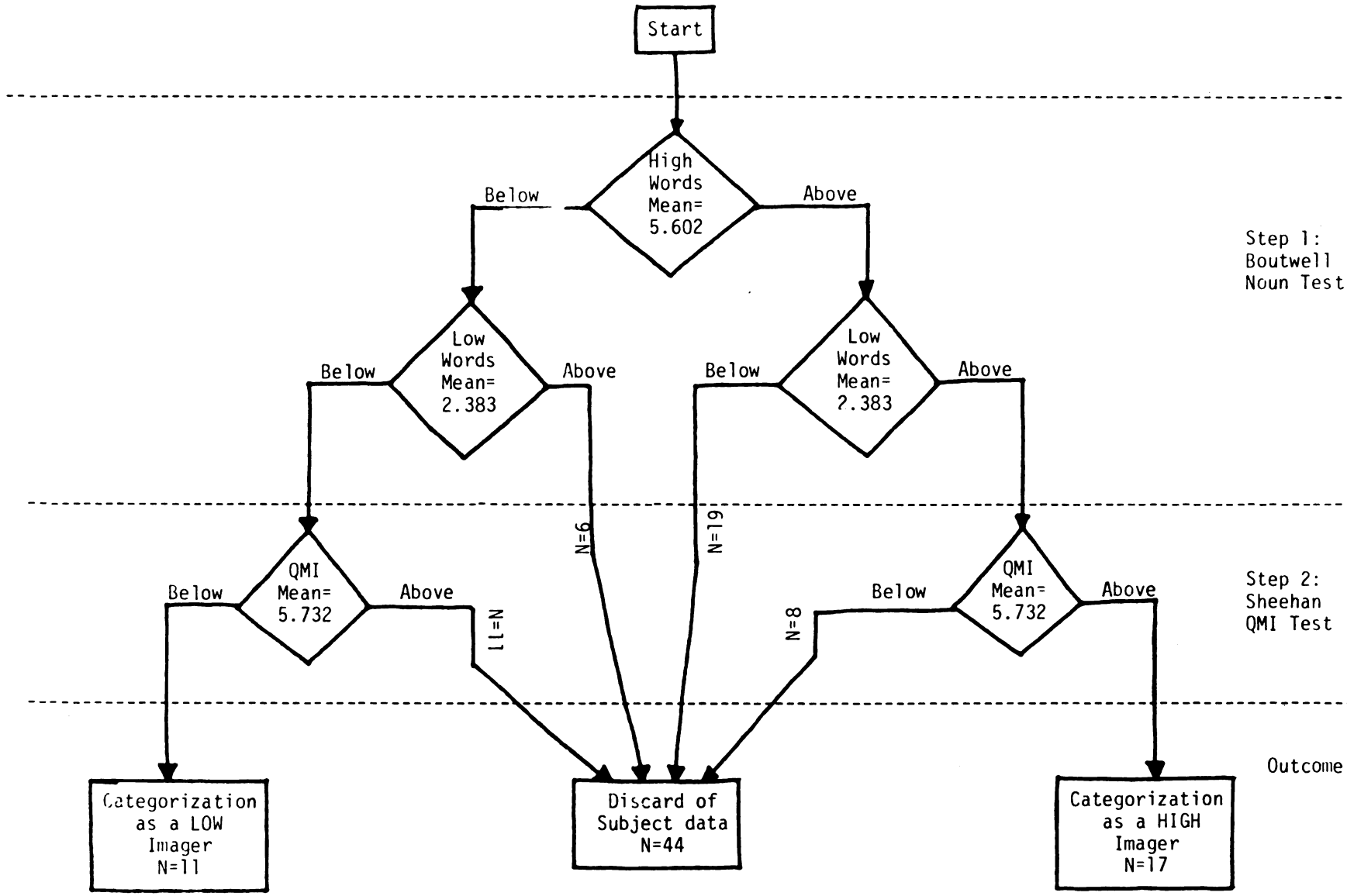


Figure 8. Flowchart of Categorization Procedure.

was lower than the overall high mean but his/her low score was higher than the overall low mean. Second, if the subject was tentatively categorized as a high- or low-imager, his/her score on Sheehan's QMI Test was compared with the overall QMI Test mean. Once again, three outcomes were possible: (1) final categorization as a high-imager if (s)he was "high" on the Noun Test and his/her QMI Test score was above the overall mean, (2) final categorization as a low-imager if (s)he was "low" on the Noun Test and his/her QMI Test score was below the overall mean, and (3) discarding the data for that subject if his/her categorization from the QMI Test score was inconsistent with that of the Noun Test. If the Noun Test category was high and the QMI Test category was low, or if the Noun Test category was low and the QMI Test was high, the subject's data were discarded.

As can be seen by referring to Figure 8, a subject was categorized as a high-imager if his high words mean exceeded 5.602, his/her low words mean exceeded 2.383, and his QMI Test score exceeded 5.732. In a similar manner, a subject was categorized as a low-imager if his/her three scores fell below the three means listed. Any other combination of scores caused the subject data to be discarded.

Figure 8 further reveals that seventeen subjects were categorized as high-imagers and eleven subjects as low-imagers. These twenty-eight subjects comprise only about 39 percent of the original group of seventy-two subjects. This outcome resulted in reduced cell sizes for the analyses of variance, to be described below.

Test Hypotheses

For purposes of statistical testing, the hypotheses of the present study will be expressed in null and alternate form.

Hypothesis 1.

Null: There will be no difference in the means of the visual advance organizer (T1), verbal advance organizer (T2), and control group (T3). $H_0 1 = \mu_{T1} = \mu_{T2} = \mu_{T3}$

Alternate: The means of the visual advance organizer (T1) will exceed those of the verbal advance organizer (T2), and the means of the verbal advance organizer will exceed those of the control group (T3). $H_1 1 = \mu_{T1} > \mu_{T2} > \mu_{T3}$

Hypotheses 2.

Null: There will be no difference in the means of the high-imagery subject group (I1) and the low-imagery subject group (I2). $H_0 2 = \mu_{I1} = \mu_{I2}$

Alternate: The means of the high-imagery subject group (I1) will exceed those of the low-imagery subject group (I2). $H_1 2 = \mu_{I1} > \mu_{I2}$

Hypothesis 3.

Null: There will be no type of advance organizer (T1, T2, T3) by subject imagery-level (I1, I2) interaction.

$$H_0 3 = \mu_{T1} = \mu_{T2} = \mu_{T3}|I1$$

$$\mu_{T1} = \mu_{T2} = \mu_{T3}|I2$$

Alternate: There will be a type of advance organizer (T1, T2, T3) by subject imagery-level (I1, I2) interaction.

$$H_1 3 = \mu_{T1} \neq \mu_{T2} \neq \mu_{T3}|I1$$

$$\mu_{T1} \neq \mu_{T2} \neq \mu_{T3}|I2$$

Two-Way Analysis of Variance

A two-way analysis of variance was performed on data from twenty-eight subjects. The dependent variable was the mean score on the learning stimulus posttest. The independent variables, cell means and sizes and sex distribution are presented in Table 2.

Table 2.--Cell Sizes, Means and Sex Distribution--Two-Way Analysis of Variance.

Imagery Level		Treatment Group			Totals
		Visual Advance Organizer	Verbal Advance Organizer	Control	
High	Size Sex Mean S.D.	N=7 M=2 F=5 4.57 2.15	N=3 M=0 F=3 4.00 1.00	N=7 M=2 F=5 5.00 1.83	N=17 M=4 F=13
Low	Size Sex Mean S.D.	N=3 M=1 F=2 5.33 0.58	N=4 M=2 F=2 5.75 1.26	N=4 M=1 F=3 4.50 1.73	N=11 M=4 F=7
Totals		N=10 M=3 F=7	N=7 M=2 F=5	N=11 M=3 F=8	N=28 M=8 F=20

The two-way analysis of variance results are presented in Table 3.

Table 3.--Two-Way Analysis of Variance Table for Learning Stimulus Posttest Scores.

Source of Variation	df	Mean Square	F	p
Treatment	2	0.09610	.03297	.96762
Imagery Level	1	1.74075	.59716	.44789
Interaction	2	2.68233	.92017	.41325
Error	22	2.91504		

Table 3 reveals that neither the treatment nor the imagery level main effects were significant at the $\alpha = .05$ level. In addition, the interaction term was not significant at the $\alpha = .05$ level. Thus, null hypotheses $H_0 1$, $H_0 2$ and $H_0 3$ were not rejected.

Correlation Procedure

In order to investigate the relationship of variables in the present study, a correlation procedure was used. For this procedure, data from seventy-one subjects were included (one subject was deleted because of a lack of data on the sex variable). Again, the larger group of subjects was used in the analysis in order to increase the size of the sample. Further, the procedure and results of the categorization procedure could be deleted because it was desired to examine the data as continuous scores rather than as discrete factors.

The eleven variables used for each subject in the correlation procedure are presented in Table 4.

Table 4.--Variables Used for Each Subject in Correlation Procedure.

Variable Number	Variable Name
1	Sex
2	Treatment Group--Visual Advance Organizer, Verbal Advance Organizer, Control
3	Boutwell Noun Test--Mean of all fifty words
4	Boutwell Noun Test--High words mean
5	Boutwell Noun Test--Low words mean
6	Sheehan's QMI Test--Mean of all items
7	Sheehan's QMI Test--Mean of Visual items (items 1-5)
8	Sherman-Kulhavy Test--Handedness Ratio
9	Sherman-Kulhavy Test--Laterality Coefficient
10	Learning stimulus posttest mean correct responses
11	The experimental group (classroom) each subject occupied.

The resultant correlation matrix is presented in Table 5. The interpretation of these correlation coefficients is based on the heuristic that any important relationship will be indicated by a coefficient of .35 or greater, indicating that at least 12 percent of the variance in the two variables being correlated is shared.

The correlation data reveal several patterns. First, when the treatments variable (variable 2) is compared with the dependent variable, the posttest mean correct responses (variable 10), the resulting correlation coefficient of -.04 indicates that there was essentially no relationship between the experimental treatments and the posttest scores.

Table 5.--Correlation of Variables.

	1	2	3	4	5	6	7	8	9	10	11
1	100	0	17	26	-4	14	30	-17	-14	10	5
2	0	100	0	-1	1	13	15	7	7	-4	-7
3	17	0	100	85	76	14	11	2	-1	2	-11
4	26	-1	85	100	35	5	2	7	3	5	3
5	-4	1	76	35	100	12	11	-7	-5	-1	-19
6	14	13	14	5	12	100	61	-8	-6	5	0
7	30	15	11	2	11	61	100	13	15	-4	-11
8	-17	7	2	7	-7	-8	13	100	88	-5	3
9	-14	7	-1	3	-5	-6	15	88	100	6	0
10	10	-4	2	5	-1	5	-4	-5	6	100	-14
11	5	-7	-11	3	-19	0	11	3	0	-14	100

Second, when the sex variable (variable 1) is compared with the other ten variables, it appears that sex did not relate importantly to any of these.

Third, when the experimental group (classroom, variable 11) the subject occupied for the procedures is compared with the other ten variables, it appears that it, too, was not an important factor.

Fourth, none of the variables associated with (1) Boutwell's Noun Test (variables 3, 4, 5) or (2) Sheehan's QMI Test (variables 6, 7) correlated at important levels. The coefficients were all positive, but at low levels.

Finally, none of the variables associated with (1) Boutwell's Noun Test and Sheehan's QMI Test (variables 3, 4, 5, 6, 7) or (2) the Sherman-Kulhavy Test (variables 8, 9) correlated above the pre-established important level of .35.

Factor Analysis

The same set of eleven variables used in the correlation procedure was entered into a factor analysis procedure. Three principal components resulted from the analysis. These components are listed in Table 6. The factors on which each variable had its highest loading are marked by an asterisk.

Table 6.--Principal Factors and Highest Factor Loadings Related to Variables.

Variables	Factors		
	1	2	3
1	24	-14	-25*
2	4	9	-18*
3	94*	2	20
4	79*	6	26
5	72*	-5	13
6	-29*	3	70*
7	-28	-17	74*
8	-2	94*	6
9	-3	93*	2
10	4*	-1	-1
11	-12*	0	5

*Note--Entries marked with an asterisk (*) were highest in loadings.

The first factor consisted of variables three, four, and five, the scores associated with Boutwell's Noun Test.

The second factor consisted of the scores associated with the Sherman-Kulhavy Test, variables eight and nine.

The final factor consisted of the scores associated with Sheehan's QMI, variables six and seven.

The results of the correlation and factor analyses are consistent with the results of the two-way analyses of variance. No relationships or factors were found that indicated an effect due to the three treatments or to imagery.

Chapter Summary

In this chapter data were analyzed, the results were presented and hypotheses tested. Additional analysis of the data was also presented. The purpose of the study was to investigate (1) the effects of a verbal and visual advance organizer on performance associated with a learning task, and (2) the effect of subjects' degree of imagery capability on learning differences associated with the two advance organizers.

One hundred fifteen subjects participated in the experimental procedure. Of these, data from forty-three was discarded due to incompleteness; data from seventy-two subjects were entered into the imagery categorization procedure.

Each subject was categorized as a high- or low-imager by comparing his/her scores on (1) a list of high-imagery words on Boutwell's Noun Test, (2) a list of low-imagery words on Boutwell's Noun Test, and (3) Sheehan's QMI Test with overall group means in these three categories. Subjects who scored above the mean of all three groups were categorized as high-imagers; those who scored below the means of all three groups were categorized as low-imagers. Of the seventy-two subjects, seventeen were categorized as high-imagers and eleven as low-imagers.

Null forms of the hypotheses were tested by use of a two-way factorial analysis of variance. The independent variables were (1) level of imagery (high or low), and (2) treatment (visual advance organizer, verbal advance organizer, control group). The dependent variable was the score on the learning stimulus posttest (mean correct).

The results of the two-way analysis of variance indicated that none of the null hypotheses could be rejected. Specifically, (1) no difference due to the three treatment groups (visual advance organizer, verbal advance organizer, control group) were found; (2) no differences due to imagery level (high, low) were found; and (3) no significant interaction of treatments and imagery levels were found.

A correlation procedure was used to investigate the relationship of variables in the study. The treatments variable was not found to relate with the dependent variable. The sex and experimental group variables were found not to relate with other variables. Finally, the variables associated with Boutwell's Noun Test and Sheehan's QMI Test were found not to relate with each other or to the Sherman-Kulhavy Test.

Finally, a factor analysis procedure, using the same variables as used in the correlation procedure, revealed a three-factor structure. The first factor consisted of the Boutwell Noun Test variables. The second factor consisted of the Sherman-Kulhavy Test variables, and the third factor consisted of the Sheehan QMI Test variables. No other factors were found.

These findings along with conclusions are discussed in Chapter V.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS FOR FURTHER RESEARCH

Summary

The purpose of this study was to investigate the effectiveness of a visual advance organizer compared to a verbal advance organizer, and to examine differences in learning resulting from each type of organizer that could be attributed to imagery level as an individual difference.

The importance of the study is related to extending knowledge about the functional properties of visuals, especially when used as advance organizers. Further, it is important to extend the concept of advance organizers to non-verbal modes. Finally, linking student differences in cerebral hemisphere functioning to classroom tasks is important, as educators attempt to improve the effectiveness of instruction.

A review of the literature indicated that the verbal advance organizer concept might be extended to the visual mode. The review also revealed that individual differences in right and left cerebral hemispheric specialization, as measured by degree of visual imagery, might be an important variable with respect to advance organizers.

The basic hypothesis of the present study was that the type of advance organizer and category of imagery would result in differential learning performance, and that these two factors would interact.

Subjects in this study were one hundred fifteen graduate and undergraduate students in various disciplines at Michigan State University. Of these, seventy-two subjects with complete data were categorized as high- or low-imagers, or discarded if data were inconsistent. Eleven low-imagery and seventeen high-imagery subjects were identified, using Boutwell's Noun Test and Sheehan's QMI Test.

Three experimental treatments were generated, a visual advance organizer, a verbal advance organizer and a control treatment. In addition, a learning stimulus and posttest were generated by the researcher.

The experimental procedure consisted of administering Boutwell's Noun Test and Sheehan's QMI Test. These two tests were designed to measure relative mental imagery. Second, subjects were exposed to the learning stimulus, a series of projected slides containing material designed to teach discrimination of Art Nouveau from other art styles. Third, the learning stimulus posttest was administered that recorded subject responses to visual discrimination items.

Following the posttest, the Sherman-Kulhavy Test, purporting to assess cerebral laterality, was administered. The experimental procedure was administered to seven groups of six to forty subjects.

Three hypotheses were tested to determine whether type of advance organizer and degree of imagery would affect learning performance, and whether these factors would interact. The data were tested with a two-way factorial analysis of variance with the alpha level set at .05. Other statistical procedures included correlation and factor analyses.

The findings of the study did not support the three hypotheses. No significant differences were found for factors in any of the analyses of variance. Further, correlation and factor analyses revealed that the two instruments used to measure imagery had a low correlation with each other and that each was a strong, distinct and separate factor in the factor analysis.

Conclusions

The alternate hypotheses will be considered in turn.

$H_1 1$: The means of the visual advance organizer (T1) will exceed those of the verbal advance organizer (T2), and the means of the verbal advance organizer will exceed those of the control group (T3).

This hypothesis was not supported by the two-way analysis of variance. As noted, however, these results are equivocal because of the restricted sample size resulting from the imagery categorization procedure. Thus, the conclusion is made that there is insufficient data in the present study to conclude one way or the other regarding the advance organizer treatments.

The results of the correlation and factor analyses were consistent with the two-way analysis results. That these additional analyses did not detect any effects due to the advance organizer treatments indicate that further study is needed in the design of advance organizers, both verbal and nonverbal.

$H_1 2$: The means of the high-imagery subject group (I1) will exceed those of the low-imagery subject group (I2).

This hypothesis was not supported by the two-way analysis of variance. These results, however, are equivocal for two reasons. First, this hypothesis test suffers from the sample size restriction that made a conclusion based on $H_1 1$ difficult. Further, the correlation and factor analyses indicate that a composite imagery factor was not, in fact, measured. Thus, the conclusion is made that imagery was not appropriately measured, and no conclusion can be made regarding $H_1 2$. Additional study is needed to increase the knowledge of what constructs mental imagery instruments measure. Further, the relationship and consistency of existing mental imagery instruments warrants continued investigation.

$H_1 3$: There will be a type of advance organizer (T1, T2, T3) by subject imagery level (I1, I2) interaction.

This hypothesis was not supported by the two-way analysis of variance. Again, both the factors of small cell size and apparent multiple components in the imagery measure make this result equivocal. The conclusion is made that the interaction was not adequately tested.

Additional correlation and factor analyses yielded results that were consistent with the earlier findings, and thus support these conclusions.

Two factors partially vitiated the findings of the present study. First, the relatively high incidence of subject mortality due to data incompleteness weakens internal validity of the study. Second, although sex was not found to be an important variable in the literature review of advance organizers and mental imagery, the sex distribution of the present study (eight males, twenty females)

represents an imbalance that may have biased the results in an uncontrolled manner.

Discussion

The results of testing the three hypotheses do not support the assertions that type of advance organizer or imagery level are significant factors in learning performance. Several factors common to all three hypotheses preclude outright rejection of the assertions, however. First, an effect of the imagery categorization procedure using Boutwell's Noun Test and Sheehan's QMI Test was to eliminate forty-four of seventy-two subjects, a reduction of 61 percent. The remaining twenty-eight subjects constituted a quite small sample for a two-way factorial analysis of variance. Thus, the negative results of the two-way analysis are equivocal.

Second, the correlation analysis, performed with seventy-one subjects (one less than the total sample available) revealed that the three scores of the Boutwell Noun Test (high words mean, low words mean and overall mean) and the mean of items on Sheehan's QMI Test had very small correlation coefficients. This indicates that the assumption that these instruments were measuring the same thing, imagery, is questionable. This concern is heightened by the results of the factor analysis. That analysis revealed that the two instruments measured strong and separate factors for the sample of subjects in this study.

Third, the art-style slides as the instructional treatment represents a sample of one. Thus the variables examined in this study should be tested using several different instruments.

The negative statistical results thus may not be surprising, given the three factors described: small cell size, multiple factors in the imagery measure, and an instructional treatment sample of one. For the sample size used, treatment differences of great magnitude would have been required to make the treatments variable statistically significant. The power of the treatments used, compared to the learning stimulus and posttest is not known. Either the power was not sufficient to overcome the limited cell size, or the treatments in fact did not affect learning in this study.

In light of the multiple-factors aspect of the imagery measure, it would have been difficult to interpret differences in learning performance due to "imagery." As it was, the lack of imagery as a significant factor may be due to a problem of: cell size; multiple factors in the imagery measure; or to the fact that no imagery differences existed that affected learning performance.

In the case of the interaction term, treatments by imagery level, the small cell size and multiple-factors aspect of the imagery measure may well be responsible for the negative result. Another possibility is that the interaction effect was not strong enough to be significant.

Finally, the specific instructional treatment used may have been inappropriate in content, organization or presentation.

Additional possible causes of no significant differences in the variables include the relatively small amount of learning that took place. Treatment differences may exist only within some optimal range of learning. Further, both the treatments and learning stimulus were

short, and the dependent measure was administered immediately after the learning stimulus. The particular values of these variables may have reduced treatment differences.

Implications for Future Research

Future research should be continued to the extent that this study is inconclusive. Several sets of variables lend themselves to further exploration. The basic relationships between advance organizers, instructional treatments, and tests of learning could be explored. Appropriate variables would include the length of the advance organizers, the length of the instructional treatment, the type of content, type of learning test and length of learning test delay. Pilot studies of materials in each of these areas would be useful.

Other studies could vary the type of instructional stimulus used. If the findings of this study were confirmed using different instructional content, organization and presentation, broader conclusions could be made.

An additional direction of investigation regarding the imagery instruments is one of construct validity. The results of the present study indicate that Boutwell's Noun Test and Sheehan's QMI Test measure quite different things. Research is needed to learn more about the constructs related to each instrument and especially how the constructs of each instrument relate to each other. The development of common theoretical constructs that relate across instruments is seen as a central need for the use of multiple-instrument measures of imagery such as the measure used in the present study. Studies that

lead to effective combinations of mental imagery instruments are needed. Replication of such studies would be useful.

The present study was limited by the small number of subjects actually involved in the statistical tests; the imagery categorization procedure reduced the available subject group by over half. Future research should examine the efficacy of this categorization procedure in terms of the number of subjects that are deleted. A fruitful approach might be to both modify the procedure and attempt to acquire larger numbers of subjects for studies such as these. Studies leading to an effective combination of mental imagery instruments that use an appropriate but minimum number of subjects would be useful.

Finally, the need for additional studies of both advance organizers and mental imagery implies that studies such as the present one, where the interaction effects of these two classes of variables are examined, will not be fruitful until progress is made in each area alone. Studies of interactions are dependent on the stability of the constructs in each independent variable classification. Studies of advance organizer and imagery interaction may have to await a greater stability of constructs in each of these areas.

APPENDIX A

PART I: LEARNING STIMULUS POSTTEST
AUDIO-TAPED INSTRUCTIONS

PART II: DESCRIPTION OF EACH TEST SLIDE

LEARNING STIMULUS POSTTEST

AUDIO-TAPED INSTRUCTIONS

"The art style to be learned is called Art Nouveau. To see whether you can identify examples of Art Nouveau among other art styles, you will see twelve test items. Each test item will consist of two slides of art styles and a third slide of the scale to use for your response. Look at the scale of the printed test instruction. For each test item please decide whether the art style to be learned, Art Nouveau, is the first slide, second slide, both slides or neither slide. Then mark your choice on the answer sheet. For each test item you will have ten seconds to decide after you see both art styles." (Twelve test items are shown.)

DESCRIPTION OF TEST SLIDES

Test Item*	First Slide	Second Slide
1	Glass vase*	Glass vase
2	Bead necklace	Upright phonograph*
3	Porcelain statuette of girl*	Jewelry pin
4	Painting of woman	Painting of man, woman, dog
5	Ceramic vase*	Metal vase*
6	Painting of woman*	Painting of woman*
7	Necklace*	Jewelry pin
8	Framed mirror	Table*
9	Stuffed chair	Lounge chair*
10	Glass sculpture	Glass sculpture*
11	Glass vase	Statue
12	Building	Chair

*Note: The slides marked with (*) are examples of Art Nouveau.

APPENDIX B

PART I: LEARNING STIMULUS AUDIO-TAPED INSTRUCTIONS

PART II: DESCRIPTION OF LEARNING STIMULUS SLIDES AND SLIDE SEQUENCE

LEARNING STIMULUS AUDIO-TAPED INSTRUCTIONS

"The purpose of this learning task is to teach you to identify one particular art style among several art styles. First, you will examine some materials in the package you have to help you in the learning task. Then you will view some slides that include examples of the art style to be learned. Finally, you will be tested to see if you can identify the particular art style to be learned, among others. After the learning task a questionnaire will be distributed. Following its completion, any questions about the experience will be answered. Please turn the page and examine these materials for the next minute and a half." (Ninety-second pause.)

"Now, please direct your attention to the screen and we'll start the slides. Remember that each slide showing the art style to be learned will have a bright spot in the upper right corner. Like this. Only slides of the art style to be learned will have this bright spot. Now view these slides. No sound will accompany them." (Twenty-four slides are shown.)

"Now, for the next series of slides, pictures of the art style to be learned will first be shown without the bright spot, then repeated with the spot. Please try to decide whether each of the following slides is the art style to be learned before the second, confirming slide. A dark screen following a slide will confirm that slide as a non-example of the art style."

DESCRIPTION OF LEARNING STIMULUS SLIDES
AND SLIDE-SEQUENCE

Slide Number	Content	Type[1]
1	Black	--
2	Non-art example	N*
3	Black	
4	Statuette	E*
5	Ceramic vase	N
6	Three statuette/figures	N
7	Ceramic vase	E*
8	Illustrated plate	N
9	Illustrated plate	E*
10	Three statues	N
11	Statue	N
12	Two statues	N
13	Table	E*
14	Chair	N
15	Chair	N
16	Table and chairs	N
17	Cabinet	E*
18	Cabinet	E*
19	Cathedral interior dome	N
20	Group of statues	N
21	Porcelain statuette of girl	E*[2]
22	Cathedral	N

[1]Art Nouveau example marked by (E), nonexample by (N). Keyed slides marked by (*).

[2]This slide was also used in the posttest sequence, in item three.

23	Statue	N
24	Skyscraper	N
25	Mezzanine	N
26	Statue	E*
27	Building	N
28	Black	--[3]
29	Lounge chair	E
30	Lounge chair (same)	E*
31	Ceramic forms	N
32	Black	--
33	Illustrated plate	N
34	Black	--
35	Vanity	E
36	Vanity (same)	E*
37	Pewter pitcher	E
38	Pewter pitcher (same)	E*
39	Cathedral	N
40	Black	--
41	Building Interior	N
42	Black	--
43	Clock	N
44	Black	--
45	Painting of port and city	N
46	Black	--
47	Entrance to building	E
48	Entrance to building (same)	E*
49	Ceramic forms	N
50	Black	--
51	Statue	N
52	Black	--

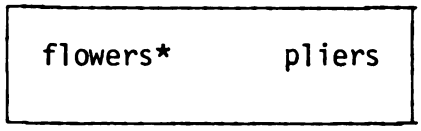
[3]Audio comment regarding delayed confirmation of examples played here.

APPENDIX C

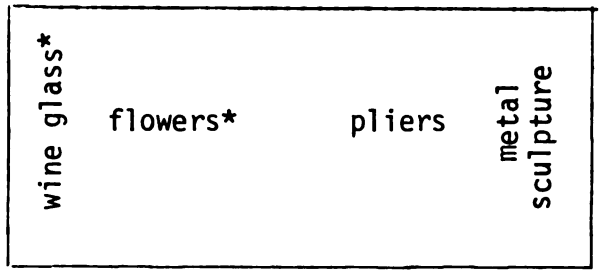
VISUAL ADVANCE ORGANIZER TREATMENT

VISUAL ADVANCE ORGANIZER TREATMENT

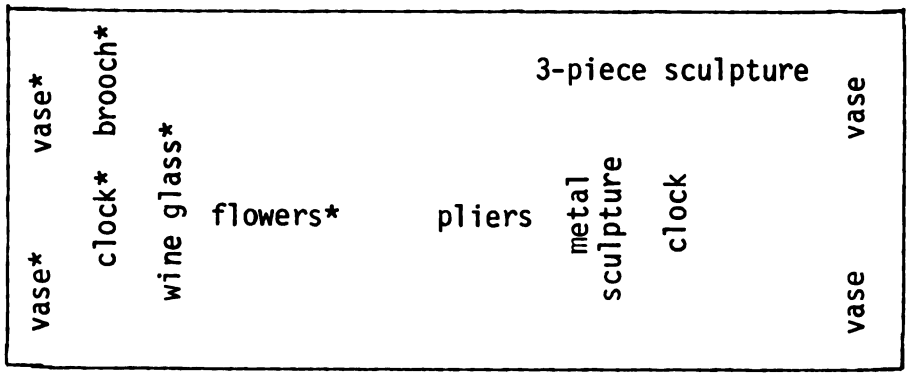
The visual advance organizer consisted of six photographs; each photograph included several objects. In the diagrams below, the mark (*) indicates an object related to Art Nouveau.



1.

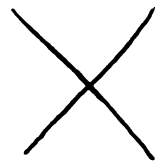


2.



3.

Photo 4 has the same objects as photo 3, but a large black "X" crosses the objects on the right



4.

vase* vase* brooch* clock* wine glass* flowers*

5.

wine glass* flowers*

6.

APPENDIX D

VERBAL ADVANCE ORGANIZER TREATMENT

VERBAL ADVANCE ORGANIZER TREATMENT

Consider how an art-style might develop and thus be identified. One style might develop out of an awareness of nature, where many forms are smooth, flowing, and exhibit a resolution or completeness. A second style might develop from an awareness of the world of mechanical forms and shapes, where shapes are joined based on function, utility and design. Each style, as a dynamic concept, grows and develops in its given direction, never rejecting its beginnings. Over time, many styles are created; they grow and develop in many directions.

We are concerned here with the first art-style noted, where the basis is a flowing, smooth form based on natural lines. As this style developed, all art-forms were affected: sculpture and glass work, painting, furniture and architecture. In each of these art-forms, flowing flowery designs were executed. Smooth, circular shapes were etched with detailed patterns found in nature. These patterns were well integrated with the shapes of the art-forms.

CONTROL GROUP TREATMENT

Masterpieces are created by tradition as well as by individuals. The original meaning of masterpiece was specialized. It designated an object which qualified a young worker in the arts for the title of master in medieval guilds. The guild itself, like its successor and rival the humanistic art academy, was a powerful instrument of tradition. As a continuing institution, it 'handed on' from one generation to the next a body of principles and attitudes toward the making of art. It could provide a foundation, a basis of information and training--a platform--from which a man of genius might rise to create the consummate examples of craft and imagination which later periods come to call masterpieces in rather looser interpretation of the original meaning of the word.

A masterpiece may mean simply an unusually fine example of a style or period, rather than an absolute summit of achievement. Even so, the older relationship with tradition persists. For a masterpiece is not recognized until it is seen against a large background.

APPENDIX F

FIFTY NOUN TEST WORDS WITH MEANS, STANDARD DEVIATIONS AND HIGH WORDS/EXCLUDED WORDS/LOW WORDS GROUPING

FIFTY NOUN TEST WORDS WITH MEANS, STANDARD DEVIATIONS AND HIGH WORDS/EXCLUDED WORDS/LOW WORDS GROUPING

Word	Mean	Standard Deviation	
Impropriety	1.69	1.31	Low Imagery Words
Interim	1.74	1.37	↓
Surtax	1.90	1.60	
Instance	1.99	1.44	
Forethought	2.06	1.45	
Criterion	2.24	1.61	
Distinction	2.37	1.61	
Misconception	2.42	1.73	
Elaboration	2.50	1.65	
Concept	2.50	1.73	
Outcome	2.56	1.74	
Chance	2.65	1.61	
Duty	2.76	1.73	
Satire	2.83	1.80	
Sobriety	2.92	1.99	↑
Predicament	3.01	1.68	Low Imagery Words
Management	3.49	2.00	Excluded Words
Amount	3.54	2.09	↓
Position	3.72	1.79	
Effort	3.75	1.80	
Idea	3.76	2.04	
Hardship	3.89	1.96	
Safety	4.01	1.87	
Underworld	4.06	2.05	↑
Discipline	4.24	1.94	Excluded Words

Word	Mean	Standard Deviation	
Amazement	4.60	1.81	High Imagery Words
Length	4.67	1.93	↓
Captive	4.76	1.93	
Islander	4.84	2.00	
Committee	5.00	1.80	
Infection	5.07	1.88	
Crime	5.11	1.80	
Mathematics	5.32	1.98	
Candidate	5.38	1.69	
Victory	5.46	1.72	
Breeze	5.46	1.73	
Festivity	5.47	1.56	
Destruction	5.50	1.64	
Industry	5.63	1.68	
Angle	5.83	1.45	
Banner	5.85	1.54	
Cell	6.00	1.61	
Jury	6.04	1.52	
Thief	6.11	1.27	
Tomb	6.15	1.58	
Monk	6.21	1.33	
Moss	6.25	1.56	
Accordian	6.26	1.59	
Prison	6.45	1.09	↑
City	6.61	1.58	High Imagery Words

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