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Exploring the relationships between visual experience, learner
traits, memory and styles of visual presentation

Jackson, Evelyn Kay, Ph.D.
The Ohio State University, 1992
EXPLORING THE RELATIONSHIPS BETWEEN VISUAL EXPERIENCE, LEARNER TRAITS, MEMORY AND STYLES OF VISUAL PRESENTATION

DISSERTATION
Presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Graduate School of The Ohio State University

By

Evelyn Kay Jackson, B.A., M.A.

*****

The Ohio State University
1992

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In memory of my Father
for all he taught me
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CHAPTER I
INTRODUCTION

The explosion of technology in America's homes, work places and schools has forced scholars in a variety of disciplines to review, re-examine and refocus attention on understanding the interaction between people, media cognition and learning. As 14 percent of the nation's teenagers drop-out of school each year, the concerns for the education of America's children are intensifi ed (National Center for Education, 1988). There is an outcry for a concentrated effort among scholars to discover ways to motivate and inspire the future leaders of our country. The national goal is to increase the high school graduation rate to 90 percent by the year 2000 (Gage, 1990). Improving drop-out prevention programs requires more than what Dale Mann calls the fours C's: cash, care, computers and coalitions (Mann, 1986). It is going to require further research and development in untested areas of drop-out prevention. From a communication perspective, developing an understanding of the audience will increase the chances of effective communication. In drop out prevention programs, the nature of the audience can be examined by attention to the habits of the nation's teenagers and their ability to process information.
Neil Postman (1979) maintained that a generation gap exists in the thinking processes of modern youth and earlier generations primarily due to the conflict in brain hemispheric conditioning. The language centered view of the older generation was strengthened by traditional schooling while the twentieth century image centered view is dominated by the media, especially television. By age 16, the average child has spent 18,000 hours in front of a television set and 15,000 hours in school (Postman, 1981, p. 37). Roughly all 18-38 year olds today were socialized by television, entertained by interactive computerized video arcades and oriented to learning by some video/visual means. Leigh Chiarelott (1984) pointed out that it is not clear in what manner television, music television, video games, music and computers influence cognitive patterns. Furthermore, the constant presence of these media forms shifts the experiential base of young learners creating tension between the print-oriented curriculum of the school and the electronically-oriented curriculum of the learner (Chiarelott, 1984). These children are a product of an image centered generation and they have been primarily instructed through a print curriculum.

Gavriel Salomon's (1979) studies identified "television literacy" as the significant gain in visual skills that accompanied the introduction of television. Today television viewers look at more characters, take in more complex settings and movements, and hear more natural sound effects and nonsynchronous music than viewers did 15 years ago. Unlike the linear, serial process of
reading books, television viewing requires simultaneous reception and processing of multiple pieces of information. Due to the physiological nature of television viewing, Jodi Cohen (1987) suggested that holding the attention of the television literate generation requires more distinct approaches to sound and imaging in conjunction with challenging formats. A generation accustomed to the complexities of a medium such as television may find the serial process of reading a book inadequate to hold their attention. The underlying premise is that changes in media presentation will necessarily affect students with a history of interaction with visuals.

Videos designed in such a way as to capitalize on the strengths and weaknesses of the modern generation's abilities to process images and sounds simultaneously may prove to be more interesting and captivating for the audience. Chiarelott (1984) challenged instructional designers and educators, proposing that if the purpose of schools is to facilitate learning, then designing curriculum and instruction to match forms of media and modes of internal representation (formed by media) is not only desirable but necessary.

Students who have been exposed to various forms of visual technologies (such as television, film, computers and videogames) and have interacted with them on a regular basis have developed a history of experience with them that biasses these students towards communication shaped in a visual fashion. In order to facilitate the learning of these students, communication with them
should be sent in modes to which they are most accustomed. The first step is to acknowledge the need for developing a more visual approach to teaching the image-centered generation and the second step is to then structure the video instruction to reflect the different levels of experience of the audience.

Variations in environmental exposure and experience with visual media may produce subtle changes in learning skills. Does an individual's environmental visual exposure and experience help him/her process video information more effectively than a person with less visual experience? Similar to how professors take into account the level of knowledge of their students when designing instructional materials, the selection and nature of the video instruction should take into account the level of experience students have with visuals.

**Purpose of this study**

Understanding the relationship between the new generation's experiences with moving image technologies (visual experience) and their learning styles is the focus of this study. Specifically, this study examined the relationship between visual experience and learning with five purposes: (a) to determine the nature of the relationship between visual experience and scores on visualization and spatial tests; (b) to determine the nature of the relationship between visual/spatial skills and learning style; (c) to develop and apply theoretical structures for visual presentations customized for specific learner characteristics; (d) to determine
the nature of the relationship between recall ability and structure of video presentation; (e) to explore potential learning style differences in this area. Central to this study were these areas of research: theories of human thought and memory, visual literacy, learning styles and formal features of film and video.

UNDERSTANDING THE HUMAN THOUGHT PROCESS

No single theory can capture the multidimensions of the concepts of thinking and meaning. Many scholars have contributed to the understanding of how people make sense out of their daily interactions (Bartlett, 1958; Betchel, 1988; Boulding, 1956; Campbell, 1989; Cooper, 1980; Gadamer, 1975; Dewey, 1938, James, 1890; Kosslyn, 1980; Langer, 1972; Ogden & Richards, 1923; Rumelhart, 1980; Osgood, 1973; Vaughan, 1988; Watson, 1979; Whorf, 1956). A history of the study of human thought processes reveals the impact of scientific research and new discoveries on the task of understanding how people process information and make sense out of their environment.

American psychologists for the first three decades in the 1900s focused on behaviorism. Internal processes were left for speculation while attention was focused on what could be readily observed and measured. As a result, extremists would not study thought as anything more than the surface manifestations it produced. One of the founding behaviorist, John Watson (1979) declared that there was no dividing line between man and brute. Scientists' research on the brain and the nervous system
supported the behaviorist doctrine by maintaining that mental activity was explained as a direct response to external events that impinged on the brain. The brain was nothing more than a one way transmitter of information. Neurons in the brain were merely passive receptors of information and they functioned in a very linear fashion (Hebb, 1980). Thus, psychologists studied the behaviors exhibited by people in response to messages being sent to the brain.

By the 1930s scientists knew that neurons in the brain were not merely one way transmitters but were capable of firing spontaneously. This finding indicated a flaw in the passive, linear perspective of the brain's role in thought and compromised the integrity of behaviorism (Neisser, 1980). However, by that time behaviorism was dominant in psychology and neuroscience was brushed aside.

In the 1950s, a new technology composed of integrated circuits and components with an internal information-processing system that governed its actions led psychologists to reexamine the nature of behaviorism. The computer's central processing unit was capable of logic and this invention served as a metaphor for human reason. The fact that scientists were able to understand the inner complex organization of this machine demonstrated "human-like" qualities of reason. Thus, the computer gave rise to the idea that the mind was indeed real and could be understood in scientific terms. It was this belief
that the computer was capable of human logic that underwrote the fears that technology would replace people in the workplace.

Stimulated by the invention of computer technologies, interest in how the mind represents the world internally was addressed through the study of ideas, symbols, images and inner narratives. In the past, these realms of study had been largely consigned to mysticism, but now for the first time the invention of the computer forced scholars to think in new ways about the nature of human thought. While attention shifted from pure behaviorism to a focus on the nature of the human mind, research on the physiology of the brain and its role in developing thought was neglected.

Between 1950 and 1960, the United States Department of Defense wanted to find a way to quickly read Russian scientific journals so they funded massive projects to develop a computer to translate foreign languages (Bar-Hillel, 1960; Bartlett, 1958). Much to the dismay of the United States government, university scientists discovered that words could not be easily translated by programming a computer with dictionary meanings of the words. A level of real world experience must be brought to the interpretation of sentences. This discovery led to the development of new theories about how the mind experiences the world (Betchel, 1988; Cooper, 1980; Palmer, 1969; Rumelhart, 1980; Winograd, 1973, 1980).

In the 1980s, a new movement grew out of a history of neglect in the study of the mind without examining the
physiology of the brain and its relevance to cognition. This research coupled with a surge of interest in creating machines that would mimic the physical design of the brain gave way to a movement known as "New Connectionism" which explored the hidden machinery underlying the surface of perceiving, thinking and remembering human cognitive processes.

Complex forms of thought exist below the level of awareness so that conscious deliberation may only be a small part of intelligence. From the connectionist standpoint, the brain arrives at knowledge through process and not through serial logic alone. A bit of information, a fact, or any experience lodged in the mind is not stored in a specific place, but rather is represented by a whole pattern of activity or a summary of activities of a network (Cooper, 1980). In a world of imperfect information, full of ambiguity, deceit, words with multiple meanings, and answers that often breed more questions, the brain uses pre-existing patterns or schemas to process and interpret new information. These schemas or structures of existing knowledge are used by the brain to guide an understanding of reality.

VISUAL PROCESSING THEORIES

*How the human vision system works*

When a person sees an object, or witnesses an event, the information in the visual field is directed to the cornea, or the outside covering of the eye. In the form of light rays, this information passes through the pupil and the lens. The lens
focuses light reflected from the object(s) onto the back of the eye (retina), where 125 million light sensitive neural receptors convert the focused light rays. Neural cells at the retina pass this energy to the brain's visual cortex (Biederman, 1988; Sinatra, 1987). Insight into the how the human visual system relates to memory was influenced by two perspectives: the Constructivist theory and the Direct theory.

The Direct Theory of Visual Processing

The Direct view of visual perceptual processing is Gibson's (1950, 1966, 1979) theory which postulates that stimuli contain all the information needed to specify a distant object. Gibson (1979) takes the position that the visual system is not just a passive system waiting to be activated by some external source of stimulation, but rather are active exploratory systems that seek out information in the environment and are highly selective in the information they pick up. The visual perceptual system includes not only the eye, but also a complex muscular arrangement that permits an optical search of the environment. Gibson asserts that the motion of the head and even the limbs of the human body play a part in the visual search when they allow movement towards the source of the stimuli. The Direct Theory eliminates all intervening cognitive mechanisms from the process of visual perception.

Vision is thought of as a perceptual system instead of a channel of inputs to the brain. Perceptual systems such as the
auditory and the visual provide information input to the brain providing, as Gibson (1966) terms it, information of the environment. Knowledge is coded information about the environment (Travers, 1970). Consider this example. A woman is starting to cross the street, sees an approaching car and waits to cross. The fact that the woman sees the car indicates she has knowledge of her environment, but the fact that she waited to cross indicated that she had knowledge about her environment.

Foder (1983) describes Direct theory as a modular perspective on the visual processing. Such a system is insulated from information available in other parts of the total system. This characteristic of the Direct view implies that if a subject is told there is a cat on the couch then that knowledge will not influence his/her perception. According to the Gibson (1970), what the subject perceives, is unaffected by what the subject may know as a result of information received from other parts of the brain. Gibson's Direct Theory of visual processing implies a new theory of human thought and memory.

The Constructivist Theory of Visual Processing

In contrast to the Direct theory, some scholars believe that the processing of visual information as a form of problem solving and hence as a form of reasoning exhibits fully rational thought and judgement (Gregory, 1978; Rock, 1983; McClelland & Rumelhart, 1981; Ullman, 1980). Visual processing can be explained as a hypothesis testing situation. The light reaching
the receptors carries fragmented and impoverished information about the distant stimuli. The task of the human visual system is to take these data (light information) and construct a reasonable conjecture about the source of the stimulation. This view is referred to as the Constructivist or Computational approach to visual perception (Gregory, 1978; Rock, 1983; Ullman, 1980).

The Constructivist theory of visual processing is not considered modular, but rather very dependent on information received from other parts of the brain to identify images (Foder, 1983). Collateral information and prior knowledge are capable of affecting what subjects see. This nonmodular characteristic of the Constructivist theory demonstrates congruence with the Connectionist view of human thought and memory. Through the use of stored schemas, subjects can supplement incoming light rays with additional information to aid in the identification of images, objects and experiences.

Richard Sinatra (1986) brought a functional process perspective to his interpretation of visual processing as grounded in the Constructivist perspective. For Sinatra, visual literacy, as he terms it, is the active reconstruction of past visual experience with incoming visual messages to obtain meaning. As Sinatra explains it, visual information presented to the brain is reshaped, modified and interpreted based upon the information already existing in the brain.
Each time an individual experiences or observes an object or event he/she has a straightforward visual experience in the present (Ihde, 1977). This means that the way the image is perceived at that moment, in certain light, at a certain angle, from a certain spatial perspective impinges new information upon the visual cortex of the brain. This information or schemata is then stored and coded in such a way that the brain has immediate access to it allowing for rapid and holistic assessment (Sinatra, p. 98). Comparisons of what is seen in the natural world to the images stored in the brain (a network of schema relationships) reveal new information to the viewer. Once this matching of new to stored information has taken place, then assimilation or accommodation occurs. Finally, the individual comes to meaning through this reconstruction and recognition of visual information. Restak (1982, p. 112) summarizes this two-step process as the imposition of meaning through a reconstruction of reality even as the immediate world "holds up the cue cards."

Visual Messages and the Development of Schemas

An appreciation of the fixating power of visual messages requires that the nonlinearity aspect of nonverbal communication be made clear. Visual messages reach individuals in many forms such as pictures, movies, television and even video games. These messages are not decoded before comprehension, but rather processed over a wide area of the retina simultaneously (Paivio, 1979). The visual system processes information in a parallel
manner. Regardless of the visual form, the information reaches the brain all at one time as a single unit of perception with the component parts seeking equal recognition by the brain (Sinatra, p. 97). The visual world then does not simply imprint itself on the retina, but the brain plays an active role in the exploration and interpretation of what it sees and has visually experienced in the past (Campbell, 1980). Television along with other visual media has then provided humans with an opportunity to create a virtual visual storehouse of objects, events and impressions. Perceivers need not always react to the information received, but may store it and use it later to modify and/or amend other information (Sinatra, p. 5).

Two key concepts underlie the development of visual processing: active experimentation and the formation of nonverbal, representational thought. Active experimentation is the continual interaction between the individual and the environment. In other words, the eye needs the hand to continue to build nonverbal logic (Sinatra, p. 8). This active view of visual processing is characterized by more than simple interpretation of messages. It is the interaction of the viewer and the environment that is of primary importance in the formation of schemas (Murch, 1973). Restak (1982) states that neurobiologists now contend that the visual cortex is more concerned with interpretations of the stimuli (more active) rather than matters of just sight (more passive).
The second concept of visual processing is the formation of and thinking by analogy, metaphor and symbols. Sinatra (p. 10) claims this outgrowth of active experimentation can manifest itself as gesture and body language, play, modeling or imitation and art. The use of symbolic thoughts helps to form the mental schemas for visual processing (Gottschaldt, 1926; Kanizca, 1979; Kohler, 1947; Wertheimer, 1923). In some cases the use of nonverbal, representational thought with language can advance the visual schemas as actual experience might do (Schwebel & Raph, 1973).

In summary so far, visual processing is the simultaneous reception of visual stimuli and the interpretation of that stimuli as it relates to stored schemas. While the reception of the visual information is critical, the active experimentation with the stimuli is of perhaps greater importance. Finally, symbolic and nonverbal, representational thought help to stimulate and form mental schemas toward visual literacy.

VISUAL AND SPATIAL SKILLS

As defined by Guilford and Zimmerman (1981), visual skills are the ability to mentally manipulate images. The ability to mentally "see" objects is believed to be dependent on mechanisms located in various parts of the brain. The combination of mechanisms in the brain that are recruited for mental manipulation of images depends on the task (Erlichman and Barrett, 1983; Farah, 1984; Kosslyn, 1987; McKellar, 1965). In
other words, different parts of the brain are used for different types of visual tasks. This understanding of visual skills is supported by the Connectionist view of human thought processes.

Vision is used for two kinds of purposes: in recognition, to identify objects and their parts, and in spatial processing, to track moving objects and to navigate as we move through space (Kosslyn, 1990). Spatial skills have been studied since the middle 1920s and there appear to be four most commonly identified skills. They are spatial visualization, spatial orientation, spatial scanning and perceptual speed. Although the specific distinctions between each of these spatial skills remains a debate, it is clear that a mental skill involving visual-spatial processing can be separated from general intelligence and measured through specific spatial aptitude tests.

While his views on the visual system are divergent from the Connectionist perspective, Gibson believed that training could produce enhanced skill in the utilization of visual perceptual systems (Gibson, 1970). Research on visualization skills has indicated positive correlations between object memory and videogame scores (Gagnon, 1986; Kuhlman, 1960; Spodak, 1972) and negative correlations with age and videogame experience (Gagnon, 1986). Further research has indicated that some spatial abilities have shown improvement through exposure to film and television (Ball & Bogatz, 1970; Gagnon, 1986; Rovet, 1975; Salomon, 1979). Diana Gagnon (1986) found a significant relationship between age, videogame playing, spatial reasoning
and visualization abilities. In her study, the more experienced videogame players tended to have better spatial and visualization abilities than less experienced players. The concept of expertise can be understood in Connectionist's terms as the accumulation of schemas specific to visual and spatial principles. In Gagnon's (1986) study, exposure through practice led to the development of visual and spatial expertise. This relationship led to the theory that the image centered generation would have a larger database of schemas specific to visual related concepts and thus would have strengths in visual and spatial skills that would, in turn, bias them towards video based instruction.

**Predictors of Career Success**

Many studies have found spatial skills to be highly correlated with and predictive of success in a variety of occupations. Visualization and spatial orientation were found to be good predictors of success in architecture (Karlins, Seheuerkoff & Kaplan, 1969), computer science (Hunt & Randhawa, 1973), art (Bennet, Seashore & Wesman, 1974) and engineering (Guildford-Zimmerman, 1947). In a 1957 study, the United States Employment Service found spatial skills to be predictive of success in four job categories: engineers, scientists, drafters, and designers.
A CONNECTIONIST APPROACH TO MEMORY

For Connectionists, memory is dependent upon the storage of schemas or patterns of experiences. Schemas were introduced into modern psychology by Henry Head (1926), an English neurologist, and then applied to a theory of memory by Sir Frederic Bartlett (1958), an English psychologist. Remembering the past is akin to the reconstruction of a story, fitting together bits of information and using past experiences to network the tale together. Bartlett (1958) showed that schemas were structures of connected knowledge acquired through world experiences which are used to make sense out of information that may be deficient, ambiguous or contradictory. They provide plausible patterns into which the pieces of information can be made to fit. Schemas abide by rules of relevance and do not run wildly out of the boundaries of what is appropriate and useful in making sense of the world. Information that seems to be nonsensical or complex is connected and presented in schemas.

The concept of schemas is relevant to the study of visual experience by the nature in which experiences are stored and used later in the thought processes. The more exposure someone has with image based technologies, the more schemas specific to visual related concepts the person will have stored. Assuming a constructivist theory of visual processing and connectionist perspective on human thought and memory, the supply of schema will affect the person's ability to interpret and make sense out of image centered experiences. How people make
inferences from partial information, think intuitively or make associations from seemingly random actions can be explained in terms of a connectionist "goodness of fit" model. New experiences are judged or fitted in relation to past patterns of experience. For example, suppose Tim is looking for a match between his card, a king of hearts, in a deck of playing cards. If Tim is not playing with a full deck (half a deck of cards), he will only have 26 cards to choose from when looking for a similar card. However, if Tim was playing with a full deck, he would have the benefit of 52 cards to choose from when searching for a card similar to his king of hearts. The more schemas or existing patterns there are to select a match from, the more chance the individual will have success at interpreting the experience. With this in mind, attention is now turned to the accumulation of visual related experiences.

The impact of television viewing on modern youth stimulated a concern in the late 60's and early 70's known as television or visual literacy. While the I.Q. scores of youth were increasing, the number of students having difficulty in learning to read and write was also increasing (Debes cited in Sinatra, 1986). The term visual literacy was originally credited to John Debes who pioneered the use of visuals in the classroom (Fransecky & Debes, 1972). Gavriel Salomon's work in television literacy has been the stimulus of many studies (including this one) seeking to explore the increase in visual skills due to exposure to television (1979).
LEARNING STYLE: CONCEPT AND IMPLEMENTATION

Learning style refers to a set of interacting characteristics that an individual employs in approaching educational tasks. Dunn and Dunn (1979) proposed a model of learning styles that encompassed environmental, emotional, sociological, physical, cognitive and hemispheric preference characteristics. The basic premise of learning style theory is that individuals have preferred ways of processing information which can be delineated.

Prior to the 1970s, researchers examined facets of cognitive style attending to one aspect of mental set which was usually represented by bi-polar extremes such as Witkin's studies of field dependence and independence (Witkin, 1954). These constructs tended to categorize a dimension of style as either black or white, whereas the focus of research on learning styles beginning in the 1970s examined shades of gray. Learning styles assessment was composed of a number of elements which were not necessarily bi-polar in nature and indicated the many strengths and weaknesses of the learner (Kirby, 1979). Cognitive style was viewed as a more specific case of the overall learning process.

Individuals' learning styles are characterized, in part, by their preferences for message construction and reception. Two of the dimensions of the learning style profile developed by the National Association of Secondary School Principals were based upon the categories described by Dunn and Dunn (Keefe, Monk, Letteri, Languis, and Dunn, 1986) as the responsiveness and effectiveness of audio and video stimulation in generating
learning. Most reports on learning style rest on the presupposition that some learners respond better when information is presented auditorially (For example see Bruner, Olver, & Greenfield, 1966; Fischer & Fischer, 1979; Joyce & Hodges, 1966). Conversely, other learners are stimulated more through a visual means of presentation such as slides, motion pictures, filmstrips, television, still pictures, etc. (Bruner, Olver, & Greenfield, 1966; Fischer & Fischer, 1979; Hill, 1979; Kolb, 1978).

Research in cognitive psychology, education and communication has explored students' learning styles from a neurological and information processing perspective; the design and implementation of individualized instruction; and methods of adapting delivery styles to learning styles. Collectively, this research sought to highlight the roles of the receiver, the environment and the various message strategies required to produce a fruitful learning environment. It is the latter realm of study, matching delivery and learning styles, that offers a perspective similar to that of communication scholars.
The Roots of Kolb's Learning Theory

David Kolb's learning-style model was selected as a guide for this research partly due to its compatibility with the area of visual literacy (Sinatra, p. 114). Visual literacy was described earlier as a thought process influenced by the individual's prior knowledge and past experience with the content structure. The relative contribution of a viewer's schemata is believed to be a determining factor in the learning style of that individual (Kolb, 1981). That is, the nature and characteristics of the schemas of an individual contribute to their way of gathering, processing, and interpreting information.

David Kolb's definition of learning styles was developed from a more specific theory of knowledge acquisition called "experiential learning." This theory deals not only with style but with the more basic questions of learning and individual development. The need for learning to be grounded in experience (Dewey, 1938), the importance of a person's active role in learning (Lewin, 1951) and Piaget's (1952) description of intelligence as the result of person-environment interaction were major influences on Kolb's research of learning styles. This becomes evident in an examination of the development of Kolb's theory.

The Stages of Kolb's Learning Cycle

Kolb (1985) developed a model of the theory of experiential learning which is consistent with the structure of human cognition and the stages of human growth and development. Kolb's model
(Figure 1) conceptualizes the learning process in a way that allows users to identify differences among individual learning styles and corresponding learning environments. The learning model is a dialectic one, founded on Jungian concept of styles or types, which states that "fulfillment in adult development is accomplished by higher level integration and expression of nondominant modes of dealing with the world." (McBer, 1985, p. 3). The perimeter of the model depicts the experiential learning cycle in which individuals reflect on their collective experiences, form generalizations about the experiential outcomes, and then use that knowledge to guide future actions at increasing levels of complexity. Kolb defines this learning cycle as having two fundamental stages. The first stage is when the person is taking in information by grasping the experience, and the second stage begins with the individual's processing of information by transforming his/her experience(s).

The multidimensions of Kolb's learning style theory surface when learners are initially grasping the experience or taking in information. This may be so in concrete ways or in ways that are more abstract in nature. The first dimension of Kolb's learning cycle, concrete/abstract, represents peoples' relative success at understanding ideas and events through concrete experience as opposed to abstract conceptualization (Bruner, 1960, 1966; Harvey, Hunt and Schroeder cited in Kolb, 1985). "Concrete" learners would involve themselves in actual life experiences, while "abstract" learners would best orient themselves through a higher order framework, or the use of a model or theory. Kolb
asserts in the second stage of his learning cycle that people have a preference for the way in which they transform their experience. This transformation of experience is defined by a second dimension, *active/reflective*, which describes an individual's preferred method for acquiring information from either active experimentation or reflective observation (Even, 1982; Flavell, 1963; Piaget, 1951). People accept or reject their ideas through different means. If they are classified as active, then they are more participatory in nature and actively test their hypotheses. If not, then they may examine already gathered data more reflectively. This cognitive dimension combined with the first concrete/abstract dimension form the four points on the experiential learning cycle. In turn, as measurement scales, they define four categories of learning styles (Kolb, 1985). It should be emphasized that Kolb's model seeks to account for the relative contribution of all of the characteristics in each learner to some degree or another. For example, a learner may be more adept at active experimentation but may also have some degree of proficiency in the other three elements defined in Kolb's model. Hence, learning styles are not described as polar exclusives but categorized as individual strengths in the learning tasks.

*Kolb's Four Learning Styles*

Kolb's learning style model characterizes a person as a certain *type* rather than describing the person by their attributes or *traits*. This orientation to classification of human activities is
not uncommon and can also be found in leadership and personality theories. The core of Kolb's model (Figure 1) shows the four types of adult learners (divergers, assimilators, convergers and accommodators) and the four traits which characterize them.

*Diversers* prefer concrete experience and reflective observation. They tend to be good brainstormers, imaginative, people oriented and often work in the humanities or liberal arts.

*Assimilators* prefer abstract information and reflective observation. They tend to be less interested in people or matters of practical application, but rather they are more focused on the integration of ideas to create theories.

*Convergers* prefer abstract information and active experimentation. They are adept at moving quickly to find a correct answer when given a problem. Similar to the assimilators, convergers would rather deal with things than people and are often thought to be unemotional.

*Accomodators* prefer concrete experience and active experimentation. They are so named because they adapt well in new surroundings and situations. They are intuitive, risk-takers, pushy and often impatient. Accomodators like new situations and focus on being active.

FIGURE 1 depicts Kolb's learning cycle with the four traits on the outer perimeter and the four learning types positioned in the middle. Each learning style is located between the two traits that characterize it.
**Figure 1.** Kolb’s learning cycle depicting the four learning style *types* and the four learner *traits*.

*Application Of Kolb’s Learning Theory*

Research applying the experiential learning style model to career orientations has produced some interesting results (Kolb, 1984). Figure 2 depicts the relationship between learner *types* and their career field. The location of the career label within the core of the model indicates the strengths and weaknesses of the learner with regards to the two adjacent learner traits labeled around the perimeter.
Professionals in physical education fields are fairly equal in their ability to involve themselves in concrete activities and actively experiment in order to process information. Nutritionists are the closest field to being characterized by Divergers. Workers in technical trades tend to be characterized as strong Convergers, whereas research has not identified any particular career that attracts strong Assimilators. Learning style applications such as these serve to help understand the nature of audiences in various fields with regards to learning contexts. The more information
you have about people as individuals in a learning situation, the better able designers are to structure job training programs.

Kolb's theory has been found effective when applied to portfolio development courses to stimulate self-discovery and interaction with others, to help students find their own learning strengths and weaknesses and to stimulate conscious efforts in developing new potential for learning (Mark & Menson, 1982). Furthermore, research findings in learning styles has shown that instruction can be constructed and disseminated to match an individual student's preferred learning style, thus resulting in a higher probability that learning will take place (Cafferty, 1980; Copenhaver, 1979; Covey, 1969; Domino, 1979; Farr, 1971; Krimsky, 1982; Lynch, 1981). According to a literature review of learning styles conducted by Claxton and Murrell (1987), no research has addressed the notion of applying Kolb's learning style model to the design of instruction for different types of learners.

FILM AND VIDEO PRODUCTION ELEMENTS

A narrative produced for television or film requires a use of specialized tools to effectively communicate patterns of images and sound that clarify and intensify significant experiences to an audience. The transformation of three dimensional life like events and dramas to a medium that is two dimensional requires the careful use of basic elements. Just as a painter works with the basic elements of point, line, plane, texture and color to establish
an aesthetic of the medium, the film/video producer works inductively with light, sound and motion to create the illusion of area, depth and volume, and the passage of time (Zettl, 1973, 1984). Each of these illusions can be accomplished and manipulated through production techniques that include, but are not limited to, lighting design, camera and lens movement, placement of camera in relation to actor movement and scenery, camera perspective, and editing style. A review of these production techniques or formal features, as they have been previously identified in film and video production research, is necessary to understand the complexities of structuring narratives for specific viewer response.

The descriptions of the production elements will focus on the intentional aesthetic effect of the production technique since this is believed to influence viewer response (Zettl, 1985).

**Lighting**

The technology used to produce images for television is not nearly as sophisticated and efficient as the human vision system. For this reason, lighting screen events for television production is important in two ways. First, there must be enough light on the set of the scene to reflect adequate amount of light into the television camera so that the camera can "see" the picture. If there is not enough light on the event when it is videotaped, then the resulting screen event will look grainy or dark. The camera will not have enough base light to make a "good" picture. It would
be similar to taking a photograph of your friends in a dimly lit restaurant without the aid of a flash (additional light). Secondly, lighting techniques aid in the creation of depth and screen space in a two dimensional medium. Even, flat lighting of subjects and objects can reduce their dimensionality from three to the two dimensions of the television screen. To create the illusion of depth, (off screen) separation lights are placed between actors and objects. Set pieces and characters are molded by lighting techniques to make them appear realistic and believable when viewed on a two dimensional medium. Viewer involvement is also intensified by the ability of television lighting to provide cues that indicate the mood of the event and the time of day (Zettl, 1984). Lighting that produces a lot of tall, deep shadows can be used to produce a scary, mysterious mood. Lighting that produces very little contrast between bright areas on the screen and the soft shadows evokes a more cheery, calming mood. Lighting that streams in through windows and seems motivated from an outside source like the sun, moon, street lamp or a skylight helps the viewer interpret the time of day of the screen event.

**Camera and lens motion**

Camera and lens movement produces the illusion of motion on the screen. Dependent on the technique used, the visual perspective is different. Through a camera lens movement called zoom, images are magnified (zoom in) or demagnified (zoom out). A camera movement such as a dolly (forward or backward
motion) conveys actual movement in and out of a scene (Wurtzel & Acker, 1989). The visual impression of camera movement can often serve to intensify viewer involvement (Zettl, 1985). For example, in a horror movie, the unsuspecting babysitter is sitting on the couch watching television with her back to the us. Slowly the camera dollies forward toward the babysitter's back. The viewers perceive this camera motion and interpret it as the killer sneaking up on the babysitter. A camera lens movement such as a zoom in to a close up of the babysitter's back would not convey the same message to the viewer. To cite another example, imagine the babysitter is in the kitchen preparing a late night snack. The babysitter finishes cutting some cheese and then exits the room, leaving the large shiny knife on the table. A zoom in camera lens movement magnifying the knife would serve to tell the viewer that the knife is about to be used to cut more than cheese. These two production elements are helpful in structuring the screen event for the viewer and intensifying viewer involvement.

**Camera angle**

The angle of the camera relative to the subject or event is accomplished through camera placement. The viewpoint afforded by the placement of the camera can provide the viewer the most advantageous or interesting perspective of the scene. A normal angle is achieved through positioning the camera at approximately the subject's eye level (Wurtzel & Acker, 1989). If children are
the focus of the scene such as in the popular children's show, SESAME STREET, the camera would be positioned in such a manner as to provide the viewer eye level contact with the children. Camera angles that are not normal serve to affect the audience's perception of what is happening on the screen (Zettl, 1991). For example, a high camera angle offers a perspective looking down on the subject. The subject will look smaller in size and stature. This camera angle can intensify viewer response when used to depict lack of power, loss of dominance or loneliness (Wurtzel & Acker, 1989). For example, a boss is scolding his employee and the viewer sees the employee from a high angle. The viewer may interpret that high angle to mean that the employee really feels degraded and hurt. In contrast, a low camera angle from below the eye level could be used to affect the viewer response of the boss as he looks over the employee. The low angle would produce the visual effect of the subject looking larger than life and thus perceived as powerful and dominant (Wurtzel & Acker, 1989).

Camera perspective

A culmination of different camera angles force a perspective of the screen event for the viewer. The most common perspective experienced by a viewer is that of an observer of the screen event. Known as the objective camera perspective, this viewpoint orient the viewer to the scene as an outside observer listening in on the event. Talk shows, games shows, situation comedies, and
soap operas generally provide an objective camera perspective. In contrast, a subjective camera perspective puts a camera in the place of the character, affording the viewer the character's point of view. The new television program that features police out on real arrests uses a subjective camera to provide the perspective of the cops. Sports coverage of football games now uses a miniature camera mounted on a football player's helmet to offer a perspective of the professional sports player. The subjective camera perspective intensifies viewer response by providing unique insight in the action featured in the screen event.

**Editing**

Editing is the way a screen event has been pieced together to convey its message. The structuring of the screen event through editing involves the juxtaposition of shots, the timing of the shots, and the transitional device used to get from shot to shot (Wurtzel & Acker, 1989).

The order and sequence into which the shots are assembled can affect what the audience perceives from the screen event. Zettl (1990) identifies several editing styles and their relationship to viewer involvement in the screen event. The *analytical sequential* montage is an editing style that presents a story sequentially from beginning to end with every detail of the action presented for the viewer. Consider a story about a little boy who raids a cookie jar. Edited according to this style, the viewer would see the little boy walk into the kitchen, climb up on the high stool,
take the lid off the cookie jar, put his hand inside and pull out several chocolate cookies. The viewer would then see the boy climb back down the stool, sit on the floor, eat his cookies, his mother enters the kitchen, and the boy stares up at his mother through a forest of chocolate cookie crumbs.

A more abbreviated version of the cookie raid could be presented through a different editing style called a **sectional analytical** montage. The screen event would be edited in such a way as to show only various sections of the event. This montage often stresses reaction rather than action (Zettl, 1973). Reconsider the cookie raid depicted by a sectional montage. It would look like this to the viewer: the boy looks at the cookie jar, a little hand in the cookie jar, the little boy sitting on the floor staring up at his mother with chocolate cookie crumbs all over his face.

An **idea associative** montage is more abstract in nature as it combines other elements intermittently between the events of the story being told. In the cookie raiding example, the viewer would see this sequence of shots: the boy looks at the cookie jar, a shot of a thief eyeing a precious gem in a jewelry store window, a little hand in the cookie jar, a shot of a black leather gloved hand taking the precious diamond out of the window, the little boy sitting on the floor staring up at his mother with chocolate cookie crumbs all over his face and then a shot of the black leather gloves being handcuffed. The objective is for the viewer to extract the general idea of a criminal act rather than the main story presented in the little boy's cookie raiding adventures. This style of editing can be
accomplished through a comparison of events as in the cookie raiding/thief example or events can be collided in order to express or reinforce a basic idea.

A collision idea associative montage about the state of the earth's ecological decay might look something like this to the viewer: the boy looks at the cookie jar, a shot of Earth from space, the boy climbs up on the stool, a close-up of garbage being dumped in landfills, a little hand in the cookie jar, a shot of congested freeway traffic with heat waves depicting the car fumes, the boy's hand pulling out lots of cookies, a shot of the redwoods being cut down, the little boy sitting on the floor staring up at his mother with chocolate cookie crumbs all over his face and then a shot of whale gutted open on the beach with a zoom out to a shot of Earth from space. The message being conveyed through this collision of images is that there is always a price to pay for our actions.

No matter the editing style used, the transitions used to piece the shots together can influence viewer response to the pacing and overall impression of the screen event (Wurtzel & Acker, 1989). Cuts are instantaneous in nature and are the most economical way to string together images for a screen event. Cuts are also the least obtrusive transition since they are invisible to the viewer. Another transition, the dissolve, serves to overlap images and produce a longer transition than a cut. Dissolves provide continuity of action, bridge large space and time intervals, and help to adjust the rhythm of the screen event to the mood or
rhythm of the actual event (Zettl, 1991). These are the two basic transitional devices used in television and film production.

**THE CONCEPT OF VIDEO STYLES**

Form, style and genre are sometimes used interchangeably in the literature to describe manipulations of the organization of film and video production variables. Film critics use the term genre to describe the number of popular film types similar in form, style, imagery and subject matter (Bywater and Sobchack, 1989). Attention is paid to the elements that compose the film as it is classified into groups of films with similar plots, characters and settings.

Robert Edmonds (1982) discussed style as the unique organization of film characteristics. Furthermore, he contended that the recognition of patterns in film elements and their subsequent style is a perceptual exercise in artistic appreciation for the viewers. Thus, genre or style is considered to be a matter of organization of elements and form. Robert Kraft (1987) outlined rules for structuring film form according to its organization and influence on viewer perception. Kraft introduced a new dimension to the concept of film form by advancing the notion that these strategies constitute a rhetoric of film, manipulating the viewers' evaluations of the effectiveness of the narrative elements. The structuring of visual messages to achieve particular viewer responses and the subsequent research of the process of structuring visual presentations is well established.
(Andrew, 1976; Coynik, 1974; Eisenstein, 1949; Gianetti, 1982; Kracauer, 1960; Kraft, 1987; Metz, 1974; Monaco, 1981; Pudovkin, 1958). Knowledge gained from these research traditions can contribute to a development of ways in which to structure video presentations for instructional contexts.

In past research traditions, the structuring of film or video messages has been referred to as form, style and genre. Used interchangeably in the literature, these terms reflect a reference to the structuring of production elements to produce a film or video narrative. While film theorists characterize film style through the identification and organization of production elements, some video experts use style to refer to program format (McQuillin, 1987; Newcomb, 1974). Television critic, Horace Newcomb (1974), reserves the term, style, to comment on the organization of production variables such as lighting, sound, pace, characterization and set design. Williams and Fulton (1984) defined style as the result of manipulations of a variety of production variables in such a way as to create a distinctive look, tone or impression to television work.

SIGHT, SOUND and MOTION, Zettl's (1990) book of television and film aesthetics, focuses on the structuring of screen events and the application of media aesthetics to the television and film production process with the intent of clarification and intensification of an event for an audience by an artist (p.14). Zettl identified five aesthetic fields of film and video that are
considerations of structure. They are lighting, screen area, depth, time, and sound.

The first aesthetic field is defined by light. According to Zettl (1973, 1991), lighting helps to clarify and intensify our environment and provides a context for our experiences. The intention of the manipulation of lighting for screen events is to provide adequate light in which to produce the information the camera needs to create an image, as well as cues of depth and time orientation for the audience of the screen event.

The second aesthetic field identified by Zettl (1973, 1990) is area. The area of the screen albeit film or video is limited in its two dimensionality. Real space becomes confined by available screen dimensions and needs to be manipulated to extend the space. Camera framing, angles and perspective all aid in the extension of screen space. For example, if the viewer is watching a screen event and sees a shot of a female jogger running along a wooded path suddenly turn and look backwards, the screen space is extended by the framing of the jogger looking behind her off the screen.

Depth is the aesthetic field that is created by cues the viewer receives from the composition of the image within the screen frame. The overlapping planes detected in images that partially cover one another, the relative size of objects within the screen frame and motion along the z-axis are all clues that help the viewer perceive depth in the screen event. Camera angles, camera and lens motion, and lighting can all be used to
manipulate the viewer's perception of depth within the two dimensional screen of television (Zettl, 1990).

Sound composes another aesthetic field as identified by Zettl (1990). Sound serves to supply essential information to the viewer, establish a mood or energy, and to supplement the rhythmic structure of the screen event. Music, sound effects and natural dialogue are used to extend the screen event for the viewer. Background noise during a party scene in a soap opera helps to enlargen the screen space to extend to the viewer's room. Music is also used as transitional devices to provide continuity for the viewer from one scene to the next and to provide cues of elapsed time. Music and sound effects can set the pacing and energy of the screen event while also intensifying the event for the viewer. For example, the scrawny legs of a swimmer underwater is viewed from the subjective perspective and the viewer hears the natural splashing of water along with the "done, done, done, done, done" of the familiar "jaws" music. Expectations are heightened, energy is high and the viewer calls out for the legs to kick faster.

Zettl's concepts of light, screen area, depth, time and sound are a culmination of film and video production research that provides guidelines for structuring the formal features with specific attention to aesthetics. One recent application of Zettl's concepts of contextual aesthetics is evident in Barbatsis and Guy's (1989) comparison of U.S. and British soap operas in an examination of the contribution of composition or form to the
meaning of the text. Four out of five aesthetic fields were analyzed employing a content analysis of formal features to determine the screen event density and viewer involvement. The technique developed for this study has tremendous applications for the analysis of video productions. This method of analysis yielded a set of production conventions, or a style of presentation, which allowed comparisons of production techniques between the sets of US and British soaps. In summary, the content of video presentations were clarified and intensified for the viewer through the structuring of the program.

**Video Styles: The Producer's Perspective**

Herbert Zettl (1982) contended that a video producer can manipulate a person's perception, and ultimately a person's behavior, by the precise calculated application of aesthetic variables such as light, sound and motion. The perspective of the video producer in operationalizing video styles is necessarily centered around the selection of production variables and the conscious structure of those variables to achieve a predefined objective whether it is to entertain, inform or persuade.

The use of style in producing media messages suggests controlling influence from a particular vantage point. Thus, the attribution of style to a particular video implies an intentional and/or integrated combination of elements which produces a distinctive, unified and sustained product. To illustrate, consider the composition of various music styles. Similar characteristics
are evident in each style of music. It is the variation of those characteristics inherent in each style of music that makes it different. Bill Monroe created a new style of music using the same instrumentation as Old Time String Band music. Instead of guitars, banjos, fiddles and mandolins featured in ensemble playing, Monroe fathered Bluegrass music by changing the tempo, and highlighting solo instruments (Goldblatt & Shelton, 1966).

Both styles of music are characterized by string instrumentation, tempo and even similar songs. The difference between the two styles of music lies in the careful structuring and variations of those basic elements. Applying this to video, a variation in the combination of basic production elements such as lighting, color, composition, pace, style of editing, camera perspective, and lens movement could produce various forms of video.

Commercial advertising have launched several campaigns that serve as excellent examples of fresh, innovative video styles. A coffee commercial that utilizes jerky, unconventionally framed camera shots with obvious edits reflects a home movies genre and echoes the visual structure with a message of "our coffee made your way." In a similar fashion, a men's slacks commercial uses the same type of video only focusing on men's pants as they play, work, and relax. The viewer is forced to focus on the jeans through this calculated awkwardness. Finally, the jeans' commercial colors the viewers' perception blue as everything is cast in a blue hue for the duration of the spot. All three of these
commercials are good examples of how varying the formal production features can produce different video forms.

From a producer's perspective, if the objective of the production is to enhance the learning opportunities for a specific audience, then the structure of formal features must reflect such intentions. The more that is known about the nature of the audience, the more the video production can be tailored for effective instruction. Previous research findings regarding the effects of formal production features on viewers' perceptions helped to identify the selection of production variables for this study.

**Video Styles and Learning**

A review of research which addresses the impact of formal production features on the viewer will help to clarify the importance of the relationship between the structure of visual presentations and the learning process. There is much evidence to suggest that structural characteristics of film, such as camera perspective, camera angle, lighting, framing, cutting, pacing, zooming and panning compose pictorial form and can be manipulated to affect the viewer's understanding and subsequent memory for the visual events (Andrew, 1976; Arnheim, 1974; Chandler, 1934; Coynik, 1974; Eisenstein, 1949; Hevner, 1935; Hutson and Wright, 1983; Metz, 1974; Monaco, 1981; Pickford, 1972; Shoemaker, 1964; Tannenbaum & Fosdick, 1960).
A number of authors suggest that formal features of film and video such as camera angle, camera perspective, camera movement, lens movement and editing work to emulate mental processing. Messaris (1982, 1987) for example, noted that the close-up shot visually externalizes the mental act of paying attention. Messaris also suggested that some editing conventions are used to bring the viewer into the scene. He identified "point-of-view" editing which utilizes frequent shifts in camera position or magnification to achieve the visual effect of bringing the viewer into the scene rather than relying on a fixed camera position. Messaris stated that this visual effect resembles how a person would pay attention in a particular situation. Another characteristic of editing style was examined by Tiemens (1989) who determined that rapid camera cuts are more natural to viewers than pans or zooms. He indicated that it is natural for people to make up to five eye movements (cuts) every second because fixations of the eye are as short as 200 to 500 milliseconds.

Meyrowitz (1986) suggested the importance of various production conventions in affecting the viewer's perception of interpersonal space or what Hall (1959) terms proxemics. Television production framing variables and camera perspective on content motion are believed to be proxemic conventions that serve to orient the viewer to a scene, mediate viewer perception of relationships among characters and influence viewer response to characters (Meyrowitz, 1986, p. 260). The difference between a
wide, medium and close up camera field of view is the difference between viewing a group of friends sitting in their kitchen from the other room in the house (WS); watching them from the kitchen door (MS); and sitting down at the table with them (CU).

Consequently, the structuring of the program interacts with the content variables of the production to shape the nature of viewer response with the variation and sequencing of camera framing (WS, MS, CU) serving to intensify viewer response (Zettl, 1990). Different shots can also work to emphasize the relative importance of what is being viewed. Lewis (1970) notes the size of an object effects the way we feel and understand it. He stated that "big" and "little" particularize and generalize. "The close-up focuses attention on what is important through magnification of relevant details and exclusion of unwanted portions of a subject. The full shot encompasses all of a subjects and facilitates recognition." (Lewis, 1970, p. 25)

To date, most effects research concerned with the influence of video production elements on audience perceptions isolated one or two of the basic video elements at a time (McCain & White, 1980; Sharff, 1982; Zettl, 1982). There has been little research on the totality of production formal features and subsequent audience perceptions. These findings indicate that camera perspective, camera framing and editing style are important production elements particularly in the structure of videos intended for instructional applications.
Past research findings have suggested patterns in the use of video in instructional interactive design for attention and memory aids (Alwitt, Anderson, Lorch & Levin, 1980; Clavert, Hutson, Watkins & Wright, 1983). Findings from this research indicate that certain production effects such as panning may help sustain attention, while static shots and slow zooms tend to decrease sustained attention. Hutson and Wright (1983) proposed that achieving attention is necessary for comprehension. Before one can process and comprehend information, one must first attend to the salient features of the presentation. Further, other scholars contend that comprehension is a necessary condition for sustained attention (Lorch, Anderson, & Levin, 1979). Therefore, it seems that instruction that can be readily understood will encourage sustained attention, whereas material that is perceived as confusing will most likely fail to hold attention regardless of the manipulation of production variables (Anderson & Lorch, 1983). These findings indicate that if instruction is to be effective then it must be designed to keep the student's attention and organized in such a way as to be clear and capable of matching the level of knowledge of the learner. These instructional design objectives are necessarily related to content and the structure of the lesson as well as the way in which it is presented. Further study of the manipulation of production elements (camera perspective, camera framing and editing style) and the subsequent styles of video presentation as they relate to the audience's visual experience and learning is needed.
The relationships between visual experience, learning and styles of visual presentation are not easily defined. In fact, a separation of the relationships between the three concepts may not do justice to understanding the complexities of the interrelationships. There are limited tools available to understand how a person's visual experience influences their learning in a situation in which video is used. In this study, the need to find some nonlinear explanation of this situation led to the production of several visual treatments.

A review of the literature indicated that camera perspective and editing style were two production features most likely related to learning. Careful examination of Kolb's stages of learning and Zettl's interpretations of production elements reveal conceptual similarities. These similarities were used to design the four visual treatments for this study.

Exploring the multidimensional relationships between visual experience, learner traits, styles of visual presentation and memory was without a doubt a complex problem. With limited tools available to understand the situation, it was necessary to develop some new visual tools to help contextualize the research problem.

The construction and production of four visual treatments used in this study were based on a connection between the information this researcher extracted from Kolb's learning styles
theory and Zettl's structural analysis of production conventions. In other words, Kolb’s learning stages (concrete experimentation, abstract conceptualization, active orientation, reflective observation) and Zettl's interpretations of the functions of video production elements were equated. Editing style and camera perspective were selected as the formal production features to construct the four visual treatments since research findings indicate the influence of such elements on audience attention and memory (Alwitt, Anderson, Lorch and Levin, 1980; Clavert, Hutson, Watkins and Wright, 1983; Messaris, 1970; Meyrowitz, 1986; Tiemens, 1989). An explanation of the theoretical connection made between Kolb’s learning stages and Zettl’s production interpretations details the construction of the four visual treatments used in this study.

Concrete/Abstract = Editing Style

In production, editing styles are one way to structure the orientation for the viewer. The editing styles that best mimic Kolb’s concrete/abstract dimension are analytical sequential montage and idea associative montage respectively (Zettl, 1990). The analytical sequential montage is an editing style that presents a story sequentially from beginning to end with every detail of the action presented for the viewer. The analytical sequential montage was selected as the editing style that would best sequence the screen event for learners with the strength in the ability to involve themselves openly in new concrete experiences.
The detailed representation of an event afforded by this editing technique was equated to the detailed, concrete experiential trait of learners. In contrast, the abstract conceptualization trait of learners was represented by the idea associative montage. The idea associative montage demands that the viewer relate two interwoven sequences together in order to make sense of the screen event. The abstract nature of this editing technique was believed to be best equated to the learners' strengths in creating concepts and generalizations from observations.

Reflective/Active = Camera Perspective

Applying Kolb's dimension of participation in learning (reflective/active), camera perspective offers the viewer a certain level of implied participation. Reflective camera perspective was that of the observer. The viewer saw the action from a third person perspective. As in a daytime soap opera, screen event drama was presented through camera placement that observed the action. In contrast, an active camera perspective was depicted by a subjective camera involving the viewer as a participant. The camera was put in the place of the main character allowing the viewer to participate in the action.

The appropriate production elements were combined to reflect the learning styles created by Kolb. The result was four treatments of video that hypothetically equate to the four styles of learners. A table depicting that equation follows:
Table 1

The Application of Learning Style and Video Aesthetic Theories to the Construction of Four Visual Treatments

<table>
<thead>
<tr>
<th>Learning Style Traits</th>
<th>Visual Treatment</th>
<th>Production Formal Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>concrete + reflect</td>
<td>First Observer</td>
<td>Sequential montage with objective camera</td>
</tr>
<tr>
<td>abstract + reflect</td>
<td>Experienced Observer</td>
<td>Idea montage with objective camera</td>
</tr>
<tr>
<td>abstract + active</td>
<td>Experienced Participant</td>
<td>Idea montage with subjective camera</td>
</tr>
<tr>
<td>concrete + active</td>
<td>First Participant</td>
<td>Sequential montage with subjective camera</td>
</tr>
</tbody>
</table>

The design used to create four visual treatments was grounded in Kolb's theory of learning and Zettl's analysis of production elements as an effort to probe the interrelationships between a person's visual experience, learning and response to visual treatments. The four visual treatments by nature of editing styles and camera perspectives depicted various levels of visual complexity. From the perspective of the viewer, the level of visual complexity may be dependent on his/her visual experience.
or the ability to recognize and interpret visual elements within the video presentation.

**VISUAL EXPERIENCE AND LEARNING**

In his work with children, Salomon (1979) made the argument that the relations between media codes and mental processing is not just a one-way process. He demonstrated that experience with media codes can actually become part of a child’s mental schemata, "resulting in a child's ability to think in terms of such codes as zooms and camera cuts" (Salomon, 1979, p. 213). While Salomon’s landmark observations of children were not conclusive, his studies led this researcher to the investigation of visual experience and its influence on mental processes in older audiences.

Learning from video is thought to be influenced by the methods used to amplify the important contextual and substantive features of the lesson (Hannafin, 1985). A deterrent to comprehension may lie in not only the structure of a message but also in its visual complexity. There is some evidence that suggests viewer experience with moving image technologies may be a factor in message comprehension. Research on the visual complexity of television messages and the degree of viewer attention paid to them reveal that the more visually complex the television message, the more mental effort is required by the viewer to comprehend it (Thornson et al, 1985). In 1983, Salomon stipulated that traditional instructional video
presentations are less effective with adult learners who are very familiar with the conventions of televised messages. This raises the question, would changing the styles of video presentation increase sustained attention among adult learners who have varying degrees of visual experience?

**Defining Visual Experience**

Visual experience is the level of ability any given person has to understand visual and spatial orientations as well as the person's ability to infer meaning from those media codes. The research based in communication and education concerning visual literacy and learning styles served to provide a basis for identifying the constructs of visual experience. Those dimensions were (1) visual/verbal orientation and (2) active/passive transformation.

The first dimension was based upon Sinatra's (1986) distinctions between visual and verbal literacies. Visual preference can best be described in the words of Dunn, Dunn and Price (1985, p.4) as "a learner whose primary perceptual strength is visual and can recall what has been observed: such people, when asked information from printed or diagramatic material, often close their eyes and visually recall what they had seen earlier." Alan Richardson developed the Verbalizer/Visualizer Questionnaire, a procedure for evaluating this dimension in 1977. Findings of validation research of Richardson (1977) and Walter (1953) indicate that two-thirds of the population reflect a mixture
of verbalization and visualization skills, while one third fell into equal numbers of habitual visualizers and verbalizers. This seems to indicate that the verbal/visual dimension is not polar in nature, but indicates strengths and weakness between the two extremes. Sinatra's theory of the development of the visual and verbal literacies coincides with Richardson's (1977) and Walter's (1953) findings.

The active/passive dimension was founded in the theories of Dewey (1938), Lewin (1951), Sinatra (1986) and David Kolb (1976, 1981). Active/Passive transformation was the term given to the way an individual transforms his/her experience into meaningful information (Kolb, 1981). Active experimentation exists on one extreme with an individual choosing participation in his/her environment in order to process information. The other extreme is the more passive in nature characterized by reflective observation. Previous research has operationalized this concept in terms of frequency of use of "moving image" technologies (Compaigne, 1983; Gagnon, 1986).

A Connectionist Perspective on Visual Experience

The evidence to suggest that visual experience plays a key role in instructional contexts in which video is used as a stimulus is minimal to date. Using Richard Sinatra's definition of the visual literacy process as a foundation, visual experience encompasses an individual's schemata. The stored repertoire of experiences (represented as quantity and quality) constitutes a person's visual
experience. Thus, an individual's visual experience changes with increases in exposure and alterations in the quality or types of exposure to visual stimuli. Moreover, from a Connectionist perspective of how people process information, the more practice a person has with image based technologies, the more schemas specific to visual concepts they will have stored in memory. When faced with an experience in which this knowledge is needed, the visual experienced person will be able to retrieve the right concept instantly (Chase & Simon, 1973).

Compaigne (1983) explored a new form of literacy that is believed to have been birthed in the mass introduction of micro-electronic technologies such as videogames. Research aimed at exploring the influence of practice with these new technologies on visual and spatial skills supported Kolb's theories about the role active experimentation plays in transforming information for individuals engaged in the learning process. Diana Gagnon (1986) found a significant relationship between age, videogame playing, spatial reasoning and visualization abilities. The more experienced videogame players tended to have better spatial and visualization abilities than less experienced players. Furthermore, practice with videogames improved subjects' scores on visual and spatial tests.

Visual experience was defined by the quantity and quality of exposure and participation an individual has with visual technologies. This perspective of visual experience assumes that the quantity of exposure will not necessarily ensure the quality of
exposure, but the frequency of exposure of events that are similar in nature can lead to a variety of schemas available to the user at lightning speed.

In summary, the dimensions of visual experience are still not clear cut. They are as complex in nature as Kolb's learning traits, yet not as well defined. Partly for this reason, a definition of visual experience was based upon the research findings of others, but primarily rested upon the theories of Connectionists (Bechtel, 1988; Cooper, 1980; McClelland, Rumelhardt & Hinton, 1986). Assuming a Connectionist model of perception, the frequency of exposure to image based technologies should play a vital role in distinguishing the novice from the expert with regards to the processing of messages received from video. In turn, research has shown that visual experience also has an impact on the perception of media complexity thus, influencing the viewer's attention. The relative contribution of visual experience to viewer comprehension under various message structures or video styles is not well understood.

PURPOSE OF THIS STUDY

In order to efficiently communicate with and educate the visually and technologically oriented generations of today and tomorrow, it is necessary to understand more about how people process, store and use information received from visual media. This study examined the relationships between visual experience, learning and visual treatment.
This study addressed the following five research questions.

1. What are the dimensions of visual experience which are related to learning styles?

2. What are the relationships between a person's visual and spatial orientation and the dimensions of their visual experience?

3. What are the relationships between a person's visual and spatial skills, and their ability to remember information presented visually?

4. What are the relationships between a person's learning traits and their ability to remember information presented visually?

5. When presented stimuli in various visual styles, what is the relationship between learning style (type) and memory?
CHAPTER II
EXPERIMENTAL MATERIALS

The Production of Four Visual Treatments

Visual treatments were one of the independent variables in this study. The four videos were each 7-11 minutes in length, but varied in the production structure as indicated in the Table 1. The intent of structuring the production content of the video in four different treatments was to allow for the cross comparison of subjects as they were matched and mismatched with their theorized video style. The structure of the videos employed other production elements believed to contribute to level of viewer involvement (Zetl, 1990). A concentrated effort was made in the design, production and presentation of these videos to apply other production elements such as lighting, camera lens movement and cues of screen depth consistently in each video.

The content of the videos centered around SALLY, a bag lady in a house. As SALLY moved about the room, she put goods in a black bag. The floorplan for the production set of SALLY can be found in Figure 12 located in Appendix A. The set was designed to look like the inside of a home, with the living room and bedroom visible to the viewer. Among the furnishings was a bar stocked with wine, an old record player with picture discs, an old dresser
with a mirror and knick knacks, a couple of coffee tables, a bookshelf well stocked with books, a clothes dresser, bed, coat rack and plants. The placement of these props and furnishings was consistent in each video. To create a realistic environment, the set was partially enclosed by production flats with windows and doorways. The living room and bedroom were dressed with pictures and floor coverings creating a unifying theme in the house.

The motivation for lighting was daylight filtering in the house. Since SALLY was to "break in" during the day, lighting was intended to appear naturalistic as it bounced off the walls and spilled through the windows. The advantage of this approach was to create the believable environment so that the viewers would not be distracted by a lack of realism.

Camera perspectives varied for each video however, attention was given to the consistent use of Z-axis staging. The same three dimensional depth was portrayed in all four videos. Each viewer was given depth cues in each video, no matter the camera perspective.

Each of the four treatments of the video was structured differently by varying camera perspective and editing sequence. All shots were carefully planned and storyboarded in order to assure the representation of four distinct styles of video presentations. A sample of the opening sequence of each video is presented in Figures 3, 4, 5 and 6 with a description of each video style.
Figure 3. Opening sequence for the First Observer video.
The *First Observer* video showed a straightforward, objective perspective of the detailed sequence of events as the bag lady broke in the house through a window and continued to circulate fondling and taking items as she went.

Illustrating a more abstract perspective of the robbery, the *Experienced Observer* video depicted a sectional edited version of the bag lady circulated the house fondling jewelry and taking some items. Shots were edited together leaving out details such as her specific movements and focusing on her reactions with the intent of portraying the event in a more abbreviated fashion. Figure 4 shows the opening sequence of the sectional edited version of SALLY.
Figure 4. Opening sequence of the Experienced Observer video.
Figure 5. Opening sequence of the Experienced Participant video.
Figure 5 illustrates the opening sequence of the *Experienced Participant* video. A similar sectional editing technique depicting SALLY's robbery was employed in this video style. Subjective camera shots of the bag lady crawling in the house and stealing items were presented in the abbreviated format. In this version the subjective perspective was dominant.

The *First Participant* video followed a natural detailed sequence of events, only it was shot from a subjective camera perspective depicting SALLY's viewpoint. This production style used the camera to illustrate the actions and movements of the main character's. While not all camera shots were characterized as subjective, a majority of them were from SALLY's perspective. Most objective shots were used to establish the setting or allow for editing continuity.
Figure 6. Opening sequence of the *First Participant* video
After the initial post production, an evaluation of the treatment of production elements in the four videos was achieved through collaboration with R. Compesi, P. Kipper and H. Khani (personal communication, March 14, 1991), three experts in the fields of video aesthetics and production. Dr. Ron Compesi is a professor of broadcast communication arts at San Francisco State University and the author of SMALL FORMAT TELEVISION PRODUCTION (1991). Dr. Philip Kipper is a professor of broadcast communication arts at San Francisco State University and editor of FEEDBACK magazine. Hamid Khani is a lecturer at San Francisco State University and a freelance corporate video producer. All three experts have at least six years of experience teaching video aesthetics and advanced video production.

A discussion among the panelists about the definitions of the production techniques in question (editing style and camera perspective) composed the evaluation. After a consensus about these definitions had been reached among the group, the experts were asked to watch each video and record on a form given to them which production elements were dominant in each of the four videos (Appendix C). The three experts were in agreement with the researcher about the presence of the production elements in each of the four styles. Next, the panel was asked to read the explanations of the four components of Kolb's learning styles and then to state their degree of agreement with the equation of the Kolb scales (concrete/abstract, reflective/active) and the production techniques used in the videos. The expert
panel agreed to the equation of the production techniques and the Kolb scales as described earlier in Table 1. The review panel had several comments and suggestions for revisions in the videos.

The first versions of the videos employed the use of objective camera, subjective camera, idea associative montage, and analytical sequential montage. The review panel agreed the four visual treatments could represent the four learning styles, but when placed in the context of the experimental design, two of the videos were believed to be problematic. The two treatments that applied the idea associative montage could contaminate subjects' recall scores by providing associations for memory. In the pilot version of the Experienced Observer was edited using the idea associative collision montage. Shots of SALLY in the house were intercut with shot of rich people buying, eating, drinking. The expert panel agreed that in the poor/rich montage, there were memory cues for viewers. For example, the panning of an elaborate banquet table preceded SALLY's savoring of an apple and such juxtaposition would provide viewers with a means to remember that the bag lady took an apple. The same was true for the associations in the pilot version of the Experienced Participant version of SALLY that employed a idea associative comparison montage. This style intercut SALLY's criminal activities with those of a professional thief. After much discussion, the expert panel recommended the substitution of analytical sectional montage in the place of the idea associative montage. The sectional montage presents the action from beginning to end, but
leaves out some details forcing the viewer to rely on viewing experience to follow the action. This editing style was judged by the expert panel to be an adequate substitution for the abstract nature of the idea associative montage. In SALLY, the sectional montage depicted her outside the window looking in the house and then in the next shot she is peeking inside the bedroom from inside the house. The viewer has to make the connection that she has broken in the house. The sectional montage is as abstract as the idea associative, but does not provide clues for memory. After revisions were made in all of the four videos, they varied in length from 7-11 minutes. Given the nature of sequential and sectional montages, it was not possible to produce four visual treatments equal in length.
Video styles were operationalized in this study as the one of the four visual treatments the subject viewed. Figure 7 illustrates the application of Kolb's scales to Zettl's interpretation of visual structure yielded four styles: First Observer, Experienced Observer, First Participant, Experienced Participant. At a glance, the learner traits that compose each learner type can be found by locating the black perimeter labels closest to the learner type. For example, Converger is composed of active and abstract traits. The
video style intended to match the Converger is depicted as the screen emerging from the core of the diagram. For the Converger, the video style is the *Experienced Participant*. Storyboards depicting each video style can be found in Figures 13 - 15 and 16 located in Appendix B.

**MEASURING INSTRUMENTS**

*Spatial Visualization and Spatial Orientation Tests*

Standardized tests that have been widely tested and retested on large samples of the population are available to assess subjects' *visual* skills (Guilford-Zimmerman, 1981). The Guilford-Zimmerman Spatial *Visualization* Test is designed to measure the subject's ability to manipulate ideas visually (see Appendix D). The Kruder-Richardson analysis indicated the reliability of this measure of spatial visualization to be .88 (Guilford-Zimmerman, 1981).

The Guilford-Zimmerman *Visualization* test is composed of pictures of an alarm clock which is shown in the first position. This is followed by a sphere with an arrow superimposed over it pointing in the direction the clock is to be rotated. The subject must imagine the clock being rotated in the direction of the arrow from the first position and then select the picture that represents the clock in its new position. Scores on the tests indicate the subject's relative ability to recognize and visualize objects in various spatial positions.
While there is still some debate over the specific distinctions of spatial skills, it is evident that a mental skill involving spatial processes can be separated from general intelligence and measured through specific aptitude tests (Kosslyn, 1990). Tests are available to measure spatial orientation abilities. The Guilford-Zimmerman Spatial Orientation Test is believed to test the subject's ability to determine changes in direction and position relative to the human body (see Appendix E). Kruder-Richardson estimates of reliability for this measure of spatial orientation have been computed to be .93 (Guilford-Zimmerman, 1981).

In the Guilford-Zimmerman spatial orientation test, the subject is presented with two pictures of the prow of the boat against a background scene. The subject is required to determine how the position of the boat has changed in the second picture relative to the initial position.

Both Guilford-Zimmerman tests are standardized and available through Consulting Psychologists (1990) with specific scoring procedures provided for a fee.

Memory: Recall and Recognition

Recall Measures

Two memory measures were designed for the experiment. The first measure of memory was an unaided recall test (Appendix F). Brown (1976) suggested that unaided recall requires subjects to rely exclusively on their own memories in order to generate an appropriate set of responses. In accordance
with this definition, subjects were given five minutes to list any object they remembered seeing the bag lady take out of the house. This approach tapped each subject's essential memories of the video scene without cues or prompting.

Scoring for unaided recall counted the total number of correctly recalled items. An item was considered correct if the subject's description totally discriminated it from another item. For example, writing "watch" was not counted as correct since other correct items were a man's silver watch and a ladies gold watch. If the subject wrote, gold watch, then the item would be scored as correct. In this study, recall was operationalized as the subject's scores on the unaided recall tests.

Recognition Measures

The second measure of memory tested subjects for recognition memory. A videotape was created of 37 objects. These objects were those that had been taken by the bag lady randomly mixed with "foil" objects that were not present in the scenes. The foil objects were either in the house but never taken (14 objects), or could have logically been in the house (6 objects).

Successful recognition often depends on duplication of contextual cues present at the time of encoding (Lockhart, Craik and Jacoby, 1976). By videotaping all objects against a light green background, removing them from their original context, the test was made more difficult. In this situation the viewer himself/herself must recreate in memory the original encoding
context, thus, this technique is held as a good test of the distinctiveness of the memory trace (Lockhart, Craik & Jacoby, 1976).

For the recognition test, each item appeared on the screen for 7 seconds. Ten seconds of black was recorded between each object allowing time for the subjects to record their answers on the score sheet (see Appendix G). The subject was instructed to mark "yes" if they remembered the object being taken from the house and "no" if they did not remember the object. A total of 17 items had been taken from the house. A method suggested by Woodworth and Schlosberg (1954) was applied for scoring. Subjects were penalized for guessing by the subtraction of the number of wrong answers from the total correct. This figure was then divided by the number of objects on the recognition test and converted into a percentage. Recognition was operationalized in this study by this test and the resulting percentage score.

LEARNING STYLE INVENTORY

Assessment of learning style types was accomplished through Kolb's Learning Style Inventory (1976, 1985) which can be found in Appendix H. This is a 12 item inventory which required the subjects to rank order (4 being the highest and 1 the lowest) four words on each item. One word in each row corresponds to each of the four learning modes in Kolb's model. By adding the ranks according to the four points on the learning cycle, a learner's profile (strengths and weaknesses) can be
plotted. Profiles can then be compared to a interpretation booklet that outlines the four styles of learners, their thinking patterns and occupational preferences.

Kolb's Learning Style Inventory has demonstrated very good internal reliability as measured by Cronbach's Alpha, N=268 (Kolb, 1985). The scales produced the following Cronbach Alphas: Concrete Experience a=.82; Reflective Observation a=.73; Abstract Conceptualization a=.83; Active Experimentation a=.78; Abstract Concrete a=.88; Active Reflective a=.81.

**Learner Types**

In this study learning styles were operationalized two ways. The first method characterized subjects by their overall learning style as indicated by Kolb's Learning Style Inventory. Each learner was characterized by a type that was defined by learning strengths and weaknesses. Scores from each of the four learner traits were subtracted from each other to produce a set of numbers. The *Reflective Observation* score was subtracted from the *Active Experimentation* score and the score in the *Concrete Experience* column was subtracted from the *Abstract Conceptualization* column. Using the numbers as x and y values respectively and a model depicting the four learning styles, subjects' learning style types were plotted (Kolb, 1985). For example, *Convergers* demonstrate strengths in abstraction abilities and active experimentation with weaknesses in the bi-polar traits of reflectiveness and involvement in concrete experiences.
Learner type was operationalized as membership to one of Kolb's categories of learners: *Converger, Accommodator, Diverger, Assimilator*.

**Learner Traits**

Learner types were the more general, encompassing characterization of subjects, while traits more specifically described by weakness and strengths in each of the four learner categories. Learner traits were operationalized by subjects' scores on each of the scales: Concrete Experience, Reflective Observation, Abstract Conceptualization, Active Experimentation.

Kolb's Learning Style Inventory (1985) was used to measure subjects' type and relative strengths in each of the four traits. The four endings to each of the 12 statements on the Learning Style Inventory were ordered to reflect each of the four learner traits. Forming four columns, the same order was applied to each statement. Subjects' responses in each of the four columns were added vertically to produce scores on the four learner traits: Concrete Experience, Reflective Observation, Abstract Conceptualization, Active Experimentation.

**VISUAL EXPERIENCE INVENTORY**

The 20 statements that compose the Visual Experience Inventory were derived from instruments used in previous studies and were written based on previous research findings (Compaigne, 1983; Dewey, 1938; Gagnon, 1986; Kolb, 1976, 1985;
Lewin, 1951; Richardson, 1977; Walter, 1953). The statements were written to reflect the active/less active and visual/verbal dimensions with the intentions of gathering quantitative and qualitative data on topics involving orientations to visual images as well as "moving image" technologies. These topics included (1) television viewing; (2) experience playing videogames; (3) use of VCR to rent movies or record off air; (4) movie (film) viewing; (5) computer access and use; and (6) leisure activity preferences. Each statement was accompanied by a either a Likert type scale or a forced choice scale. The last four questions on the inventory were intended for demographic data collection. A copy of the Visual Experience Inventory can be found in Appendix I.

Based on this researcher's experience and observations. These questions were designed to assess the visual/verbal dimension:

When you find yourself using an instruction manual or booklet, do you rely more on the diagrams or text?

Given a choice, would you rather solve a jigsaw puzzle or a crossword puzzle?

When you are using a map, do you visualize yourself on the map or do you navigate by using compass directions (NS-EW)?

If you could choose between playing a word game like Scrabble or a picture word game like Pictionary, which would you choose?

How often do you play video games?

How often do you watch television?
The active/passive or active/less active dimension was operationalized in the Visual Experience Inventory as the amount of selective exposure that characterizes an individual's use of visual "moving image" technologies. Questions also asked respondents to quantify amount of exposure and activity with regards to movies, VCR movies, art museums, computers, picture taking, and camera ownership. A forced choice scale was given with these selections: once a week or more, every other week, a few times a month, a few times a year and never. The following questions were derived from Richardson's Visual/Verbalizer Questionnaire (1977) and were reworded to meet the Visual Experience Inventory format.

If you were to describe your dreams, which would you say is clearer in your mind, the details of the dream or the overall theme(s) of the dream?

When you need instructions to do something, do you prefer to have someone show you or to read the instructions.

Which do you enjoy doing the most in your leisure time: watching tv or reading a book?

Which do you enjoy doing most in your leisure time: renting movies when you can afford it or watching television?

The Visual Experience Inventory was piloted among 190 participants and then factor analyzed to determine its reliability and validity. After analysis, the inventory was revised to
represent the verbal/visual and the active/passive dimensions with revised statements. The revised version is in Appendix J.

Visual experience was operationalized as the scores achieved on the Visual Experience Inventory. Dimensions of visual experience were defined as the sum of scores on the verbal/visual categories and the sum on the active/passive categories.

SUBJECTS

The rationale for this study developed from a concern for understanding and educating the technologically oriented generation thus, the sample was drawn from an urban university population (N=215). The image-centered generation, whom are presently of college age, was used as subjects since it is their visual experience that was of interest. The group that took part in the study was diverse. It included Asians, Pacific Islanders, Chicanos and Blacks as well as Caucasians. Subjects ranged in age from 17 to 50 with a mean of 25. Fifty seven percent of the subjects were male and 43 percent female. Eight percent of the subjects were age 18 to 25.

PROCEDURES

Eleven dates and times were set for pretesting and viewing the experimental materials. The visual treatment to be shown to individuals was generally randomly assigned, but dependent to some degree on the particular size of the testing group in order to ensure equal exposure to all four treatment videos. Eleven groups
of subjects were selected from a university course based upon age, availability and willingness to participate in the testing. All testing took place in university classrooms equipped with 27" color television monitors and videotape playback facilities. All subjects were seated at either a desk or a table to allow for writing.

The experimenter began by thanking the subjects for participating and then read the following:

The questionnaires you fill out today are not intelligence tests. We are interested only in your individual responses. During the activities that will take place in the next hour, I ask that you not talk to one another. Please don't confer or compare with those sitting next to you. The questionnaires we will be using today are timed. Please listen carefully to my instructions. Only look at the questionnaires when instructed. I am about to pass out folders and pencils to you. When you get a folder, turn it so that the dot is on the top right of the folder. Read the instructions on the front of the folder, but please do not open your folder until I ask you."

All subjects were then given folders that contained in order the Visual Experience Inventory, The Guilford-Zimmerman Spatial Orientation test, The Guilford-Zimmerman Visualization test, Kolb's Learning Style Inventory (1985), and a Recall Response form. General instructions reiterating the experimenter's first announcement were attached to the front of the folders. Each
folder was coded with a number written inside a colored dot sticker. After a few minutes had passed, the experimenter asked:

Has everyone read the instructions on the front of the folder? On my signal, take out your first questionnaire, close your folder. Your questionnaire should look like this (experimenter held up Visual Experience Inventory). Please read the instructions at the top of the questionnaire carefully. You may begin.

Subjects were given four minutes to complete the Visual Experience Inventory. The experimenter then said:

Please place your completed questionnaire in the back of your folder. Now take out the next questionnaire in your folder and the computer score sheet marked "1". This survey should have pictures of alarm clocks on the front of it. Let's read the instructions together.

The experimenter then did some of the sample items with the group helping them understand the instructions. Care was given not to offer techniques for solving the problems, but rather concentrated on the written instructions only. After the group indicated that they understood the directions, the experimenter read the following:

Let me remind you that this is not a test of intelligence or skill. I am only interested in your individual response. You may begin now. You will have 10 minutes. (Time passed) Please place your questionnaire and the computer score sheet in the back of your folder. Take out the next questionnaire
with the computer score sheet numbered 2. Let's read the instructions together.

The experimenter then did some of the sample items with the group helping them understand the instructions. Care was given not to offer techniques for solving the problems, but rather concentrated on the written instructions only. After the group indicated that they understood the directions, the experimenter informed the subjects that they had 10 minutes and could begin. At the end of the 10 minutes, the experimenter read:

Please place your test booklet and the computer sheet in the back of your folder and take out the next questionnaire. It should be marked "Learning Style Inventory". Please read the directions." (The experimenter would pause appropriately and then continue.) Remember to rank the sentence endings with 4 as the best for you and 1 as the selection that least fits you.

Subjects were given 5 minutes to complete the LSI and then instructed to place the questionnaire in their folders and close their folders. Viewer involvement was presumed by the verbal introduction to the video presentation and the introduction of the instructional objectives of the exercise. Concurrent with Robert Gagne's strategies for instructional design, students were given the general objectives of the next exercise before viewing the videotape. The experimenter read the following:

We are about to watch a video so please position your chairs so that you have a good view of one of the monitors. (The
experimenter would make certain subjects did move closer to the monitors.) You are about to see a brief video presentation. We are interested in your evaluation of the scene for use in television production. After viewing, you will be asked questions about the scene. I am now going to play the presentation. Please watch; there is no audio on the video.

At the end of the video the monitors were turned off and the subjects were instructed to return to their folders and remove the questionnaire labeled "First Video Response". This questionnaire asked subjects to list all the items that were taken out of the house in the video they had just seen on a response form (Appendix F) They were given three minutes to perform this task.
The experimenter then read the following:

You are about to see a videotape showing you a series of objects. Some of these objects appeared in the television scene you saw a few moments ago. Some of the objects were not in the scene. Each object will be shown to you for a few seconds. As you watch, try to remember if you saw the main character taking the object out of the house. When the object is no longer on the screen, you will have time to mark your answer on the numbered sheet given. Mark "yes" if you remember the main character taking the object out of the house. Mark "no" if you do not remember the main character taking the object out of the house. Please make sure you respond either yes or no to each item on the sheet. Please write the number that's on your folder on the top of the questionnaire I just passed out. Is everyone ready to begin? I'll play the tape now. You are about to see item number one.

At the conclusion of the videotape, the subjects were reminded to write the number that was on their folder on their sheet. They were then asked to place the questionnaire in their folders and to pass their folders forward. The entire process took place over a period of one hour and ten minutes. Even with repeated announcements concerning the time it would take to complete these tests, subjects were notably tired and sometimes appeared to be frustrated. The experimenter displayed her gratitude to the subjects for their endurance and participation by giving them chocolate candy.
CHAPTER III
RESULTS

In this study several types of analysis were performed on the data to determine the effects of visual experience on an individual's learning, the impact of visual and spatial skills on learning, and the influence of learner traits on an individual's ability to respond to visual presentations. All of these relationships were believed to be important in understanding how to tailor instruction for people of varying learning styles characterized by strengths in learner traits and different levels of visual experience. In presenting the results of the analysis, descriptive statistics will be presented first followed by analysis guided by five research questions and a post hoc analysis of the interactions between variables relevant to this research.

Descriptive Statistics

Table 2 presents a summary of the data categorized by learning style types. In this sample, gender was relatively evenly distributed among three of the four learning style types (Accommodator, Diverger, and Converger). In the Assimilator group there were twice as many males as females. Age was distributed with 80 percent of the sample in the targeted 18-25 group, 12 percent in the 26-32 group, 6 percent in the 33-40
group and the remaining 2 percent were in the 41-50 group. There were more *Assimilators* than any other learning style type.

### Table 2

**A Summary of Learning Style Types: Age and Sex**

#### Demographics

<table>
<thead>
<tr>
<th></th>
<th>Accommodator</th>
<th>Diverger</th>
<th>Converger</th>
<th>Assimilator</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=</td>
<td>52</td>
<td>54</td>
<td>31</td>
<td>75</td>
</tr>
<tr>
<td>Sex:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male(%)</td>
<td>44</td>
<td>46</td>
<td>58</td>
<td>72</td>
</tr>
<tr>
<td>Female(%)</td>
<td>56</td>
<td>54</td>
<td>42</td>
<td>28</td>
</tr>
<tr>
<td>Age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25(%)</td>
<td>80</td>
<td>83</td>
<td>77</td>
<td>78</td>
</tr>
<tr>
<td>26-32(%)</td>
<td>13</td>
<td>6</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>33-40(%)</td>
<td>4</td>
<td>11</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>41-50(%)</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Analysis aimed at describing the application of Kolb's Learning Style Inventory was performed to determine the nature of learner *traits*. The interrelationships between Reflective Observation, Active Experimentation, Abstract Conceptualization
and Concrete Experience were analyzed (n=215). Correlations between the traits are presented in Table 3. Reflective observation was negatively related to Active Experimentation at -.29 (p<.01). Abstract Conceptualization was negatively correlated to Concrete Experience (r=-.33, p<.01). These intercorrelations followed the predictions of Kolb's theory. That is, the strongest negative relationships exhibited were between the expected traits: Abstract Conceptualization and Concrete Experience; and Active Experimentation and Reflective Observation (Kolb, 1985, p. 6).

Table 3
Pooled Within Groups Correlation Matrix of Kolb's Learning Style Traits

<table>
<thead>
<tr>
<th></th>
<th>Concrete Experience</th>
<th>Reflective Observation</th>
<th>Abstract Conceptualization</th>
<th>Active Experimentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-O</td>
<td>-.2130*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-C</td>
<td>-.3253*</td>
<td>-.0092</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-E</td>
<td>.0277</td>
<td>-.2879*</td>
<td>-.1980*</td>
<td></td>
</tr>
</tbody>
</table>

Note. N=215.

*p<.01
Research Questions

Analyses addressed five research questions. Each question is presented here with a presentation of the results of the analyses relevant to the question.

What are the dimensions of visual experience which are related to learning styles?

The Visual Experience Inventory was factor analyzed to determine the nature of its hypothesized dimensionality. The inventory was constructed with two dimensions: visual/verbal preferences and active/less-active orientations to visual activities. The factor analysis produced three factors with weak loadings and little separation between them. Reliabilities produced for the items were extremely low. An examination of the raw data revealed subjects' responses to the items were fairly disparate. Effort was made to sum up responses on visual/verbal items and active/passive items placing subjects in high, medium and low categories in each dimension. Analysis of variance was used to examine any differences in recall or recognition scores among the three levels of the visual groups and the three levels of the active group. There were no significant differences observed. Then each item on the Visual Experience Inventory was treated as nominal data and Chi Squares were used to determine differences in recall or recognition among the four groups of learning styles. Again, no significant differences were found. One last attempt at understanding the Visual Experience Inventory measure led to
the summing of the subjects' scores on the items on the inventory to create one score. The reasoning behind this move was consistent with Kolb's theory that the ingredients may well be summative in nature. The total score was used to determine any correlations with learning traits. There were no significant correlations.

In examining visual experience as operationalized as visual and spatial abilities, some positive correlations with learning traits were found. Table 4 depicts the relationships between visual skills, spatial skills, and the four learner traits. Visualization skills significantly correlated with subjects' abilities to form abstractions and generalizations (r=.19, p<.05). Spatial skills also correlated with subjects' abstract conceptualization traits (r=.16, p<.01).

Table 4
Pooled Within Groups Correlations for Guilford-Zimmerman's Visual and Spatial Orientation Measures and Kolb's Learner Traits

<table>
<thead>
<tr>
<th></th>
<th>Concrete Experience</th>
<th>Reflective Observation</th>
<th>Abstract Conceptualization</th>
<th>Active Experimentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>-.09</td>
<td>-.04</td>
<td>.19*</td>
<td>.05</td>
</tr>
<tr>
<td>Spatial</td>
<td>-.08</td>
<td>.07</td>
<td>.16**</td>
<td>-.01</td>
</tr>
</tbody>
</table>

Note. N=215.

* p<.01    ** p<.05
What are the relationships between a person's visual and spatial skills and the dimensions of their visual experience?

Correlations were run using the total visual experience score as well as the subscores produced by adding the responses to the two dimensions. There were no significant correlations between visual skills, spatial skills and the visual/verbal and active/less active dimensions of visual experience.

What are the relationships between a person's visual and spatial skills, and their ability to remember information presented visually?

Multiple regression was used to analyze the relative contributions of the independent variables in explaining the variance in recall and recognition. The sample was subdivided by video treatment group and separate regressions for each of the video groupings produced no significant results. A subdivision by learning style was also unsuccessful in yielding significant results. When treated as a whole sample, only spatial orientation was found to be significant in explaining 3.5 percent of the variance in recognition scores (Table 5).

Subjects' scores on the four learner traits and the two Guilford-Zimmerman visual and spatial orientation tests were entered into the multiple regression analysis. A stepwise procedure was used which selected the variable that maximized the overall multivariate F. The variable that is selected first creates the best mathematical separation between subjects. New
variables are then entered into the equation on the basis of their ability to increase the amount of variance explained in the dependent measure. Table 5 shows the only variable which significantly accounted for variance in recognition was spatial orientation skills.

Table 5

Stepwise Multiple Regression Analysis with Recognition as the Dependent Measure

<table>
<thead>
<tr>
<th>Step</th>
<th>Independent Variable</th>
<th>R Squared</th>
<th>F* (df)</th>
<th>Beta</th>
<th>Adjusted R Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spatial Orientation</td>
<td>.035</td>
<td>7.93* (213)</td>
<td>.19</td>
<td>.03</td>
</tr>
</tbody>
</table>

* p<.01.

What are the relationships between a person's learning traits and their ability to remember information presented visually?

Multiple correlations were run on the four learner traits, recall and recognition. The only learner characteristic that produced significant correlations with recognition was active experimentation (r=.14, p<.05).
When presented stimuli in various visual styles, what is the relationship between learning style (type) and memory?

Table 6 depicts a summary the results of the analyses of the four learning styles by types. Analysis of variance revealed significant differences between the four groups in visualization skills ($F=2.04$, $p<.01$) and spatial skills ($F=2.13$, $p<.01$). Convergers had the highest average in visual skills (15.6), while Assimilators achieved the highest average score in spatial orientation (13.2).

**Table 6**

A Summary of Learning Style Types: Within Group Means for Recall, Recognition, Visual and Spatial Measures

<table>
<thead>
<tr>
<th></th>
<th>Accommodator</th>
<th>Diverger</th>
<th>Converger</th>
<th>Assimilator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean  SD</td>
<td>Mean  SD</td>
<td>Mean  SD</td>
<td>Mean  SD</td>
</tr>
<tr>
<td>Recall</td>
<td>10.8  3.0</td>
<td>9.2  3.6</td>
<td>11.3 12.7</td>
<td>10.1  2.8</td>
</tr>
<tr>
<td>Recognition</td>
<td>12.4  4.4</td>
<td>10.5  4.9</td>
<td>10.4  4.2</td>
<td>11.1  13.6</td>
</tr>
<tr>
<td>Visual Skills*</td>
<td>10.9  7.3</td>
<td>9.8  7.5</td>
<td>15.6  8.3</td>
<td>12.1  8.8</td>
</tr>
<tr>
<td>Spatial Skills**</td>
<td>10.3  7.4</td>
<td>8.1  6.4</td>
<td>12.0  8.1</td>
<td>13.2  9.6</td>
</tr>
</tbody>
</table>

* ANOVA showed significant difference between groups; $F=2.04$, $df=213$, $p<.01$.

**ANOVA showed significant difference between groups; $F=2.13$, $df=213$, $p<.01$.**
It was hypothesized that subjects that viewed the video version designed for their learning style would perform better on the memory tests than the other three groups. The sample was sorted according to learning type and analysis of variance was performed on each type to determine each group's performance under the four video treatments. In all cases, no significance difference was found between groups in their recall or recognition scores. This was indeed disturbing and further analysis led to the reexamination of Kolb's model of learning styles.

**Post hoc Analysis**

Since nothing was revealed in the analysis of the general learner types, further analyses of learner traits was examined. Post hoc analysis of the relationships between learner traits and responses to the four video treatments proved to be interesting.

Evident in the design of the Visual Experience Inventory and the visual treatments produced for particular learning styles, multilinear relationships were expected. While univariate methods of analysis were useful in examining some relationships, they were not comprehensive enough to provide a model of analysis for this particular study. An analysis of covariance model was employed in the post hoc analysis for its ability to represent complex relationships among several types of variables. This technique was useful when it became clear that analysis required an examination of the relationship between a quantitative dependent variable and a categorical independent variable, with
one or more quantitative variable as other independent variables (Wildt and Ahtola, 1978). As a post hoc procedure, recognition scores were used as the dependent measure of memory, the different visual treatments as the categorical independent variable. The other quantitative independent variables were the scores in the four learner traits, visual skills, spatial orientation skills and the summed scores on the Visual Experience Inventory. The analysis of covariance model explained nearly one fourth of the variance in recognition memory. The trends in the data revealed interactions that indicated relationships among learner traits, spatial skills and video presentations.

Table 7 shows the main effects and interaction effects of learning stages, visual experience, visual skills, and spatial skills with visual treatment. The model explained 23 percent of the variance in recognition scores. Specifically, contributors to the explained variance were (in order of significance) spatial skills, video treatment group, visual experience, abstract conceptualization learner traits, and concrete experience learner traits.
Table 7  

**Analysis of Covariance with Recognition as the Dependent Measure**  

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Degrees of Freedom</th>
<th>F Value</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAIN EFFECTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video Treatment group</td>
<td>3</td>
<td>4.25</td>
<td>.006*</td>
</tr>
<tr>
<td>Spatial Skills</td>
<td>1</td>
<td>9.09</td>
<td>.003*</td>
</tr>
<tr>
<td>Concrete Experience Trait</td>
<td>1</td>
<td>3.89</td>
<td>.050**</td>
</tr>
<tr>
<td>Abstract Conceptualization Trait</td>
<td>1</td>
<td>.33</td>
<td>.566</td>
</tr>
<tr>
<td>Visual Experience</td>
<td>1</td>
<td>7.53</td>
<td>.007*</td>
</tr>
<tr>
<td><strong>INTERACTION EFFECTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstract Conceptualization Trait with video treatment group</td>
<td>3</td>
<td>2.94</td>
<td>.035**</td>
</tr>
<tr>
<td>Concrete Experience Trait with video treatment group</td>
<td>3</td>
<td>2.67</td>
<td>.049**</td>
</tr>
<tr>
<td>Concrete Experience Trait ***</td>
<td>1</td>
<td>4.42</td>
<td>.037**</td>
</tr>
<tr>
<td>Concrete Experience with video treatment group***</td>
<td>3</td>
<td>2.51</td>
<td>.054**</td>
</tr>
<tr>
<td>Abstract Conceptualization with video treatment group***</td>
<td>3</td>
<td>2.77</td>
<td>.043**</td>
</tr>
</tbody>
</table>

* *p<.01  
** *p<.05  
*** Calculations reflect a control for any ceiling effects in the first variable listed
Using the calculations in the analysis of covariance model and accounting for the interaction between variables, the nature of relationships between variables were graphed. Figure 8 illustrates the relationship between recognition ability and visual experience. The subjects' responses to the Visual Experience Inventory were totaled and used in the analysis as a single score. In all video treatment groups, there was an inverse relationship between visual experience and recognition. As subjects' level of visual experience increased, recognition scores decreased.

![Graph showing the inverse relationship between Recognition and Visual Experience](image)

**Figure 8.** The Nature of the Relationship between Recognition and Visual Experience in all Video Treatment Groups.

Another variable that was examined in this study for its underlying contribution to the variance in recognition was spatial
orientation. Subjects' spatial abilities seemed to have a bearing on their ability to later remember objects in the video. As subjects' spatial skills increased, recognition memory increased (Figure 9). This relationship between spatial orientation and recognition was consistent in all visual treatment groups. There were no indications of significant interactions of spatial skills with learner traits, visual skills or visual experience (Table 7).

**Figure 9.** The Nature of the Relationship between Recognition and Spatial Orientation in all Video Treatment Groups.

The diversity of the sample analyzed in this study presented an artificial convergence of results in some learning traits. To
compensate for the ceiling effect caused in part by the similarity in subjects' demographics, the analysis of covariance model was adjusted to provide more detailed information that might otherwise be unavailable. This was accomplished by squaring the value of the variable and entering it into the model. Respondents' scores on abstract conceptualization and concrete experience learning traits were adjusted to compensate for any ceiling effects.

Interaction among treatment groups was significant in the learner traits of abstract conceptualization and concrete experience. An analysis of recognition scores between visual treatment groups yielded significant results when focusing on subjects' abilities to generate abstract concepts. Figure 10 illustrates that First Participant and Experienced Participant scored highest in recognition tests when their abstraction abilities were not strong. The First Observer group demonstrated a linear relationship between their recognition scores and abstraction abilities. Recognition scores diminished as abstraction abilities increased in the Experienced Observer treatment group.

Two observations stand out when viewing Figure 10. The groups First Observer and Experienced Participant viewed the subjective camera versions of SALLY. With this in mind, notice that when abstraction abilities were low, groups Experienced Participant and First Participant, score higher in recognition, whereas, groups First Observer and Experienced Observer scored low. The only difference in the structure of the video treatments between the two pairs of groups was the camera perspective.
As a learner *trait*, the ability to abstract requires attention to detail in order to extract the larger picture. Furthermore, abstraction abilities are characterized by thinking rather than feeling. When viewing a video from an objective perspective, the viewer is forced to scan a large amount of information and abstract out the pertinent information for later recall. Thus, videos presented in an objective perspective require high abstraction abilities on the part of the viewer. If the video is
intended for training or instruction, these findings indicate that
the learner must possess high abstraction abilities in order to
recall the material. In contrast, if the video is presented from a
subjective perspective, then the viewer is focused from the point
of view of the main character. The perspective is selected and
forced upon the viewer. Less abstraction is required for the
viewer when the perspective is already presented through a
subjective means. These findings suggest that if the viewer's
ability to abstract information is relatively low, then a less
demanding perspective is helpful in improving recall ability.

The curvilinear nature of the relationships between abstract
countemplization and the First Participant group and the
Experienced Participant group indicated that the camera
perspective may only make a difference when abstraction abilities
were low. When abstraction abilities were moderate, camera
perspective appeared to have no impact on recognition memory.
Subjects characterized by high abstraction abilities and who saw
the sequentially edited versions scored higher in recognition.

Figure 11 illustrates the relationship between subjects'
abilities to successfully involve themselves in new experiences
and score high on the recognition memory. Three of the four
visual treatment groups demonstrated weaknesses in the learner
traits of concrete experience while scoring high on recognition
tests. This trend presented some interesting challenges to the
theoretical assumptions underlying this study.
**Figure 11.** The Nature of the Relationship between Recognition and Concrete Experience in the Four Video Treatment Groups: First Observer (FO), First Participant (FP), Experienced Observer (EO) and Experienced Participant (EP)

The decrease in recognition in the two *Participant* groups conflicted with the assumption that the subjective camera perspective would offer more detail and a vicarious experience to subjects. Furthermore, those subjects with strengths in involving themselves in new experiences would be able to remember more from the videos matched to their learning style. However, the trend in Figure 11 seems to indicate that the groups that saw the subjective versions of SALLY demonstrated decreases in
recognition memory. These findings question the validity of the construction of the videos in their representations of the learner trait, concrete experience.

On the other hand, two groups were hypothesized to decrease in recognition memory with increases in concrete experience. The group that viewed the version of SALLY that was shot with an objective camera perspective and edited sectionally confirmed that hypothesis. However, the First Observer group was particularly characterized by a curvilinear relationship to recognition. For this group, recognition ability sharply decreased when high levels of the learning trait concrete experience were present.

A closer examination of Figure 11 illustrates that among the learners at a low to moderate range of concrete experience, those groups that scored higher in recognition tests were the viewers that had seen the complex edited versions of SALLY (EO and EP). Interestingly, the group that had viewed the more specific, straightforward view of SALLY (FO) demonstrated that high levels of the learning trait concrete experience negatively influenced recognition skills. Again, this finding was influenced by the curvilinear relationship of recognition and concrete experience for that particular group.

In summary so far, variations in learner memory was explained in part by spatial skills and visual experience. The learner traits abstract conceptualization and concrete experience explained variance in learner memory. A more detailed view of
the problem revealed that those variations in memory were due in part to the video style each learner viewed. The nature of those relationships and subsequent implications will be discussed in the following chapter.

Findings indicated that when subjects were administered a visual stimulus and asked to demonstrate their recognition of objects in a visual way, 23 percent of the variance in their ability to remember could be explained by (1) their visual experience; (2) their spatial skills; (3) their ability to form abstractions and generalizations; (4) their ability to involve themselves in new experiences without biases; (5) and the style of video they viewed. The significance of the complexity of the relationships between learner traits, memory and the style of video the subjects viewed was established. In addition to these findings, an analysis of learner types and traits produced some interesting results. The four styles of learners differ in type by visual and spatial scores. More specifically, visual and spatial skills were positively correlated with skills in the assimilation of concepts and generalizations.
CHAPTER IV
DISCUSSION

What is suggested by the findings in this study is that there were no single predictors of recognition in this setting, but rather an array of complex relationships that work together to influence memory. It was these underlying relationships that emerged as the focal point. Evident from the synthesis of theories across disciplines and the application of those theories to produce four experimental visual treatments, this study sought to reach beyond the identification of single predictors and explored the complex relationships among the multiple variables that influence people with different amounts of visual experience in similar instructional settings with different visual treatments. The discussion of findings in this study will therefore, be guided by this objective.

Analysis in this study addressed five research questions. Each question is listed below with a discussion of the findings related to that question.

What are the dimensions of visual experience which are related to learning styles?

While it seemed intuitive that the Visual Experience Inventory was a measure of visual preference and activity, all

100
related measures of visual and spatial skills proved to be significant for explaining differences in recognition among different learning style, it seemed evident that the Visual Experience Inventory was not an accurate measure of visual experience. The measure of visual experience may be too general in nature to display any relationships with learner traits. Furthermore, this was a measure of visual preference, verbal preference and activity history with image based technologies. The dimensionality in visual experience may range from actual visual experience to representational experience. Most people experience visual activities such as reading a book or catching a ball. These type of experiences are real and tangible which may influence memory of visual experiences. Representational visual experiences like looking at a photograph or observing a painting or sculpture are tangible activities, but they employ some aspect of interpretation of points, lines, form and dimension. These types of visual experiences may involve more complex schema in order to process and commit them to memory. The other dimension of visual experience is also considered representational of a three dimensional world but is communicated through a two dimensional medium such as television. Watching television, playing video games, and working with computer graphic programs requires a knowledge of the rules and concepts governing images in the transformation from a two dimensional medium to the illusion of three dimensional space. Visual and spatial skills are more likely to be correlated with schemas
accumulated from this kind of advanced representational visual experience.

All three of these types of visual experience (actual and both levels of representational) were represented in the Visual Experience Inventory. The lack of dimensionality may be more a matter of the instrumentation design than of the lack of relationship of visual experience with learner traits.

Visual skills and spatial skills were correlated with the abstract conceptualization learner trait. This means that a person’s ability to determine the orientation of objects relative to their body and to manipulate ideas visually is related to their ability to use logic and systematic planning to understand problems and situations. Visual skills, spatial skills and the ability to form abstractions and generalize require attention to detail and order. These skills are considered by David Kolb (1985) and (Guilford-Zimmerman, 1981) to be most important for mechanical jobs or careers as pilots, engineers and machine operators.

What are the relationships between a person's visual skills, spatial skills and the dimensions of their visual experience?

There were no observed correlations between visual skills, spatial skills and visual experience. This is not to suggest that there are no relationships between visual experience, visual skills and spatial skills, but rather that those relationships are complex in nature. Applying what is already known about the relationship between visual experience and the development of spatial skills (Gagnon, 1985) to the present findings, further research is needed
to determine the interaction of underlying dimensions of visual experience and the subsequent relationship to visual and spatial skills. Instead of looking at visual experience as something that can be categorized into polar extremes of visual/verbal and active/passive, research should seek to understand the complexity of the combination of types of visual experience. A model of visual experience should reflect the different natures of representational and nonrepresentational experiences but in such a way as to account for their commonalities. Variations in the quality and quantity of visual interactions may produce a clearer understanding of how transformation experiences afforded by the more complex representational image based technologies relates to human short term memory. With a more detailed view of these complexities, relationships of visual experience to visual and spatial skills could then be measured. Further research in this area should seek to define and refine an integrated model of visual experience that allows for the comparison of both actual, nonrepresentational experiences and levels of representational experiences.

What are the relationships between a person's visual experience and their ability to remember information presented visually?

As measured in this study by the Visual Experience Inventory, visual experience had a diminishing effect on recognition for all video treatment groups. This finding may be misleading due to the variations of representational and
nonrepresentational visual experience accounted for in the inventory. In other words, the measure was too general and did not reflect a measure of experience with the visual and spatial concepts displayed by video technologies. This assumption is supported by the relationships found between spatial skills and recognition.

Another explanation for the negative relationship between visual experience and recognition memory could be that the videos were not complex enough to maintain the attention of the subjects with above average visual experience. The differences between the sectional montage and the sequential montage may seem minimal for a fairly experienced television viewer. A more complex plot may have lended itself to a better representation of the differences between sectional and sequential montages.

Recognition measures may also have been influenced by the plot of the videos. SALLY roams around a house, not unlike most people's house, as she takes things out of drawers, off of shelves and tables. A method of memorization developed by the Greeks employs mental imagery in placing items around familiar surroundings in order to remember them. If you wanted to recall a grocery list, you would memorize it by mentally placing the items on the list around your house in a strange, unusual fashion. For example, if milk and strawberry jam was on your list, you might imagine your kitchen filled with a sea of milk with a large whale eating strawberry jam. Since SALLY was in a house, subjects may have had an easy time recalling the objects by
mentally placing them in context of a bedroom, a bookshelf or a bar.

Another approach to addressing the relationship between visual experience and recognition was to examine spatial skills as they related to recognition measures. There were significant differences in spatial skills between learning style groups, but all subjects' scores on recognition measures increased as their spatial orientation skills increased. These findings suggest that the ability to determine spatial relationships is helpful in extracting information from different styles of videos. Furthermore, these findings may be of use to those professionals interested in designing instruction for audiences with high degrees of visual experience.

What are the relationships between a person's learning style and their ability to remember information presented visually?

When examined by learning style types, no significant differences in recall or recognition were found between groups. Examining learners by type was as unproductive as examining visual experience as one variable. Learning styles are composed of several integrated learner traits and it was the analysis of those traits that contributed the most to the findings in this study.
When presented stimuli in various visual styles, what is the relationship between learning style and memory?

An examination of subjects' responses to the different visual treatments revealed some interesting results. When characterized by the below average ability to form generalizations, the learners that remembered the most were those that had seen the videos with a subjective camera perspective. This finding indicates that when the audience's ability to form abstractions is low, the subjective perspective would be the most productive design for instructional videos. Based on these findings, instructional videos targeted to professionals in medicine, accounting, nursing and engineering would be more effective if learning tasks were presented from a subjective camera perspective (Kolb, 1985).

People characterized by a below average abilities to open themselves up to new experiences in their learning were better at remembering what they had seen in the complex videos. That is, the people that viewed the videos that were edited in the most complex nature were the same ones that remembered the most about SALLY. The complex edited versions were shorter in duration and more abstract in nature. Learners with a reluctance to open themselves up to new experiences may benefit from a more abstract, abbreviated version of the video.
IMPLICATIONS

Visual Experience Inventory

The Visual Experience Inventory was designed to assess how much actual experience a person had with visual images. Originally, it was constructed to reflect a person's visual/verbal preference of activities and their actual participation in activities related to visuals. The problem was the type of visual experience was not characterized. Actual visual experience that may include tactile stimulation will form different schemas than experiences with representational types of visual experience. The strong relationship between spatial skills and recognition indicates a need for further exploration in the differentiation and assessment of nonrepresentational and representational forms of visual experience.

There are several factors that are believed to be related to a person's actual visual experience that were not measured in the Visual Experience Inventory. Access to the technologies or activities, time to attend, money to participate and quality of interaction are all inhibitors for visual experience in one form or another. These factors must be accounted for or included in the model of representational visual experience in order to determine qualitatively different levels of visual experience. The Visual Experience Inventory used in this study could be modified to reflect these other variables. Intuitively, items seem to have some face validity. Overall, this study suggests that spatial skills played a vital role in instruction that employs the use of videos.
This finding beckons more research in the area of visual experience that requires the development of spatial skills. A reliable measure of representational forms of visual experience could prove helpful in determining the appropriate video style for an individual.

**Corporate Media Producers**

The origin of this study evolved from an interest in the design and production of corporate and instructional videos. The premise was that the identification of a learner's characteristics could lead to the production of a video style to compliment their learning. It was believed that this process would yield more successful training or better education through videos. This theory is rooted in learning style theory that addresses the notion of matching teaching styles to learning styles in order to improve student learning. This study found that styles of visual presentation did interact with some learner characteristics.

The learner traits identified in this study characterize aspects of the audience for any corporate media producer. When designing training videos for a specific group, an array of visual treatments could be structured to meet instructional objectives. In addition to the structure of content, alternative media could be used to tailor instruction to accommodate the same claims of learner traits. For example, interactive subjective nursing simulations could be designed to facilitate strengths in active experimentation and desires for participation. Imagine an
interactive video that allows the learner to not only view from a subjective viewpoint, but actually participate in the scenario by selecting personal paths in the software program. Such instructional programs are already being used for doctor-patient simulations. For professional training in physical science, abstract yet active approaches would be productive. Complex montages that build to a clash or comparison of events may be a production structure that would suit people characterized by a tendency towards the technical trades. Audio can also be factored in to aid in the effectiveness of the presentation since audio often reinforces the visual concept or creates messages by its purposeful contradiction (Zettl, 1990). These are only a few of the production treatments that can be used to create more effective videos for instructional purposes.

There is enough evidence to suggest that further research is needed to determine methods for combining production variables to achieve effective learner characteristic matches. Using Zettl’s (1990) model of aesthetics, production variables can be categorized and combined in ways in which to maximize each of the learner characteristics and the combinations thereof. A model of corporate video styles could be developed to reflect the possible combinations of production features. Such prescriptive production is not feasible or desirable on the commercial market, but in corporate and instructional settings such targeting could prove to be cost effective. Corporations are already utilizing interactive computer work stations to train people how to make
cars, operate power plants, make pizzas, and sell banking services. These approaches to training and corporate education are already preferred over the cost of person to person training in large corporations. With the effective design of instructional videos such as it is proposed here, the chance of meeting the needs of the learner would be greater. The less the risk of not effectively teaching the worker, the less money wasted on training.

Future Research

More research is needed in this area to determine what other relationships influence memory in a video presentational setting. After all, this study only accounted for 23 percent of the variance in memory. What can explain the other 77 percent? Would the quality of visual experience influence an individual's learning from video? Several questions arose from the knowledge gained through this study that justify further research. Investigation needs to be conducted to examine the influence of task complexity in learning situations with visual stimuli on memory, alternative methods of visual instructional systems, and the complexities of visual experience.

Only short term memory was tested in this study. There was no attempt made to test for long term memory. Under the same conditions, measurements of memory after a long period of time may have radically altered the findings. For example, there may have been significant differences in recall and recognition abilities between the four learner types. Moreover, the trends in the data
among the four visual treatment groups may have been clearer under long term memory conditions.

In this study people were only asked to recall objects they had seen in a video. They were not asked to form generalizations, apply new knowledge or learn new skills. Often corporate videos are intended to train workers in learning new procedures, practices or acquire new skills. Task complexity by nature integrates concepts of learning that may interact with the learning process as well as the delivery system used to instruct. The structure and nature of instructional videos presented linearly or interactively could enhance or deter learning depending on the learner's competencies. More research is needed in this area to determine the influence of task complexity, visual structure and learner traits on learning. In light of complex instructional objectives, at what level does the learner traits level off or diminish in their influence on memory? These trends should be examined in light of the styles of visual presentation and the nature of instructional delivery systems.

Other methods of delivery of instructional material should be explored to determine their effectiveness on learners with different strengths. Interactive video is an exciting innovation that combines elements of artistic design, computer programming, video production and user response mechanisms. Applications of interactive video have ranged from entertainment to corporate training to instructional. Through the use of a microcomputer and a video disc player, interactive video can offer the user an
individualized, self paced, quality, educational experience in which the user can see, hear, and actively experience the consequences of their choices. The system consists of a computer, monitors, videodisc player, printer and the software (videodisc and compute program) necessary to drive the interactive experience. Complimenting learner strengths can take place not only in the video design, but in the delivery mode as well.

New applications of interactive media systems electronically place the user on the screen within the computer program. As the user responds and moves, consequences of their actions trigger the animated background. People with a great deal of visual experience could very well be excited about such applications of visual technologies. Perhaps only certain personality types would be excited enough to participate or even prefer such methods of instruction.

As a delivery medium, interactive video has the capacity to collect data about the user and then deliver instruction that is tailored for the most effective path to the user. The more information available about people as individuals, the better able designers will be able to structure media messages with applications for improving learning efficiency. If the shortest distant between two points is a straight line, then perhaps the most efficient means of instruction is a direct path between the student and the material. The direct path can only be accomplished by research that integrates at the very least,
knowledge about human thought processes, memory, learning and visual experience.

The parameters of visual experience are not yet well defined. More research is needed to determine the complexities of representational forms of visual experience and their influence on strengthening the skills required to transform two dimensional images into three dimensional applications. With the Connectionist assumption that exposure and practice has the power to increase ability, understanding the complexities of visual experience is synonymous to understanding today's image centered generation.

The concern for the education of the nation's teenagers needs to be addressed from a more innovative approach. Instead of financing only old drop out prevention programs, funding needs to be channeled into the research of more innovative ways to meet the needs of the image centered generation of today and tomorrow. The design of curricula and instruction needs to reflect the changes in the learners over the past fifteen years. The key is to develop creative ways of applying what we know or think we already know in order to reach beyond the surface. Determining the complexities of the dimensionality of concepts central to the image centered generations is the place to begin. Some aspect of visual experience characterizes the 14 percent of teenagers that are dropping out of school. Unless we do the research, we will continue to fail.
APPENDIX A

FLOORPLAN FOR THE PRODUCTION OF THE FOUR VISUAL TREATMENTS OF SALLY
Figure 1.2  Floorplan for the production of the four visual treatments of SALLY
APPENDIX B

STORYBOARDS FOR VISUAL TREATMENTS
Figure 1.3 Storyboard of First Observer visual treatment
Figure 1.3 (continued)  Storyboard of First Observer visual treatment
Figure 1.3 (continued)  Storyboard of *First Observer* visual treatment
Figure 1.3 (continued) Storyboard of First Observer visual treatment
Figure 1.3 (continued) Storyboard of *First Observer*
visual treatment
Figure 1.3 (continued)  Storyboard of *First Observer*

visual treatment
Figure 1.3 (continued) Storyboard of *First Observer*

visual treatment
Figure 14. Storyboard of Experienced Observer visual treatment
Figure 14 (continued) Storyboard of Experienced Observer visual treatment
Figure 14 (continued) Storyboard of Experienced Observer visual treatment
Figure 14 (continued) Storyboard of Experienced Observer visual treatment
Figure 14 (continued) Storyboard of Experienced Observer visual treatment
Figure 14 (continued)  Storyboard of Experienced Observer visual treatment
Figure 1.5 Storyboard of Experienced Participant
visual treatment
Figure 1.5 (continued)  Storyboard of Experienced Participant visual treatment
Figure 15 (continued)  Storyboard of Experienced Participant visual treatment
Figure 15 (continued)  Storyboard of Experienced Participant visual treatment
Figure 15 (continued)  Storyboard of *Experienced* Participant visual treatment
Figure 15 (continued)  Storyboard of Experienced Participant visual treatment
Figure 15 (continued)  Storyboard of Experienced Participant visual treatment
Figure 15 (continued) Storyboard of Experienced Participant visual treatment
Figure 15 (continued)  Storyboard of *Experienced*

*Participant* visual treatment
Figure 15 (continued) Storyboard of Experienced Participant visual treatment
Figure 16. Storyboard of First Participant visual treatment
Figure 16 (continued). Storyboard of *First Participant*

visual treatment
Figure 16 (continued). Storyboard of First Participant visual treatment
Figure 16 (continued). Storyboard of First Participant visual treatment
Figure 16 (continued). Storyboard of First Participant visual treatment
Figure 16 (continued). Storyboard of *First Participant*
visual treatment
Figure 16 (continued). Storyboard of First Participant
visual treatment
Figure 16 (continued). Storyboard of First Participant visual treatment
Figure 16 (continued). Storyboard of *First Participant*

visual treatment
Figure 1.6 (continued). Storyboard of First Participant visual treatment.
Figure 16 (continued). Storyboard of First Participant visual treatment
Figure 16 (continued). Storyboard of First Participant visual treatment
APPENDIX C
EXPERT PANEL REVIEW
PART 1
Using the table below, please place a check by the production techniques you believe to be present in each video.

<table>
<thead>
<tr>
<th>PRODUCTION TECHNIQUES</th>
<th>VIDEO 1</th>
<th>VIDEO 2</th>
<th>VIDEO 3</th>
<th>VIDEO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBJECTIVE CAMER A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBJECTIVE CAMER A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDEA ASSOCIATIVE MONTAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANALYTICAL SEQUENTIAL MONTAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PART 2
PLEASE READ THE EXPLANATIONS OF THE FOUR COMPONENTS OF KOLB'S LEARNING STYLES

CONCRETE EXPERIENCE- These learners would involve themselves in actual life experiences. This stage of learning is characterized by learning from specific experiences.

ABSTRACT CONCEPTUALIZATION - These learners best orient themselves in learning situations through a higher order framework, or the use of a model or a theory. This stage of learning is characterized by thinking.

ACTIVE EXPERIMENTATION - These learners are participatory in nature and actively test their hypothesis. This stage is characterized by doing and not watching.

REFLECTIVE OBSERVATION - These learners understand ideas and situations through objectivity, patience and careful judgement but without necessarily taking any action. This stage is characterized by looking for the meaning of things.
PART 2 CONTINUED

Relying on your expertise in video aesthetics please...FILL IN THE TABLE BELOW BY INDICATING YOUR AGREEMENT (YES/NO) WITH THE EQUATION OF THE PRODUCTION TECHNIQUE AND THE LEARNING STYLE COMPONENT. THEN STATE YOUR DEGREE OF AGREEMENT BY LISTING SA FOR strongly agree, A for agree, NS for not sure, D for disagree and SD for strongly disagree.

<table>
<thead>
<tr>
<th>LEARNING STYLE COMPONENT</th>
<th>PRODUCTION TECHNIQUE</th>
<th>AGREE</th>
<th>To WHAT DEGREE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE</td>
<td>Analytical Sequential Montage</td>
<td></td>
<td>Strongly Agree/Agree</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>Idea Associative Montage</td>
<td></td>
<td>Not sure/Disagree</td>
</tr>
<tr>
<td>ACTIVE</td>
<td>Subjective Camera Perspective</td>
<td></td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>REFLECTIVE</td>
<td>Objective Camera Perspective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PART 3

Comments
EXAMPLE OF VISUAL APTITUDE SURVEY


INSTRUCTIONS: This is a test of how well you are able to visualize spatial position. The first picture at the left shows a clock. Next to it is a sphere with an arrow marked on it. The arrow shows how the clock is to be moved. In each item you are to note how the clock would move if it were moved as indicated by the arrow on the sphere.

Answer: When the clock is moved to the one quarter turn shown by the arrow, it is then in position B. Therefore, the correct answer is B.
APPENDIX E
EXAMPLE OF SPATIAL APTITUDE SURVEY
EXAMPLE OF SPATIAL APTITUDE SURVEY


Instructions: This is a test of your ability to see changes in direction and position. In each item you are to note the position of the boat has changed in the second picture from the original position in the first picture. To work each item: First, look at the top picture and see where the motor boat is headed. Second, look at the bottom picture and note the CHANGE in the boat's heading. Third, mark the answer that shows the same change on the separate answer sheet. Note: the bars represent the boat's prow (front end).

Answer: The correct answer is D. It shows that the prow of the boat has dropped below the aiming point.
APPENDIX F
FIRST VIDEO RESPONSE
FIRST VIDEO RESPONSE

In the space provided below, please list the objects that the character took out of the house. Name the object(s) or give a brief description of important physical characteristics. Please print clearly.
While watching the videotape, mark a "yes" if you remember the main character taking the object out of the house. Mark a "no" if you do not remember seeing the character take the object out of the house.

1. Harmonica □ Yes □ No
2. Green Liquor Bottle □ Yes □ No
3. Apple □ Yes □ No
4. Grey Hat □ Yes □ No
5. Boots □ Yes □ No
6. Black Gloves □ Yes □ No
7. Diamond Ring □ Yes □ No
8. Gold Watch □ Yes □ No
9. String of Pearls □ Yes □ No
10. Binoculars □ Yes □ No
11. Patterned skirt □ Yes □ No
12. Long Sleeved Faded Red Sweatshirt □ Yes □ No
13. Two White Candles □ Yes □ No
14. Umbrella □ Yes □ No
15. Green Scarf □ Yes □ No
16. Black Bag □ Yes □ No
17. Money □ Yes □ No
18. Bracelet □ Yes □ No
19. Expensive Pens with Blue Case □ Yes □ No
20. Red and Yellow Glass Vase □ Yes □ No
21. Clear, Decorative Liquor Bottle □ Yes □ No
22. Flower-patterned Handbag □ Yes □ No
23. "Butcher" Paperback Book □ Yes □ No
24. Empty Green Liquor Bottle □ Yes □ No
25. Brown Book □ Yes □ No
26. Green Diamond Earrings □ Yes □ No
27. Pottery Brown Lotion Dispenser □ Yes □ No
28. Silver Watch □ Yes □ No
29. Old Picture-Record □ Yes □ No
30. Brass Bunny □ Yes □ No
31. Green Liquor glass □ Yes □ No
32. Brass Candle Holder □ Yes □ No
33. Keys □ Yes □ No
34. Weaved Wine Bottle □ Yes □ No
35. Full Liquor Bottle with Bows □ Yes □ No
36. Decorative Dripped Candle □ Yes □ No
37. Pear Broche □ Yes □ No
APPENDIX H

EXAMPLE OF LEARNING STYLE INVENTORY
EXAMPLE OF LEARNING-STYLE INVENTORY

Kolb's Learning Style Inventory, reproduced with permission of the McBer and Company, copyright 1976.

INSTRUCTIONS: The Learning-Style Inventory describes the way you learn and how you deal with ideas and day-to-day situations in your life. Below are 12 sentences with a choice of four endings. Rank the endings for each sentence according to how well you think each one fits with how you would go about learning something. Try to recall some recent situations where you had to learn something new, perhaps in your job. Then, using the spaces provided, rank a "4" for the sentence ending that describes how you learn best, down to a "1" for the sentence ending that seems least like the way you would learn. Be sure to rank all the endings for each sentence unit. Please do not make ties.

Example of completed sentence set:

When I learn ____ I am happy. ____ I am fast. ____ I am logical. ____ I am careful.
APPENDIX I

VISUAL EXPERIENCE INVENTORY (PILOT)
1. What do you primarily rely on when you use instruction manuals?
   - Diagrams
   - Text

2. Which puzzle would you prefer to solve?
   - Jigsaw Puzzle
   - Crossword Puzzle

3. What strategy do you use when interpreting a map?
   - Visualize myself on the map
   - Use compass directions (NS-EW)

4. What are your daydreams usually like?
   - Indistinct and hazy
   - Extremely and vivid

5. When you need instructions to do something, which do you prefer?
   - Have someone show me
   - Read the instructions

6. If you could choose between playing a word game like Scrabble or a picture word game like Pictionary, which would you choose?
   - Scrabble
   - Pictionary

7. What are your dreams like?
   - Extremely vivid
   - I seldom dream

8. How do you feel about learning new words?
   - Not excited at all
   - Very enthusiastic

9. Which do you enjoy doing most in your leisure time?
   - Watching tv
   - Reading a book

10. Which do you enjoy doing most in your leisure time?
    - Renting movies (when I can afford it)
    - Watching tv
11. I play videogames:

<table>
<thead>
<tr>
<th></th>
<th>once a week</th>
<th>every other week</th>
<th>a few times</th>
<th>a few times</th>
<th>Never a month</th>
<th>Never a year</th>
</tr>
</thead>
</table>

12. I watch television:

<table>
<thead>
<tr>
<th></th>
<th>once a week</th>
<th>every other week</th>
<th>a few times</th>
<th>a few times</th>
<th>Never a month</th>
<th>Never a year</th>
</tr>
</thead>
</table>

13. I rent VCR movies:

<table>
<thead>
<tr>
<th></th>
<th>once a week</th>
<th>every other week</th>
<th>a few times</th>
<th>a few times</th>
<th>Never a month</th>
<th>Never a year</th>
</tr>
</thead>
</table>

14. I record tv shows on my VCR to watch later:

<table>
<thead>
<tr>
<th></th>
<th>once a week</th>
<th>every other week</th>
<th>a few times</th>
<th>a few times</th>
<th>Never a month</th>
<th>Never a year</th>
</tr>
</thead>
</table>

15. I go to the movies:

<table>
<thead>
<tr>
<th></th>
<th>once a week</th>
<th>every other week</th>
<th>a few times</th>
<th>a few times</th>
<th>Never a month</th>
<th>Never a year</th>
</tr>
</thead>
</table>

16. I use a computer:

<table>
<thead>
<tr>
<th></th>
<th>once a week</th>
<th>every other week</th>
<th>a few times</th>
<th>a few times</th>
<th>Never a month</th>
<th>Never a year</th>
</tr>
</thead>
</table>

17. What sex are you?  Male    Female

18. Please check the age group to which you are a member.

<table>
<thead>
<tr>
<th>18-25</th>
<th>26-32</th>
<th>33-40</th>
<th>41-50</th>
<th>51-62</th>
<th>63+</th>
</tr>
</thead>
</table>

19. Place a check by the items that you presently own.

<table>
<thead>
<tr>
<th>VCR</th>
<th>Video Camcorder</th>
<th>Television</th>
<th>Computer</th>
</tr>
</thead>
</table>

20. Place a check by the items that you use in your workplace.

<table>
<thead>
<tr>
<th>VCR</th>
<th>Video Camcorder</th>
<th>Television</th>
<th>Computer</th>
</tr>
</thead>
</table>
APPENDIX J
VISUAL EXPERIENCE INVENTORY (REVISED)
1. When you find yourself using an instruction manual or booklet, do you rely more on the diagrams or text?
   
   Diagrams ____________________________ Text

2. Given a choice, would you rather solve a jigsaw or a crossword puzzle?
   
   Jigsaw Puzzle ____________________________ Crossword Puzzle

3. When you are using a map, do you visualize yourself on the map or do you navigate by using compass directions (NS-EW)?
   
   Visualize myself on the map ________________ Use compass directions (NS-EW)

4. If you were to describe your dreams, which would you say is clearer in your mind, the details of the dream or the overall theme(s) of the dream?
   
   Details ____________________________ Overall Theme(s)

5. When you need instructions to do something, which do you prefer?
   
   Have someone show me ____________________________ Read the instructions

6. If you could choose between playing a word game like Scrabble or a picture word game like Pictionary, which would you choose?
   
   Scrabble ____________________________ Pictionary

7. Which do you enjoy doing most in your leisure time?
   
   Watching tv ____________________________ Reading a book

8. Which do you enjoy doing most in your leisure time?
   
   Renting movies (when I can afford it) ____________________________ Watching tv

9. I play videogames:
   
   Once a week every few times a few times Never

10. I watch television:
    
    Once a week every few times a few times Never
11. I rent VCR movies:

   once a week  every other times
   a few times
   or more week  a month  a year
   Never

12. I go to art museums:

   once a week  every other times
   a few times
   or more week  a month  a year
   Never

13. I go to the movies:

   once a week  every other times
   a few times
   or more week  a month  a year
   Never

14. I use the computer:

   once a week  every other times
   a few times
   or more week  a month  a year
   Never

15. How often do you take pictures (photographs)?

   once a week  every other times
   a few times
   or more week  a month  a year
   Never

16. Do you own a video camera?  _____Yes  _____No

17. How many art classes have you taken (including present)?

   One  Two  Three  Four  Five
   or more

18. Please check the age group to which you are a member.

   _____18-25  _____26-32  _____33-40  _____41-50  _____51-62  _____63+

19. What sex are you?  _____Male  _____Female
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