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When Education Becomes Entertainment: The Effects of Heavy Viewing of Content Light Programming on Instructional Television Comprehension and Recall

Marilyn Terzic

A Thesis

in

The Department

of

Education

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ABSTRACT

When Education Becomes Entertainment: The Effects of Heavy Viewing of Content Light Programming on Instructional Television Comprehension and Recall

Marilyn Terzic

Do the types of television programs we watch affect our comprehension and recall of events presented in another genre? If so, to what extent? Research evidence confirms that network and specialty channel programs are produced to reflect the audiences' learning styles, in order to accommodate the individual differences in the ways in which people process audiovisual information. In light of these findings, this study examines the relationship between heavy viewing of content light television programs and an individual's comprehension and recall of events presented in a documentary. After watching a 10–minute documentary, content light and content heavy television viewers were given an intervening task and attitudinal survey, followed by two tests measuring their recall of the program's narrative and visual components. The results indicate that the content light group found concrete and readily visualized information easier to comprehend and recall, than semantically and acoustically complex details which were mastered by the content heavy group. As well, the content heavy group had a tendency to see the information

presented in the documentary as a whole, and were able to have an overall perspective and appreciate its total context. By contrast, the subjects in the content light group viewed the program as a collection of parts, and often focussed on one aspect of a situation to the exclusion of the others. Suggestions pertaining to the use of advance organizers, attention attracting devices, embedded questions, music, repetition, and on–screen narrators in instructional television programs are discussed.

ACKNOWLEDGMENTS

Although the preparation of a thesis is never easy, without the understanding, help, and close cooperation of my committee, it would have been even more difficult.

My sincere thanks go to my committee chair, Dr. Richard F. Schmid, and David Wells for their guidance and assistance, and to Dr. Robert M. Bernard for his insightful remarks.

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INTRODUCTION

Television is an emotional medium: It can to move us to laughter, anger, tears, or wonder. It also informs us. Yet the information it provides is often of little substance. Even in journalistic or public affairs programs, we seek and are given entertainment. Hardly ever do we see examples of critical thinking or a synthesis of ideas. From news programs to cartoons, situation comedies (sitcoms) to made–for–television movies, we tend to watch programs that reaffirm our thoughts and beliefs, offer us vicarious experiences, or simply help us to unwind. As Burling (1992) notes, people usually watch television because it is an easy way to keep the little gray cells harmlessly occupied.

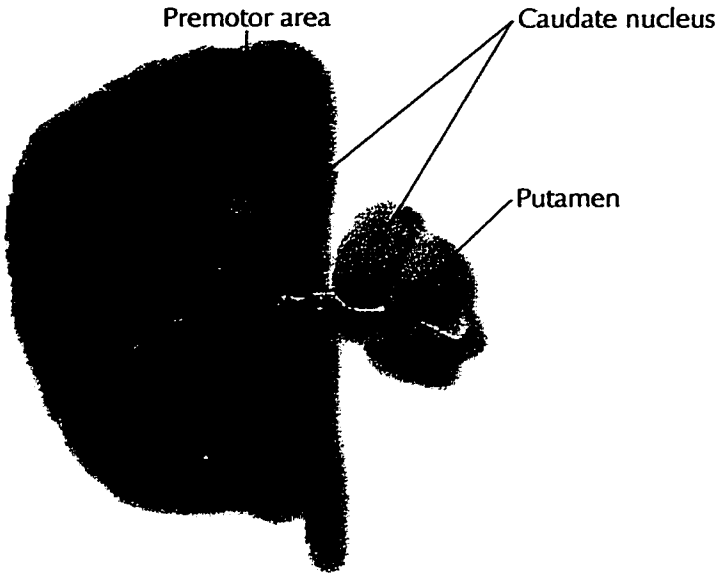
In view of the vast array of content light programs streaming into our homes, what are educators to make of instructional television in general, and documentaries, in particular, that purport to be valuable educational tools? Research conducted on behalf of major foundations interested in the use of documentaries in schools suggests that educators can benefit from the medium's educational power (Corporation for Public Broadcasting, 1991): Documentaries can inspire students to further research, generate discussion, and render an emotional and visceral truth to an event that often seems lifeless and distant. Thus, they can open new paths of inquiry for students, and reach them in a variety of ways.

Although the added benefits of using audiovisual materials in instruction are clear (Corporation for Public Broadcasting, 1991), the effective use of documentaries can only be achieved if efforts are made to accommodate the audiences' learning styles. Therefore, if

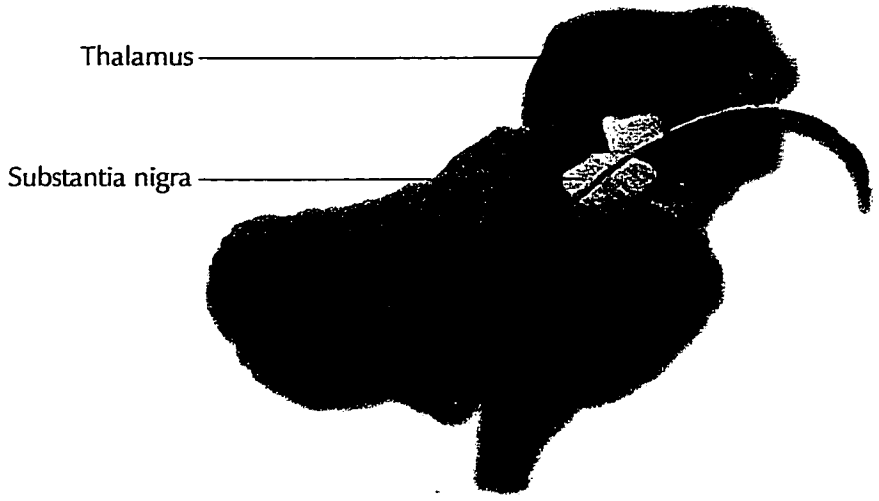
documentaries are to serve as an exciting, accurate, and powerful gateway to learning, an understanding of the cognitive processes involved in the recall and recognition of televised events is required.

Empirical investigations have shown that we store information in two ways: *procedurally*, through repetition and conditioning, or *declaratively*, through intentionally discovered facts (Anderson, 1983; Pines, 1986). Television's cultural and social effects studies, on the other hand, suggest that heavy viewers of *content light* programs are submerged, reinforced, conditioned, and influenced in their judgments and their opinions (Gerbner & Gross, 1979; Gitlin, 1982). On the basis of images they have persistently been exposed to, such viewers have chosen to store information procedurally. The memories they have stored and the experiences they have acquired are presumedly dominated by the sights, sounds, values, and thoughts of television programs they have repeatedly watched. Consequently, their understanding and appreciation of television images and sounds are prejudiced by previously stored information (Healy, Fendrich, Crutcer, Wittman, Gesi, Ericsson, & Bourne, 1992). These memories, which are activities of the lower brain region "do not communicate with the conscious mind" (Pines, 1986, p. 362; Figure 1). Hence, the memory of heavy television viewers may be of a lower level, for the recognition of television pictures, in this case, may be analogous to the level of the pictures' contextual structure.

In the recognition process of television images, factual or declarative memory plays an equally important role. Among commercial television audiences, viewers who watch television selectively and sporadically, choosing programs that demand a higher level of



Anterior view of the brain



Lateral view of the brain

Figure 1
PROCEDURAL MEMORY CENTERS
Areas of the brain responsible for the storage and subconscious retrieval of skills and associations.

Courtesy of the University of Washington's Digital Anatomist Project

concentration, are the minority. The selective memories of *content heavy* television viewers are stored in the *cerebral cortex*—one of the most sophisticated region of the brain, connecting the declarative memory system to the brain's intellectual achievement centers (Pines, 1986; Figure 2). Thus, it is suspected that declarative memory systems assist the individual's recognition and appreciation of highly specialized and artistically demanding television pictures.

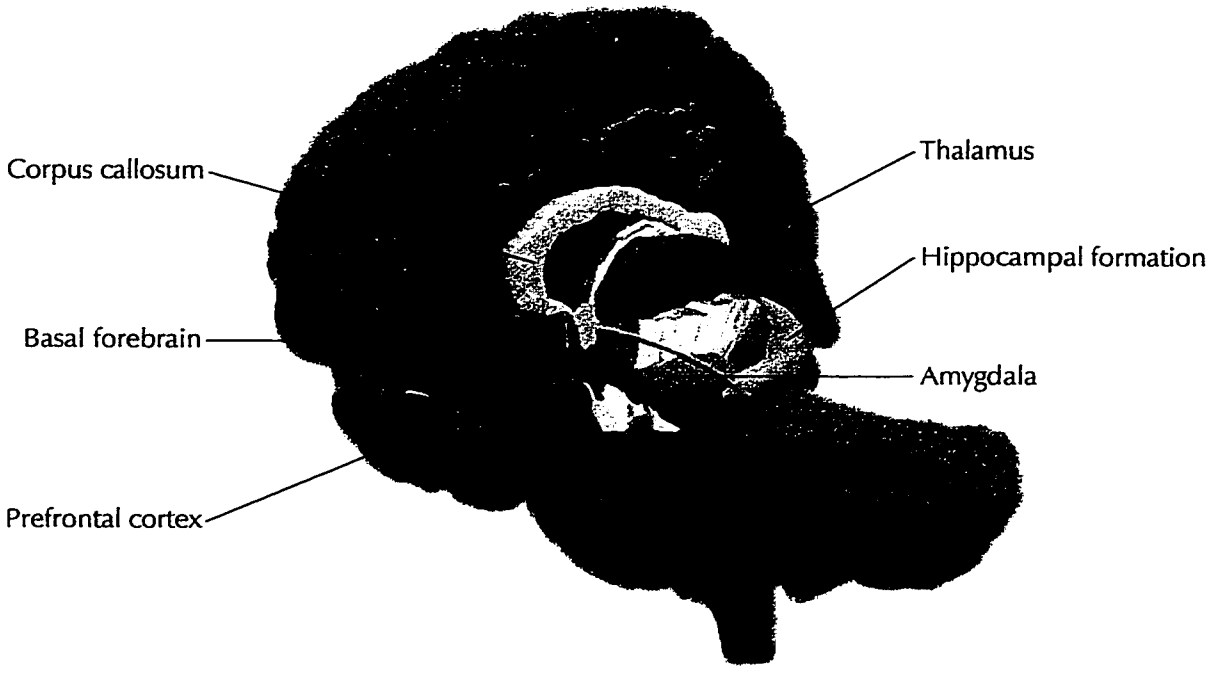


Figure 2
DECLARATIVE MEMORY CENTERS
Areas of the brain responsible for the storage and recall of information available to the conscious mind.

Courtesy of the University of Washington's Digital Anatomist Project

Therefore, if we choose to watch television programs that are analogous to the memory system we employ in the final recognition and appreciation of such events, it can then be speculated that the recognition of television images depends on our procedural and declarative memory systems. The extent, however, to which television viewers favor one over the other could be determined by both the amount of time spent watching television and the types of programs they choose to watch (Gerbner, Gross, & Melody, 1973; Hall, 1977).

Most network television programs (i.e., situation comedies) are light in content, thus requiring limited cognitive processing. For the most part, comedy "can be construed as an aggregation of miniature plots in which some persons or groups triumph over others, and in which these others are debased, demeaned, disparaged, ridiculed, humiliated, or otherwise subjected to undesirable experiences short of truly grievous harm" (Zillmann & Bryant, 1991, p. 270). As a result, situation comedies use explicit cueing devices, such as laugh–tracks, to emphasize specific passages that are to be retained, as opposed to documentaries which employ more discrete means to promote recall that the viewer must extrapolate on his/her own. Unlike situation comedies, documentaries engage the subjectivity of viewers by arousing their interest in the vitality of the historical world. They "arouse a strong desire to take pleasure from knowing; they do not cue with anything like the same power as fictional stories the desire to enjoy the sensuous pleasure of gazing" (Nichols, 1991, p. 180). Consequently, given that most students have limited experiences in viewing such content rich materials, the screening of a documentary in the classroom often

does not allow them to learn about the facts, figures, and critical details of the presentation (Burling, 1992). Instead, the program turns out to be nothing more than entertainment or an emotional indulgence. Therefore, the purpose of this study is threefold:

1. To determine whether or not heavy viewers of content light television programs experience difficulty interpreting events presented to them in a documentary;

2. to offer guidelines to future producers of instructional television programs regarding instructional and message design strategies; and

3. to emphasize the need to engage in more vigorous empirical research centered on television's perceptual, cognitive, and compositional properties.

LITERATURE REVIEW

Learning from Television: A Review of Learning Theories

Three families of learning theories exist: the *behaviorist, cognitivist,* and *constructivist.* However, given that behaviorism and cognitivism were the theories with which many audiovisual materials were produced, the following review focuses on these two approaches to learning. The implications of a constructivist approach are discussed in the concluding remarks.

Behaviorism. Thorndike's (1874–1949) *connectionism,* Pavlov's (1849–1946) *classical conditioning,* and Skinner's (1904–1990) *operant conditioning* were used in early research to examine the impact of the design of educational programs on behavior. Found in learning situations which call for discriminations, generalizations, and associations, these theorists attributed the learner's change in behavior to conditioning (Seels, 1989). The use of behaviorism in education is based on the principle that instruction should be designed to produce observable and quantifiable actions by the learner. As such, behaviorists consider the mental state of a learner to be merely a predisposition: Since mental states cannot be observed, "teaching should not be directed toward strengthening the mind... but should be aimed at predicting desirable outcomes in students" (Thompson, Simonson, & Hargrave, 1996, p. 10). Therefore, if learning is regarded as a series of connections between stimuli and responses, then the key factor in attaining a desired effect lies in the design of the

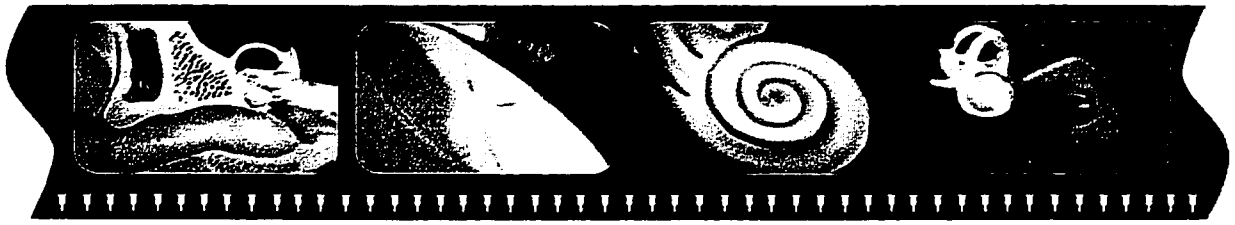
environment, as "Instructional explanations, demonstrations, illustrative examples, and matched non–examples are all considered to be instrumental in guiding student learning" (Ertmer & Newby, 1993, p. 58). To illustrate this paradigm, as it relates to televised instruction, a discussion on the use of color in instructional media follows.

The increased sophistication amongst the visually literate student population, as well as its aesthetic appeal, are just two of the underlying elements for the need (as it is no longer an issue of choice) of using color in instructional media. Although the widespread use of color in instructional materials has been limited to attention getting or sustaining mechanisms (Lamberski, 1980), there is still some debate as to its effectiveness in enhancing learning (Chu & Schramm, 1967; Mount, Mount, & Toplin, 1988).

The theoretical foundation of early audiovisual materials was rooted in behaviorist psychology. At the time, instructional film and video programs were based on the notion that independent variables affect dependent variables, that is, learning outcomes in the form of knowledge or skill acquisition: The subjects were presented with a film/video containing a *instructional cue* (color, which in this case refers to the stimulus itself); *practice* (by means of doing exercises which required the subjects to recall and list facts); and *reinforcement* (if the subjects failed to respond correctly, they were exposed to the materials a second time, in anticipation of favorable results). To this day, television producers have relied heavily on the behaviorist paradigm to ensure the success of their situation comedies: The laugh–tracks that accompany the trials and tribulations of the characters are often used to highlight the amusing parts of the program, as well as the salient points that are to be remembered.

In his survey of studies, Chute (1979) attempted to provide some justification for the effectiveness of color cueing strategies in instructional media presentations. As a firm supporter of the use of color in all forms of visual communication media, his arguments were founded on learner aptitudes. In situations dealing with moving images (such as film or video), Chute (1979) encouraged the use of color, since it provided high aptitude learners with the necessary amount of visual stimulation required to successfully process and learn new information. He further asserted that individuals with high "mental abilities" would benefit from complex colored stimuli (e.g., Figure 3), as "more incidental and task-relevant learning [would occur] from a color, rather than a monochrome presentation" (Chute, 1979, p. 253). Conversely, Chute (1979) predicted that low aptitude learners would be overwhelmed by the complexity of the stimulus materials.

Required degree of visual stimulation for high aptitude learners



Required degree of visual stimulation for low aptitude learners

Figure 3
COMPLEX COLOR VERSUS SIMPLE BLACK AND WHITE AUDIOVISUAL PRESENTATIONS
According to Chute (1979), the amount of visual stimulation required for optimal learning is analogous to an individual's aptitude level.

Courtesy of Discovery Communications

Although his arguments were centered on aptitude levels, Chute (1979) failed to provide any evidence supporting cognitivist theories. He was primarily concerned with the individual's ability to recall facts, as there were no indications of higher level cognitive processes or intellectual skills (i.e., discriminations, forming concepts, applying rules, problem solving).

As well, if learning is to occur, consideration must also be given to the optimal level of stimulus complexity presented in audiovisual materials. In a series of experiments, VandeMeer (1954) showed five scientific films to ninth and tenth grade science students in an attempt to test the validity of using color in instructional films. His goals were to demonstrate that: (a) color was an effective cueing instrument, (b) the use of contrasting colors may help relevant data stand out, and (c) color's aesthetic component would yield greater learning. As opposed to his initial beliefs, all three hypotheses were deemed inconclusive. The students were unsuccessful in identifying and recalling the relevant data. Their attention was often detracted from important learning cues, and even though the majority of learners stated a preference for materials filled with a large spectrum colors, this factor had no effect on their overall performance.

Aside from the conclusions obtained by these studies, the researchers have failed to analyze, or at least provide an understanding of the medium being used. Traditionally, media research has characteristically concentrated on the effects of individual programs, series, or overall features such as violence and sex on television (Clarke, 1974). Research into educational television has also been conducted within this general perspective, focusing

on performer variables (i.e., credibility, age, dress and appearance) and content organization elements (i.e., order and balance of segments, review strategies, cues and advance organizers), as opposed to the medium's structural features (Clarke, 1974). Television and film are both audiovisual media, in which the audio component lends its authenticity to the picture (Zettl, 1990; Metallinos, 1996). For instance, without taking one's aptitude level into account, a high definition television image paired with low definition sound would be to no one's advantage, as an imbalance would result between the picture and sound combinations: The viewer's attention would be directed towards the visual aspect, thus adhering less to the aural content. A similar situation would result if one were to study from a textbook rich in visuals, bearing little or no supporting text. To this effect, Dwyer (1978) further maintained that:

> Students have a preferred or optimal level of stimulus complexity at which they enjoy interacting with visualization and that this level of complexity is in turn based on the complexity of the subject matter, the experiential background of the learner, and the complexity of the stimulus. (p. 142)

Thus, the constructs of the medium should be equally understood if one wants to promote a condition yielding successful learning. Otherwise, the subject's inability to make sense of the stimuli might lead to frustration, and contribute to his/her indifference to learn.

Cognitivism. Cognitive theory was a major advancement over behaviorism. It brought the mind back to psychology, as researchers were now concerned with intellectual processes, and the ways in which we engage in problem solving or more complex forms of learning (i.e., reasoning, higher level of information processing). Supported by Gestalt and developmental theorists alike, "cognitive interpretations... are concerned with the cognitions (perceptions or attitudes or beliefs) that the individual has about his environment, and with the ways these cognitions determine his behavior" (Hill, 1963, p. 28). Thus, the learner constructs understanding rather than reproducing instruction (Resnick, 1981). Although the cognitive research paradigm recognizes an interaction between external stimuli and internal processes that support learning, cognitive theory inherited a bias from its behavioral predecessor. It focussed almost entirely on behavioral data, such as response times and error rates, to draw conclusions about the learning processes themselves, as well as the encoding, storage, and retrieval stages of information processing. As Good and Brophy (1990) pointed out:

> Cognitive theorists recognize that much learning involves associations established through contiguity and repetition. They also acknowledge the importance of reinforcement, although they stress its role in providing feedback about the correctness of responses over its role as a motivator. Even while accepting such behaviorist concepts, cognitive theorists view learning as involving the acquisition or reorganization of the cognitive structures through which humans process and store information. (p. 187)

In short, cognitivists are concerned with "what" one has learned and "how" one has obtained the information. According to this view, information is not simply added to the knowledge the learner had previously stored in memory; the learner tries to line new knowledge to old knowledge, selecting, reorganizing, and restructuring it in the process. In addition, unlike the management of operant behaviors, instruction involves the stimulation of the learner's information processing strategies, aptitudes, and stores of relevant specific memories in relation to the information to be learned (Gagné, 1977; Orey, Okey, Jones, & Stanley, 1991).

The medium of television, at least in its commercial use, has often been perceived as a form of escapism or entertainment, whereas education mediated by the printed word continues to be regarded as formal and well structured (Adler, 1978; Salomon, 1984). Despite this overgeneralization, the use of documentaries in education can be most effective. In addition to its widespread availability, and its ability to present aural and visual stimuli simultaneously, television can provide a reliable and effective representation of abstract concepts. However, the role of the viewer must change as s/he is required to play a more active role in interpreting the content, as opposed to the passive role exuded by the traditional television viewer.

As mentioned earlier, television is an audiovisual medium, thus, in order to make sense of the presented stimuli, deeper processing is required. Craik and Lockhart (1972) defined the phenomenon of deep processing as the recoding of information at deeper levels:

words are processed for their "semantic meaning" rather than their "orthographic features." Therefore, suggesting that televised instruction is most effective when the information it presents consists of previously learned concepts (Salomon, 1984).

However, the concept of deeper processing raises an important issue: overprocessing (Langer, Blank, & Chanowitz, 1978). Langer et al. (1978) have demonstrated that people tend to process familiar information with a certain "mindlessness." In other words, when watching a televised event, individuals have a tendency to ignore information consistent with their prior knowledge. To this effect, Salomon (1977) demonstrated that lower–class children who watched *Sesame Street* with their mothers, learned equally as well as middle–class children. He further supported this argument by drawing an analogy between the achievement of high– and low–ability students and the instructional methods used in the classroom:

> Students often report enjoying instructional methods from which they end up learning the least; they make judgments on the basis of the perceived attributes of the instructional procedures, and subsequently expend mental effort accordingly. For example, high–ability students perceived well–structured instruction to be undemanding and invested less effort than needed; they enjoy the instruction more but end up learning less than less able students. (Salomon, 1984, p. 649)

It appears, therefore, that the depth with which televised information is processed may depend on the way in which the medium is perceived. The more students perceive the medium as "easy," the more amount of invested mental effort will be expended: They would acquire little and only impressionistic information that would sustain their initial perception of "ease" (Salomon, 1984). Therefore, if students are likely to invest less mental effort in processing potentially instructive messages, how can cognitive skills be affected through visual media?

According to Salomon (1972), the codes we receive from the visual world follow the process of internalization. The codes themselves are considered to be internalized only when they form a "general scheme" (made up of both pictures and words) disconnected from its source. Thus, the elements contained within our sensory storage units are not the actual events themselves; rather they are schemata of the observed (Figure 4). Hence, Salomon (1972) provided three hypotheses as to how visual media attempt to shape our minds:

1. Codes which serve for communication purposes serve also for covert mediational ones;
2. external communicational codes can be incorporated or internalized to serve in representational capacities; and
3. the codes, once internalized, can then be generalized, can be detached from their original context, and can thus serve as schemes of thought. (p. 403)

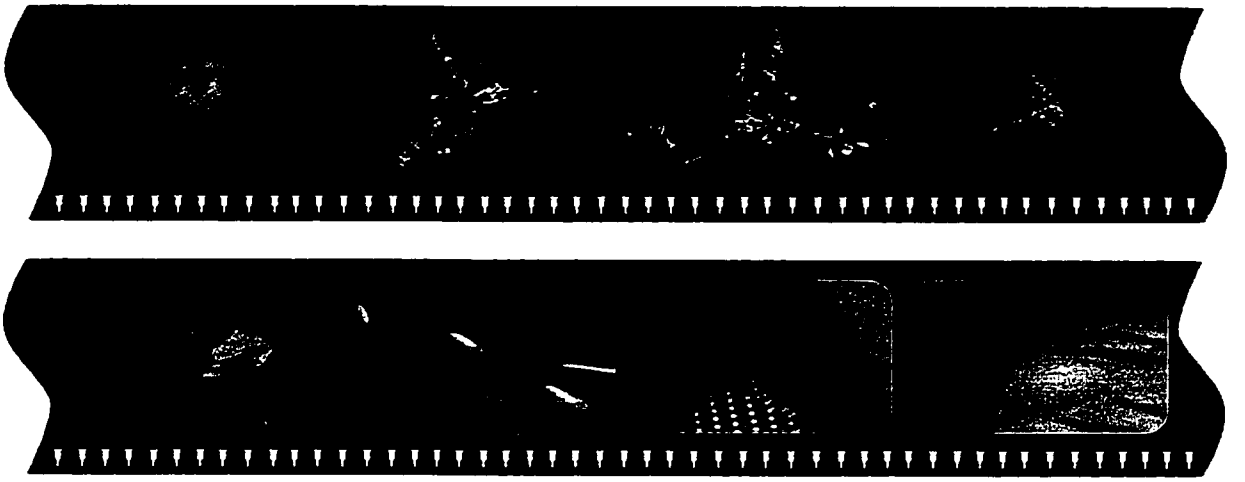


Figure 4
VISUAL PERCEPTION PROCESS
First, light information is flipped upside down. Next, the information breaks up into fragments, and splits at the crossroads of the visual field. The fragmented pieces then make their way to the primary visual cortex—this layered region filters and codes the information.

The coded information is then parceled out to as many as 32 locations of the brain for finer processing. The cerebral cortex consists of tightly packed columns of nerve cells. Here, all visual bits and pieces are processed and coded by assigned neurons: while one neuron is busy reading the contour of a cheekbone, another is reading the shape of the eyes. Eventually the outline of a face appears, and at the end of the split second journey, when everything is reassembled, a familiar image appears.

Courtesy of Discovery Communications

In an attempt to prove all three hypotheses, Salomon (1972, 1994) conducted a series of experiments designed to demonstrate that different coding elements (in television programs) do call for different mental skills. He devised two experiments in which the first dealt with zoom–ins and –outs, whereas the other consisted of the same visual content interlaced with long shots and close–ups. In both cases, the studies yielded conclusive results:

> The close–up version called upon a number skills—primarily the skill of relating details to conceptual wholes. Knowledge acquisition from this version highly depended on that skill's mastery, but not so in the zoom version, in which the same skill was overtly simulated for the viewers. By overtly supplanting the skill, its utilization is circumvented, thus giving the learners of different levels of skill–mastery a more even start. (Salomon, 1994, p. 105)

Examining cognitive structures is only but one of the many elements pertaining to cognitive theory. To demonstrate, let's take another look at the use of color in instructional media, in which subjects were required to apply a set of rules, instead of recalling facts. In a study conducted on learning disabled adolescents, Rutherford, Casey, Hasterok and Howell (1979) concluded that the overuse of color can have detrimental effects. Following a filmed presentation, the experiment in question required twenty children with normal intelligence levels (who lacked in reading skills) to assemble a four piece puzzle. The puzzle consisted of a six–inch square which was made up of four geometric shapes painted red, green, yellow, and blue (Figure 5). Only 40% of the subjects who viewed the colored film were able to complete the task. In this case, color had assumed the role of a distracter: the students found themselves overly concerned with learning the color associated with each individual piece, rather than the shape as a whole. As summarized by Rutherford et al. (1979), their shortcomings can equally be attributed to these additional cognitive factors:

The Gestalt laws of perceptual organization of parts into a whole postulates that visual fields tend toward a minimization of tension in the field, which apparently did not happen here. Wertheimer [cited in Osgood, 1953] suggests that other things being equal, nearness, similarity, continuity, and closure enhance organization. The information processing view of Miller [1956] suggests that a limit of seven [plus or minus two] elements can be handled comfortably and that the nine elements of the assembly tasks, e.g., four colors, four shapes of the individual pieces, and one shape of the completed puzzle, comprised too much information for the student to process. (pp. 1197–1198)

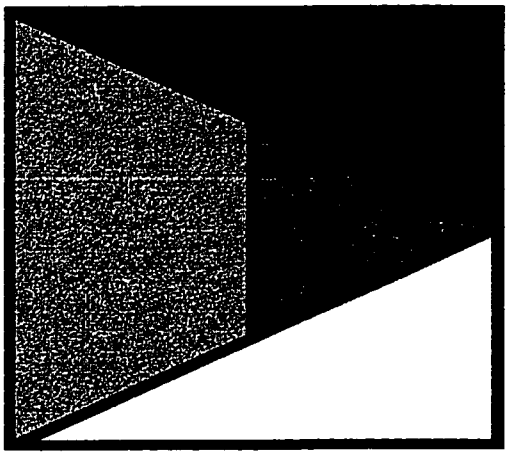


Figure 5
FOUR PIECE PUZZLE
Four piece puzzle used in assembly task. From Rutherford, R. B., Casey, R. J., Hasterok, G. S., and Howell, K. (1979). Function of color in learning an assembly task by learning disabled adolescents. *Perceptual and Motor Skills, 48,* 1196.

So, no matter how simple or trivial a task may seem, this evidence further supports the need for a cognitivist approach in evaluating the effectiveness of instructional media. No two individuals are alike, and as such their processing capabilities are likely to differ as well. Therefore, by demonstrating an understanding of the fundamental concepts of how we interpret moving images (both filmed and televised), the appropriate degree of stimulation and learning strategies can be applied accordingly.

Recall of Verbal and Visual Information: Review of Research on Imagery

Definition. For years, researchers have debated over the issue as to whether mental imagery involves some of the same representations normally used during visual perception, or whether imagery involves only more abstract perceptual representations. Thus, to attempt a formal definition of imagery is to step into a philosophical quagmire; its meaning is, at best, operationally intersubjective. Gibson (1966, 1979) interpreted the process as a layout of perceived space: a "mental layout" rather than a "mental picture." Experiments by Keenan and Moore (1979) and Neisser and Kerr (1974, 1983) reinforced this view, and suggested that effective memory images are modality specific rather than abstract knowledge structures. According to Richardson (1977), this epiphenomenon should be regarded as a quasi–perceptual event consisting of one's personal tendency to "think pictures." Thus, images may not be pictorial at all, but are probably much more abstract structures. Additional efforts by Calder (1978) supported this claim, as he viewed imagery not simply

as perceiving in mental pictures, but as a "mental format" for representing pictorial information. In essence, all these definitions have relevance, and they all view imagery similarly to sight itself, but only as a more encompassing process.

Similar debates extend to the nature of the cognitive processes involved in imagery. Paivio (1971, 1986, 1991) proposed a dual coding theory (to be discussed later) which attempted to give equal weight to both verbal and nonverbal processing. He believed that representational systems should incorporate perceptual, affective, and behavioral knowledge. To this effect, Paivio (1986) maintained that:

> Human cognition is unique in that it has become specialized for dealing simultaneously with language and with nonverbal objects and events. Moreover, the language system is peculiar in that it deals directly with linguistic input and output (in the form of speech or writing) while at the same time serving a symbolic function with respect to nonverbal objects, events, and behaviors. Any representational theory must accommodate this dual functionality. (p. 53)

This view was disputed by many, such as Pylyshyn (1973), who has suggested that mental images are the result of a series of processes that are *propositional* in nature. Specifically, he argued that the representations and processes that are functional in cognition may not be consciously accessible, and that just because something is consciously accessible does not ensure that is it functional. So, when an individual tries to picture or imagine a scene in his/her mind, the implication is that whatever is recalled must be interpreted

perceptually before it becomes meaningful. Atwood (1971) and Shepard (1967) concurred, and noted that an individual must first retrieve and then recall the image as if s/he was actually seeing it. To this effect, Atwood (1971) further suggested that, "Verbal material may be coded into a visual image and encoded into memory as a primarily visual schema. During recall, the schema is decoded visually and then recoded once again into verbal symbols" (p. 297). Kosslyn (1980), on the other hand, contended that mental representations are held in the mind as veridical images; they are *depictive*—a sensory representation. Here, images are likened to displays produced on a cathode–ray tube by a computer program operating on stored data. In other words, images are temporary spatial displays in active memory that are generated from more abstract representations housed in long term memory, and are then interpreted and classified (Figure 6). Although these former accounts seem less plausible than the hypothesis that images are modality–specific visual representations that are intrinsically spatial in format, it has proven difficult to rule them out. In fact, Anderson (1978) has argued that no behavioral data can ever distinguish alternative, nonvisual theories of imagery from the visual–spatial theories.

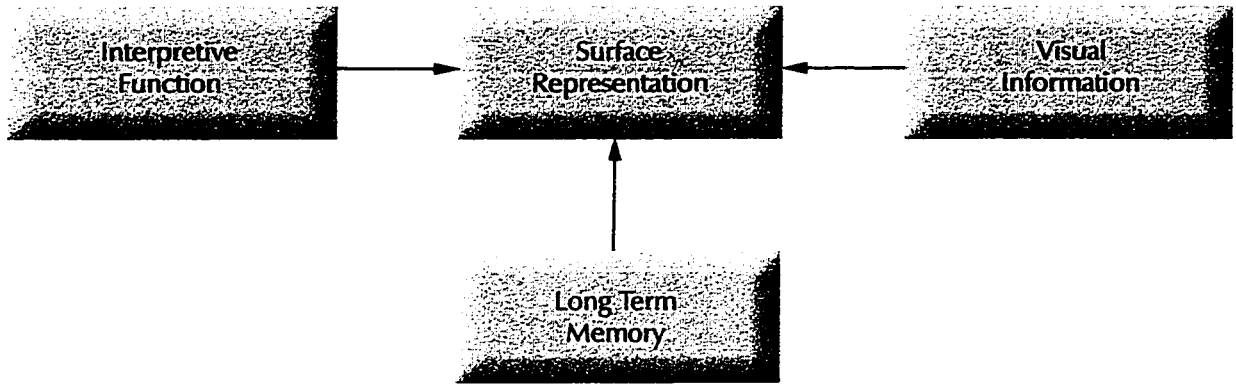


Figure 6
KOSSLYN'S IMAGERY MODEL
Kosslyn's imagery model rests on the notion that visual images might be like displays produced on a cathode ray tube by a computer program operating on stored data. Images are thus seen as temporary spatial displays in active memory that are generated from more abstract representations in long term memory, and are then interpreted and classified.

Although the imagery debate remains unresolved, these theories all view imagery as being idiosyncratic (Lorayne & Lucas, 1974; Baron & Cautela, 1983–84; Goetz & Sadoski, 1996). Individuals will interpret or encode incoming information (stimuli) differently when forming or expressing images, just as individual perception varies in other cognitive modes. Imagery, therefore, is a highly selective and personal creation. Nonetheless, the arguments set forth by these researchers are helping to shape theorizing, as the results from these empirical investigations are essentially converging—actually characterizing aspects of how imagery arises from brain functions (Kosslyn, 1995).

Individual differences in imagery. Some people learn and think mainly in verbal terms with little use of mental images (*verbalizers*), while others (*visualizers*) prefer to use imagery over verbal representations (Richardson, 1977; Riding & Ashmore, 1980; Riding, Burton, Rees, & Sharratt, 1995; Figure 7). Although evidence suggests that most people can and do switch thought processes according to the nature of a given task, there are some individuals that rely almost entirely upon one process or another (Richardson 1977; Riding, Glass, & Douglas, 1993). Studies by Gerard (1964) have indicated that a good visualizer, or imager, has a memory like a vivid multisensory collage: S/he can raise his/her blood pressure simply by imagining that s/he is running a race; verbalizers, on the other hand, can recall such scenes but in a non–sensoric way.

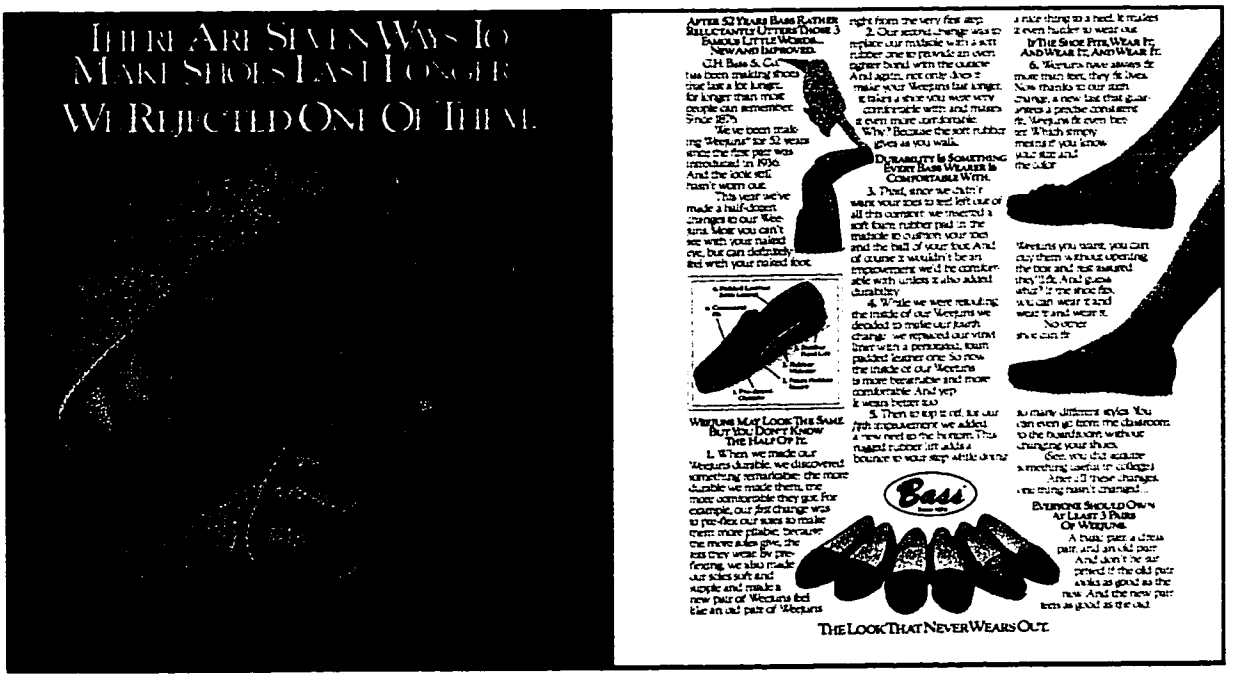


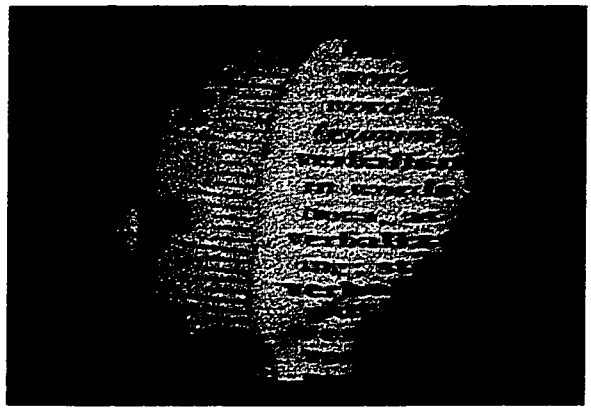
Figure 7
VERBALIZERS AND VISUALIZERS
This ad for Bass shoes employs a novel visual dimension to attract visualizers, while a point–by–point explanation is used to attract verbalizers.

Courtesy of G. H. Bass & Co.

Such perceptual differences are seen when discussing eyewitness testimony during a trial. For instance, a person who lacks in imaginal perceptual abilities will probably do poorly on the witness stand. Weak imagers encode what they see only into general categories. When asked to describe a face at the scene of the crime, all that is remembered is gender, approximate height, hair color, or any unusual features. Because no mental picture has been developed, the eyewitness will begin to lose any detailed description of the face over time. Unless s/he employs some type of rehearsal or mental process, s/he will do poorly on the witness stand. The more an individual can adapt his/her imaging mode to suit a given problem, the greater may be his/her efficiency in dealing with a variety of mental tasks. Good imagers, then, can evoke visual patterns when necessary, and can combine data from the other senses more readily than verbalizers (Riding, Glass, & Douglas, 1993). Thus, "Individuals learn best when information can be readily transferred to their mode of representation" (Riding & Douglas, 1993, p. 299). In other words, verbalizers perform best while reading, whereas visualizers learn the most from pictorial presentations (Richardson, 1977; Riding & Ashmore, 1980; Riding et al., 1995).

Study of brain hemispheres. One important explanation of why people differ in terms of imaging ability may be taken from the field of neurophysiology. There are two quite different and parallel ways for the brain to process information (stimuli) and solve problems. The left hemisphere processes information analytically and corresponds to verbal stimuli, while the right hemisphere processes information in an overall or holistic way, corresponding to nonverbal stimuli (Galin & Ornstein, 1972; Nebes, 1974; Nevitt, 1980–81; Kounios & Holcomb, 1994; Holcomb, Kounios, Anderson, & West, 1999; Figure 8). It is further theorized that individuals *passively* process and store "right–brain" information—that is, by means of repetition and conditioning—whereas "left–brain" information requires more complex forms of cognitive processing.

In regards to visual perception, the brain takes information from the left and right fields of vision and reads them separately. Information from the right side of the visual field is reflected on the right half of the retina, and then conveyed to the left side of the brain for processing, and vice versa (Figure 9). The ad for Bass shoes (refer again to Figure 7), for example, exploits the notion of right– and left–brain hemispheral processing by placing the visual element on the left (appealing to right–brain interests), and the verbal component on the right, to appeal to cognitive (left–brain) interests. Dual processing, then, occurs because the *corpus callosum*—the network of nerves that connects and carries information between the two hemispheres—allows each hemisphere to work independently, yet able to know the other's activities (Harth, 1990; Figure 10).



Logical left hemisphere of the brain

Holistic right hemisphere of the brain

Figure 8
LEFT AND RIGHT HEMISPHERES OF THE BRAIN
The logical and systematic left hemisphere of the brain has highly developed verbal abilities, while the intuitive and imaginative right hemisphere has highly developed spatial abilities.

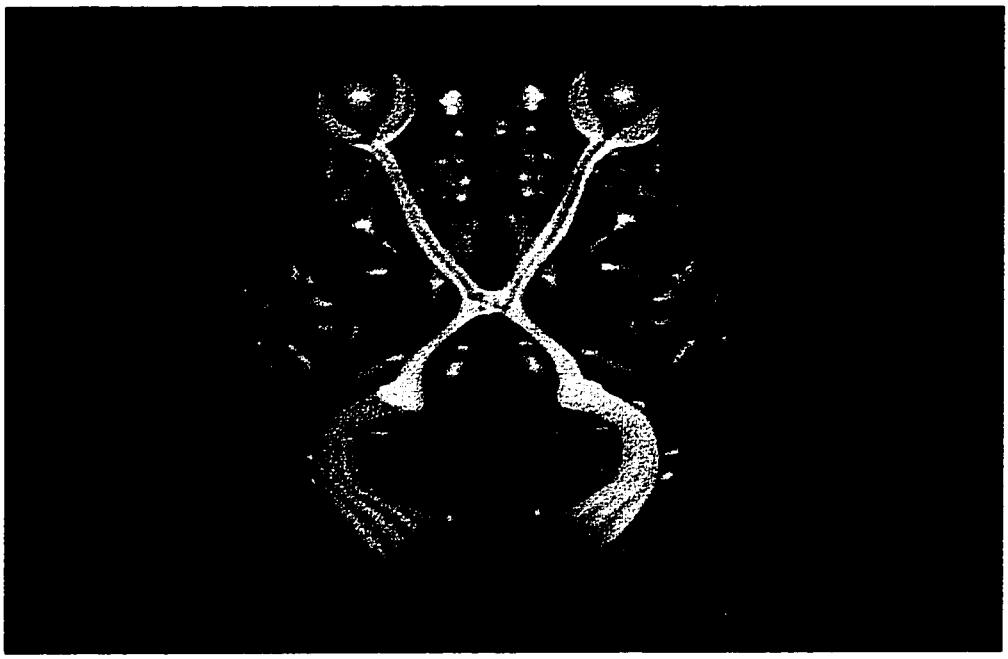


Figure 9
VISUAL PATHWAYS
Each hemisphere gets input from both eyes; a given hemisphere gets information from the opposite half of the visual world.

Courtesy of Discovery Communications

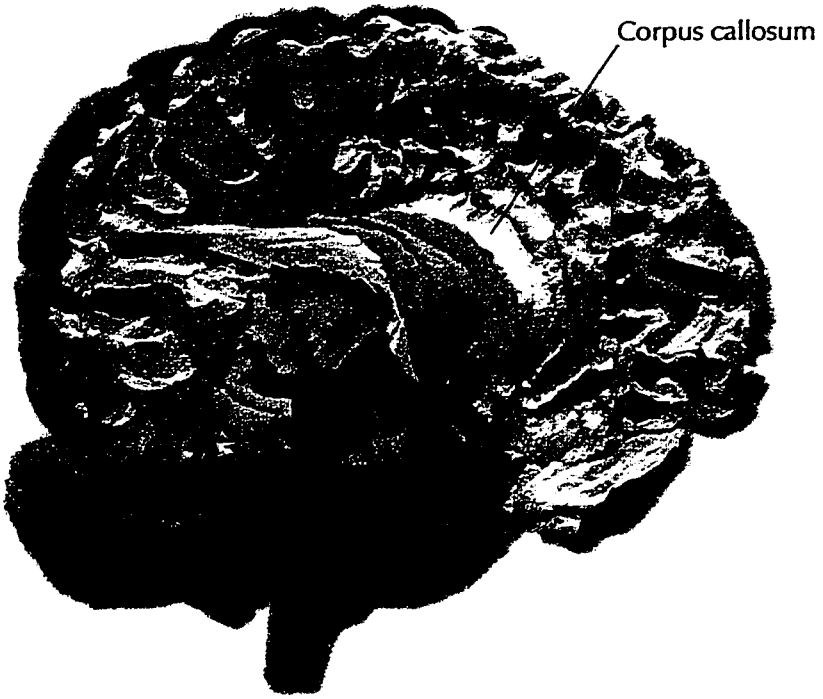


Figure 10
CORPUS CALLOSUM
The mass of white transverse fibers connecting the cerebral hemispheres.
Courtesy of the University of Washington's Digital Anatomist Project

No two people process information in quite the same way (Goetz & Sadoski, 1996). In fact, even the hemispheres of the same brain are not always equal, and most people usually have one hemisphere that is more fully developed and dominant over the other (Messick, 1984; Sackheim, Greenberg, Weiman, Gur, Hungerbuhler, & Geschwind, 1984). This could arise from innate or hereditary reasons, or because of cultural factors (Saleh & Iran–Nejad, 1995). One such important cultural factor is education which traditionally strives to stimulate the left hemisphere with verbal and linguistic skills. Manifestations of right hemisphere activities (e.g., daydreaming) are often treated too harshly, as children are discouraged from such imaginative tendencies. When a child goes to school, where imagery is considered a distraction or at best a second–rate mode of thinking, the deliberate

elimination of visual thinking begins: Textbooks are not written to elicit images. Although children's books have many pictures, imagination, like pictures in books, is decreasingly available as children grow older; possibly impeding the academic performance of students who are unable to adapt to education's analytical and global practices, particularly since mental imagery appears to facilitate meaningful learning (Alesandrini, 1982). Thus, educational activities such as *visual field trips* and *creative movements* have been increasingly employed to promote the development of the right hemisphere (Galin, 1976; Torrance & Rockenstein, 1987; Geske, 1992). In short, education that predominantly encourages left hemisphere processing limits an individual's potential.

Learning and recall: Further evidence of dual processing. Free recall is generally greater when items are presented as pictures of common objects than when presented as printed words. Concrete words are also recalled better than when presented as abstract words (Paivio, 1971, 1986, 1991; Marschark & Paivio, 1977; Schwanenflugel & Shoben, 1983; Marschark, Richman, Yuille, & Hunt, 1987; Nelson & Schreiber, 1992; Sadowski, Goetz, & Fritz, 1993a). The most common interpretation of picture superiority in free recall states that pictures are remembered better than words, because they are likely to be encoded both as images and verbal traces. Such dual coding is assumed to involve *independent* yet *interconnected* systems for encoding (Paivio & Csapo, 1973; Mayer & Anderson, 1991; Paivio, 1991; Sadoski, Goetz, & Fritz, 1993b; Figure 11). Independence implies that either code can be activated depending upon the stimulus; Interconnectedness, on the other hand, suggests that verbal processing may arouse mental pictures or images, and that image processing can yield a verbal response.

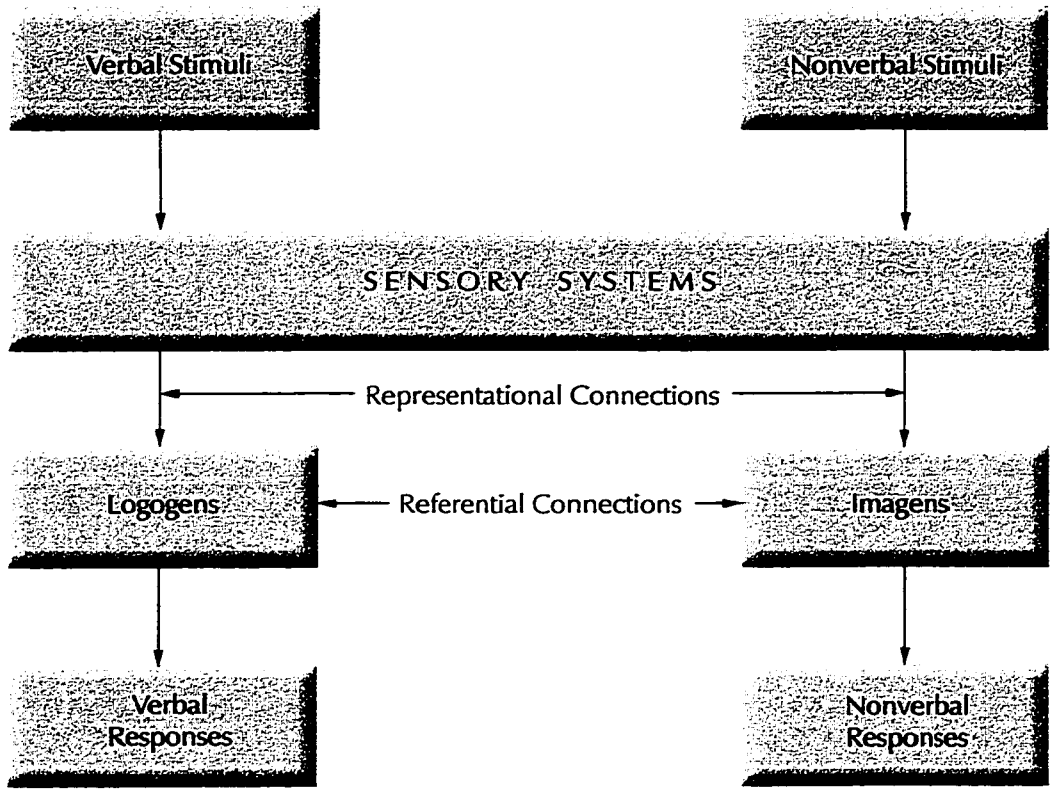


Figure 11
PAIVIO'S DUAL CODING THEORY
Paivio's (1986, 1991) dual coding theory assumes that there are two cognitive subsystems, one specialized for the representation and processing of nonverbal objects/events, and the other specialized for dealing with language.

Based on the inferences of the independence–interconnectedness assumptions, Paivio's (1986, 1991) dual coding theory identifies three distinct, yet complementary, levels of processing: (1) *representational,* involving the direct activation of verbal or nonverbal representations; (2) *referential,* pertaining to the activation of the verbal system by the nonverbal system or vice versa; and (3) *associative,* referring to the activation of representations within the same verbal or nonverbal system. A given task may require any or all of the three kinds of processing. Whereas naming pictures and imaging to words

require referential processing, asking a person to say "radio" when presented with a picture of a television set presumably requires all three types of processing. Thus, the "interconnections at every level are assumed to be one–to–many so that any particular connection is activated in a probabilistic manner determined by the individual's past experiences with language and the nonlinguistic world" (Paivio, 1991, p. 327).

In light of the modality–specific information concerning the perceptual attributes of objects and events contained within imaginal representations, the functional representations of the image system are assumed to be perceptual analogs. To this effect, Paivio (1986, 1991) proposed two different types of representational units: *imagens* for mental images, and *logogens* for verbal entities which he describes as being similar to Miller's (1956) *chunks*. Although the perceptual or semantic information that corresponds to our knowledge of the world is represented in the image system, logogens can also be considered as perceptual analogs, because "the structural–functional information they represent must be systematically related to the sequential patterns of linguistic stimuli and responses" (Paivio, 1991, p. 327). Moreover, imagens and logogens each have their own reference subsystem, where they are compared to other representations of their own type. The meaning which results from the evaluation of these is taken as the overall meaning of the message. Therefore, it is from this process that the theory derives its name.

Pictures are processed in this manner by both brain hemispheres causing verbal and nonverbal, or imaginal, activity. It is this dual processing within the brain that enables pictures to be remembered better than words. This also suggests that images are readily available from pictures and decreasingly available from concrete to abstract words, thus,

implying that image coding is superior to verbal coding for the storage or retrieval of a target object. For instance, when the information processing requirements of a paired–associate learning task were examined under conditions of imaging versus rote rehearsal, the superiority of the imagery mnemonic was confirmed (Elliot, 1973; Griffith & Johnston, 1973; Powell, 1980; Paivio, 1986; Gupta, 1988).

Pressley, Cariglia–Bull and Schneider (1987) related children's learning of concrete sentences under imagery instructions or no strategy control conditions to measures of their short–term memory and verbal competence. They found that greater short–term memory and verbal competence were associated with better sentence learning in the imagery condition but not in the control condition. Among other things, these findings implicate dual coding in that verbal and imagery skills contributed to concrete sentence learning. Begg (1973) obtained evidence for both code additivity and imagery integration effects in memory for words and phrases. In this case, cueing with one word from a concrete phrase was found to increase recall for the other word. Hence, suggesting that concrete phrases are stored as integrated images and that the presentation of one word as a cue reintegrates the entire image, whereas abstract phrases are stored nonintegratively as separate words.

Experiments by Paivio, Yuille and Madigan (1968) demonstrated that meaning is dependent upon imagery: when meaning was held constant, learning was dependent upon imagery; when imagery was held constant and meaning varied, no significant relationship could be established between learning and meaning. Their research also indicated that the positive effect of repetition quickly dissipated, and that imagery as a word attribute should be regarded as the predominant variable. Paivio and Yullie (1969) further maintained that

imaginal instruction facilitated learning more than either repetition, instructions, or no instructions at all. Specifically, word concreteness facilitated learning regardless of which instructional set was employed. Thus, an inverse relationship is proposed between recall and word concreteness: repetition with concrete words enhanced retention, while repetition involving low imagery words reduced retention (Paivio & Madigan, 1968). It is, therefore, suggested that variations in the imagery value of the word will have a predictable effect upon the amount of retention.

Marschark and Hunt (1989) proposed their own theory regarding concreteness effects in paired–associate learning. Contrary to several imagery–based explanations (e.g., dual coding theory), they maintained that the memory for a response word depended on the relative differences in the processing of relational and distinctive information, instead of the redundant verbal and imaginal memory codes. According to this view, the superiority of concrete over abstract pairs would increase under conditions that encouraged relational processing. The predicted interactions were confirmed. Concreteness effects were greater under cued recall than under free recall, because cueing ensured that encoded relations would be reactivated at retrieval.

Paivio, Walsh and Bons (1994) contested these findings as they argued that Marschark and Hunt's (1989) approach and dual coding differed only on one point that had predictive consequences: Whereas Marschark and Hunt (1989) asserted that concreteness effects are dependent on relational processing, dual coding assumes that concreteness and relational variables are independent. Subsequent experimentation comparing free and cued recall of noun pairs that varied in concreteness and pair relatedness

confirmed their initial speculations: concreteness and relatedness were independent and additive in both cued and free recall (Paivio et al., 1994). The only departure from this pattern was observed in situations where relatedness was varied between subjects. The complete absence of any interaction in cued recall, then, is the strongest support for dual coding.

Research on concreteness or imagery value on word recall also indicates the dominance of the imaginal code. Nappe and Wollen (1973) compared the effects of bizarre and common images on retention. Although they had predicted that bizarre images would facilitate recall in a paired–associate learning task, they discovered that common images produced as many correct responses and were more efficient. Additional efforts by Bergfeld, Choate and Kroll (1982) generated similar results, and found that bizarre imagery had a tendency to lose its advantage when common imagery became interactive. Therefore, the degree of image bizarreness per se did not appear to be critical for recall in this case either.

Imagery encoding was also successfully accomplished with minimal consumption of processing capacity. High imagery responses were retrieved with greater accuracy and less processing capacity than low–imagery responses (Pressley, 1977; Levin, & Lesgold, 1978; Levin, 1981; Pressley, Levin, & Delaney, 1982). This significant advantage of high–over low–word imagery, in terms of recall, may be attributed to the functional availability or greater accessibility of high imagery words in long term storage. Research by Neisser and Kerr (1973) supported these findings, and concluded that subjects took longer to recall low imagery words than words which were high in image content. Imagery and pictures evoke both a verbal and nonverbal code, but the availability of the verbal code is lower

due to the extra processing involved. The verbal code is available for both concrete and abstract words, but the former is more likely to evoke images. Thus, picture superiority can best be explained in terms of the additive effects of imaginal and verbal memory codes within the dual processing model presented, with the imaginal code decidedly the most efficient of the two effects (Paivio & Csapo, 1973).

Another stream of imagery research has focused on the possibility that the reading process itself, interferes with a student's ability to effectively use mental imagery. Rasco, Tennyson and Boutwell (1975) claimed that college students who used imagery while reading performed better than students who were presented with pictorial information while reading. However, Bower (1970) and Johnson and Raye (1981) speculated that effortful image generation might reduce a person's ability to simultaneously experience and integrate all the information, because the process itself may require most of the person's cognitive resources. Brooks (1967) and Levin and Divine Hawkins (1974) agreed, as they found that students who used imagery while listening to a teacher read, performed at higher levels than students who used imagery while reading the same material themselves. Thus, the imagery effects in many studies could have been more dramatic had the subjects listened to the text, rather than reading it (Alesandrini, 1982).

In summary, imagery, whether it is supplied to us or created by us, has been shown to play a vital role in understanding. Therefore, if the additive effects of the verbal and visual codes presented in a televised event prompt us to create imagery, the greater the likelihood will be of deeper and more elaborate processing, and thus recall.

Sight, Sound, and Motion: A Review of Literature on Television Production Techniques

Auditory complexity. Sound has power. "It represents a flow of power from one place to another, a flow that can be modified by the medium through which it travels" (Metallinos, 1996, p. 37). It contributes to the program's pace, guides the viewer's attention, introduces new topics or themes, and has the power to stir our emotions. Most importantly, it adds a new dimension to the sense of sight. Therefore, when pictures and sounds are presented concurrently, the audiovisual relationship takes on dynamics and meanings that are different than when either medium is presented alone. The successful perception of a television picture, then, depends on the proper structure and control of the picture and sound combination: They must be properly and simultaneously combined so they form a synergistic structure. On that account, how does the complexity of the soundtrack affect our comprehension of the verbal and visual elements presented in a televised event?

Studies on children's attention to television programs showed that information delivered through the audio track was just as salient as the visual component, if not more so (Anderson & Lorch, 1983; Watt & Welch, 1983; Calvert & Scott, 1989). In her attempts to establish a causal link between attention to perceptually salient auditory features and children's memory of central plot–relevant content, Calvert (1999) found that sound effects improved children's attention to, representation of, and memory of significant story content. Children who heard sound effects in rapidly paced television programs, for example, selectively attended to the visual channel more than those who did not hear any such effects. Consequently, Calvert (1999) maintained that "perceptually salient sound cues can

highlight important visual program materials, thereby bringing that content to children's attention for processing, storage in memory, and eventual retrieval from memory" (p. 460). However, it was quite the opposite in situations where sound effects were added to visually complex materials. Contrary to previous findings, television programs with auditory complex soundtracks had no impact on children's visual attention. Instead, the interest value of the auditory channel was overshadowed by the program's visual effects.

Audience arousal plays a significant role in media processing (Singer, 1980; Zillmann, 1982; Christ, 1985; Perse, 1996). Traditionally, it has been viewed as resulting primarily from content variables (e.g., fights, sexual scenes, and chases). However, experiments by Lang, Dhillon and Dong (1995) have shown that a viewer's arousal level can be affected by altering the structural complexity of the message, regardless of the arousingness of the content s/he is watching. Therefore, if an increase in the number of structural features in a television program is expected to increase a viewer's self–reported arousal, then the synchronous presentation of information through different sensory channels should provide additional stimuli reinforcement (Dwyer, 1978).

When people are aroused by the structural complexity of a television message, they automatically allocate a portion of their limited cognitive resources to storing information in long term memory (Kahneman, 1975; Lang, Bradley, & Cuthbert, 1997). Although the capacity allocated to encoding may not increase, research findings have indicated that the recognition of arousing television messages is greater than the recognition of calm messages (Lang, Dhillon, & Dong, 1995; Bolls, Potter, & Lang, 1996). This effect was attributed to the heightened interest value associated with such messages.

This may apply to 30–second advertisements filled with unique sights and sounds in order to have a lasting impact, but the functions of music in situation comedies and documentaries differ. Situation comedies do not use background music. Instead, *leitmotivs* are used to provide continuity by tying together various scenes in a script (Zettl, 1990). Essentially, the quick cuts and rapid exchange of dialogue are pivotal in maintaining the audience's short attention span: The cryptic phrases and elementary discourse among characters reflect the need to deliver the message as quickly and simply as possible.

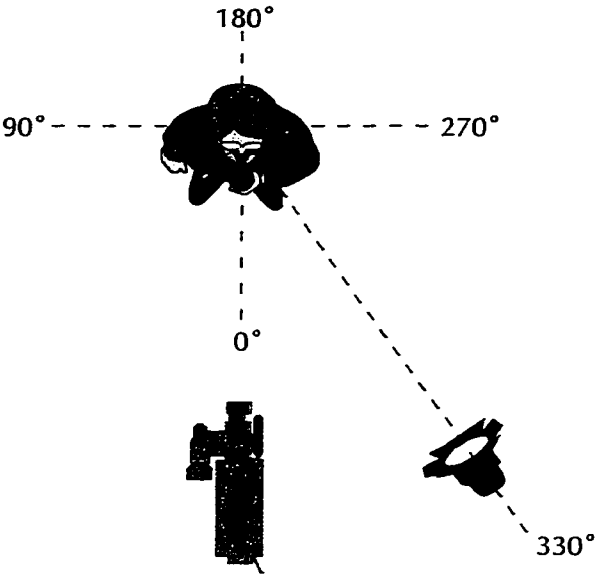
Documentary producers, on the other hand, use musical accompaniments to enhance the program's emotional impact. It is often limited to this function, for there is little evidence to support the notion that background or mood music facilitates learning (Seidman, 1981). Therefore, when background music is added to a scene containing varying levels of visual and auditory stimulation, it can be anticipated that heavy viewers of content light television programs will perceive the additional stimulus as a distracter, for it too is competing for their limited cognitive resources (Thompson et al., 1996).

Attention attracting devices. Hollywood films have acquainted today's youth to the vast world of special effects, which in turn has prompted students to demand similar features in instructional media. Without giving any consideration to the educational value or intended purpose of the instructional unit, students firmly believe that these meaningless frills would render the program more interesting and visually dynamic. If students are demanding richer visual content, provisions should be made to incorporate such features in educational media. But, will the use of special effects have a positive influence on learning? If so, to what extent?

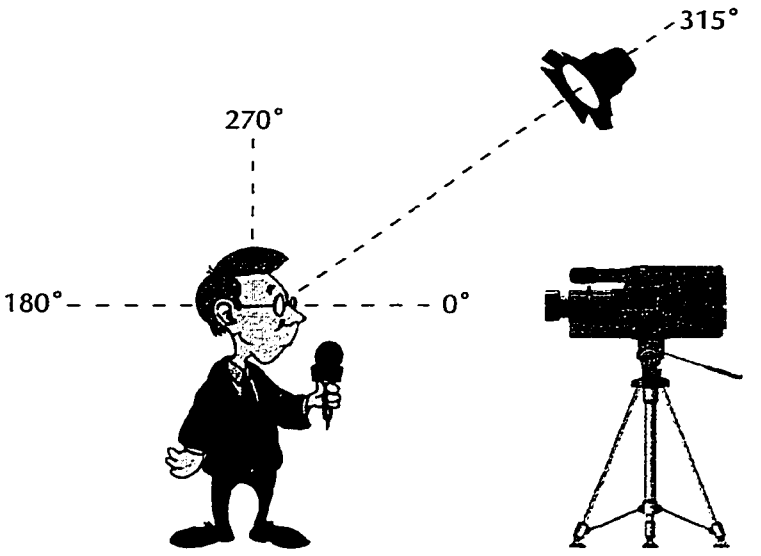
As a strong supporter of the behaviorist paradigm to the production of educational television programs, McIntyre (1965) had little regard or respect for production elements, and stated that, "They may contribute little as stimuli pertaining to the instructional message with respect to the drive and intended response of students. At best, they are frequently nonfunctional; at worst they conflict with other essential cues" (p. 59). McDonald (1961) held opposing views regarding the effectiveness of production techniques on learning and maintained that "a film may arouse interest, but be quite ineffectual for producing learning... [since] the primary utility of audiovisual procedures lies in their effectiveness in creating learning sets" (p. 65). Nonetheless, this is not to say that the use of varied production techniques does not benefit the learner. In light of the learner's lack of motivation, both McDonald (1961) and Gagné (1975) concurred that the motivational properties which are inherent to the medium may be adequate enough to trigger the learning process. But the fact remains that little evidence supports their contribution to increased learning (Torrence, 1985; Johnson & Ettema, 1986). Regardless, educational television producers continue to use special effects, hoping that increased attention will promote greater recall (Brock & Goldstein, 1985; Ball, Palmer, & Millward, 1986). Therefore, in order to understand the effects of attention attracting devices, we need to examine the materials of televised images and most profound aesthetic agents of television—color and light—as well as production variables that can affect our interpretation of the visual content, such as camera angles and shot designations.

Color and light. The lighting angle refers to the angle at which the light from a specific lighting instrument is striking an object being filmed or taped (Figure 12). Tannenbaum and Fosdick's (1960) study on lighting angles (below, flat, with the light at the camera, and at a 45–degree lateral angle to the camera–subject axis) showed that manipulating the angle of the key light source affected viewer perceptions: Low– or high–angle lighting of subjects can create either a negative (low–key) or a positive (high–key) viewer response (Millerson, 1990; Zettl, 1990; Figure 13). Therefore, the quantity as well as the quality of the light is a direct response to the contextual situation of a scene, as well as the mood it ought to evoke from the viewer.

Studies regarding the perceived differences between black and white and color images, have been explored by several researchers in audiovisual communication media, and have yielded mixed, and at times, insignificant results (Chu & Schramm, 1967; Mount, Mount, & Toplin, 1988). For instance, VandeMeer's (1954) findings documenting the differences between color and black and white instructional films represented a bridge between film and video studies on the subject. As noted earlier, no significant differences were found. In this case, the results suggested that the level of detail recalled on the immediate posttests were greater for those who had viewed the black and white version, while individuals who had seen the colored version scored higher on the delayed posttests. Fullerton (1956) provided evidence to the contrary. In an experiment in which he presented four films—with varying subject matters (library organization, heredity and environment, choice of occupation, and earning power)—to a group of high school students, he found that subjects in the black and white groups scored significantly higher in both posttests and delayed posttests.

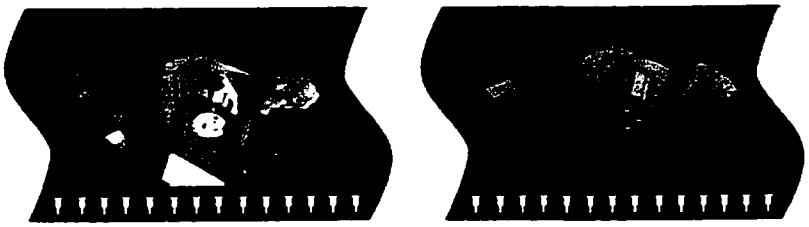


Horizontal lighting angle of a key light



Vertical lighting angle of a key light

Figure 12
ANGULAR LOCATION OF A LIGHTING SOURCE
Two angular measures are required to place a lighting instrument in three–dimensional space—a horizontal angle and a vertical angle.



High–key lighting Low–key lighting

Figure 13
HIGH–KEY AND LOW–KEY LIGHTING
When mid–gray to white tones predominate (high–key lighting) there is a feeling of lightness and cheerfulness in the room. On the other hand, when mid–gray to black tones predominate (low–key lighting), the room has a somber, sober air about it.

Courtesy of First Light Video Publishing

Additional efforts by Kanner and Rosenstein (1963) provided more meaningful results. They concluded that low–ability learners recalled more information from a colored rendition, whereas high–ability learners performed significantly better after having viewed the black and white version. Moreover, the Kanner and Rosenstein (1963) experiments suggested that color is a significant agent in increasing motivation, as well as attracting attention in low–ability and low–interest groups. Similarly, both Dwyer (1978) and Lamberski (1980) valued the use of color, because of its intrinsic motivational factors, as well as its ability to focus attention in self–paced learning materials which required active learning. Thus, the use of color in visual illustrations can improve the achievement of specific educational objectives (Dwyer, 1978).

Whereas the above mentioned studies were concerned with the ability to better recall facts from a colored interpretation, Scanlon's (1970) experimental study of viewers' perceptions of color and black and white television images was the first attempt to measure such differences. He concluded that the use of color changes both the emotional impact of

televised images, as well as the commentator's significance. Moreover, given that color has both an affective and emotional component (Table 1), the probability of recalling specific events are greater, since "what we choose to store in our long–term memory is closely tied to our emotions" (Pines, 1986, p. 369). Nonetheless, Scanlon (1970) attributed the monochrome group's highly detailed account of events to the lack of informational and emotional content emitted by color: The subjects paid far more attention to the commentator, and were forced to take detailed notes. As a result, their scores were significantly higher on the immediate posttests than on the delayed ones.

Table 1
COLOR'S AFFECTIVE AND EMOTIONAL COMPONENTS

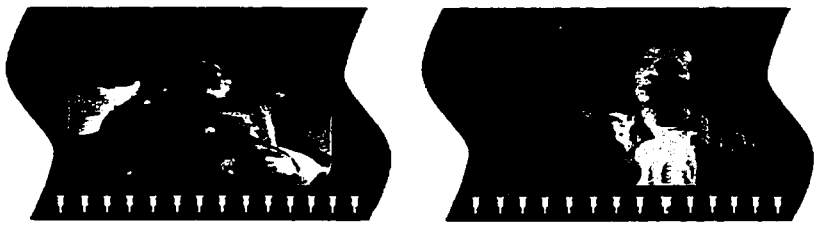
Color	Affective and Emotional Component	Example
Blue	Commands respect and authority	Coffee in a blue can is perceived as "mild"
Yellow	Signals caution, novelty, and warmth	Coffee in a yellow can tastes "weak"
Green	Secure, natural, relaxed or easygoing	Good work environment
Red	Human, exciting, hot, passionate, and strong	Coffee in a red can is perceived as "rich"
Orange	Powerful, affordable, informal	Drawn attention quickly
Brown	Informal and relaxed, masculine	Coffee in a dark–brown can is perceived as "too strong"
White	Suggests goodness, purity, delicacy, cleanliness, refinement, and formality	Suggests reduced calories, i.e., pure and wholesome foods
Black	Sophistication, power, authority, mystery	Powerful clothing
Silver, Gold, Platinum	Regal, wealthy, stately	Suggests a premium price

Source: Kanner, B. (1989, April 3). Color schemes. *New York Magazine*, 22–23.

These studies have identified areas of communication in which color pictures appear to be preferable over black and white when used to: (1) provide information, (2) facilitate learning, (3) attract viewer attention to specific objects or situations, and (4) enhance and/or elicit viewer aesthetic responses. However, they have all failed to provide us with a deeper understanding of the functions, perceptions, and cognitions of black and white versus color images. After all, there is more to a television program than a mere portrayal of sights, sounds, and motions. Therefore, to adequately determine the comparative effects of black and white versus color television on learning, a fundamental understanding of the properties of light and color are necessary in order to comprehend the operation and nature of television pictures. As VandeMeer (1954) pointed out, other than certain elements which were present in the narration, the shortcomings of his experiment were on the account of other variables, such as contrast and texture. Thus, experiments evaluating the effectiveness of television production techniques should be carefully planned to solely reflect the variable under study. So, if one is to truly benefit from the use of the television medium, efforts should be made to understand its individual constructs. Similarly, with respect to educational television programs, the construct itself (i.e., lighting, staging, editing, and sound) should act as the sole instructional design variable, as opposed to a mere complement to other design factors present in the program.

Camera angles. Most of the research performed on the effects of camera angles (whether they were placed above–, below– or at eye–level) on learning were deemed inconclusive (Tiemens, 1970; Coldevin, 1981). While investigating the relationship between camera angle (normal, high– and low–angle) and communicator credibility, Tiemens (1970) found that viewers rated the speaker in the low camera angle presentation as most communicative, knowledgeable, and authoritative. Mandell and Shaw (1973), on the other hand, failed to confirm these results. Their study on the effects of camera angle and body movements indicated that the announcer's potency was increased when a slightly low camera angle was used. This is rather evident for:

> When we look up with the camera (sometimes called low–angle or a below eye–level point of view), the object or event seems more important, more powerful, more authoritative than when we look at it straight on (normal angle or eye–level point of view) or look down on it (high–angle or above eye–level point of view). When we look down with the camera, the object generally loses somewhat in significance; it becomes less powerful, less important, than when we look at it straight on or from below. As viewers, we readily assume the camera's viewpoint and identify with its superior high–angle position (looking down on the object or subject) and its inferior low–angle position (looking up at the subject or object). (Zettl, 1990, p. 217; Figure 14)



Below–eye–level Above–eye–level

Figure 14
CAMERA ANGLES
Images shot from below–eye–level appear taller, larger, and dominant, whereas shooting from above–eye–level makes things look smaller, weaker, powerless, and somewhat diminished.

Courtesy of Molson Breweries

Contrary to these findings, McCain and his colleagues (1977) maintained that a higher camera angle produced more positive attitudes toward the presenter. Specifically, the presenter's perceived sociability, character, competence, composure, and task attractiveness were greater when a high camera angle perspective was used. They also provided evidence supporting Mandell and Shaw's (1973) findings, asserting that the use of a low–angle shot may increase the announcer's performance, but only if used in moderation.

In a more recent study, Jayasinghe, Morrison and Ross (1997) disputed these findings. Unlike the results generated from earlier works (Tiemens, 1970; Mandell & Shaw, 1973; McCain et al., 1977), their research on instructor credibility showed that camera angle alone does not significantly affect participants' perception of instructor credibility; rather the camera angle and the placement of the monitor produced a combined or interactive effect.

Shot designations. The field of view refers to how wide or how close the object appears relative to the camera, thus, how close it will appear to the viewer (Figure 15). Although most studies have reported no significant differences in learning comprehension (Cobin & McIntyre, 1961), the use of close–ups in instructional television has yielded controversial responses. Wurtzel and Dominick (1971–72) have found that interest levels were increased when close–ups were used, and that they were more positively evaluated than any other field of view designation. Williams' (1964–65) results suggested otherwise. While investigating the relationship between shot magnitudes and interest levels, no increase in interest level was reported in either the close–up or long shot treatments. Instead, the subjects felt that the tightness and looseness of the shot decreased their interest levels in the program altogether, hence the medium shot was the preferred field of view designation. To this effect, Williams (1964–65) proposed an inverse relationship between the tightness of the shot and the level of interest in the presented subject matter: Close–ups should be used selectively, instead of a strategy to reinforce specific ideas or concepts.

The use of close–ups have also been found to be ineffective in teaching the physical sciences, particularly when they are showing the instructor. While tracking the subjects' eye movements when watching television, Guba, Wolf, de Grot, Knemeyer, Van Atta and Light (1961) reported the distracting effects of this shot magnitude. Whenever the instructor was present on the screen, the students paid special attention to his facial features, and had little concern for the distracters and sometimes relevant cues present in the background. Consequently, the presence of this irrelevant cue—the close–ups of the instructor's face—resulted in a decrease in learner comprehension, for the viewer was not getting the whole picture.

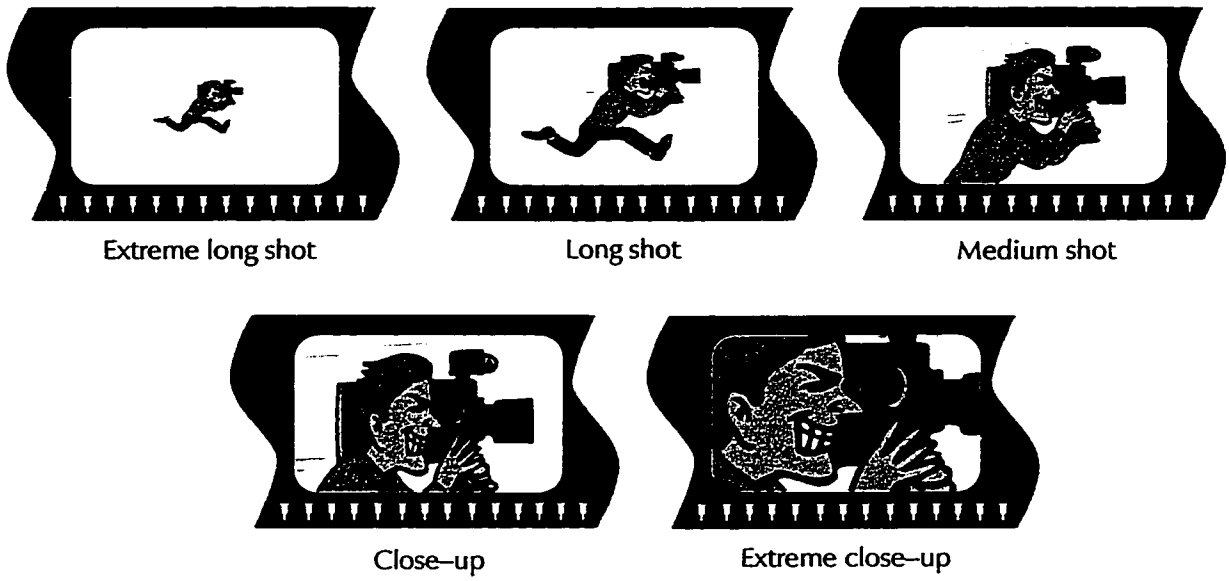
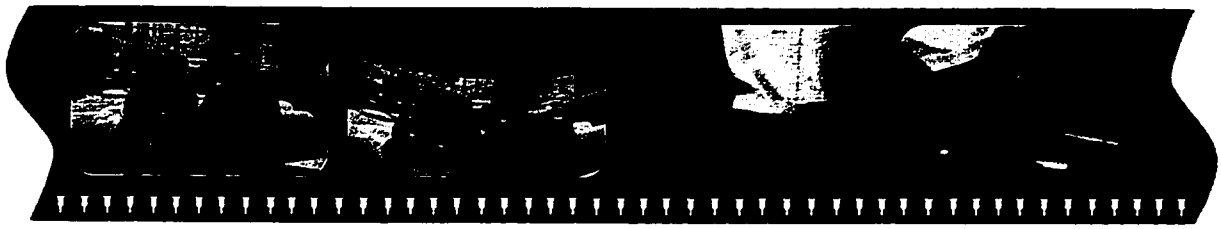
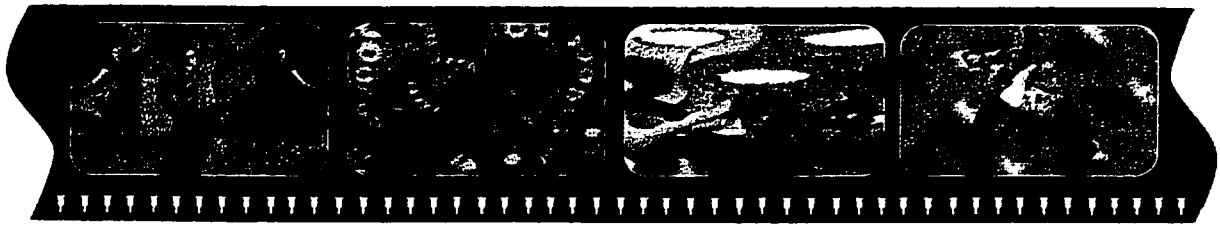


Figure 15
FIELD–OF–VIEW STEPS
The field of view distance steps are relative and depend on how a long shot or close–up is visualized.

Documentaries and situation comedies: Another look. To date, situation comedies seldom use special effects. But when they do, special effects are employed during the transitional scenes in order to reinforce select passages or to introduce the forthcoming scene (Figure 16). As mentioned before, the level of stimulus complexity present in such programs is relatively low. Visually speaking, situation comedies use six common shot designations: bust shot, cross–shot, knee shot, two–shot, three–shot, and over–the–shoulder shot (Figure 17). Most of these simple shot designations portray one prominent figure, hence ensuring that the viewer's attention is selectively focused on the relevant visual and auditory stimuli, as s/he is *looking at the event*—an objective point of view, where the cameras and microphones are being used to simply report what is going on (Zettl, 1990; Metallinos, 1996; Figure 18). In other words, the director is using an approach that "comes as close as possible to the point of view of an observer, someone who watches an event without much involvement" (Zettl, 1990, pp. 211–212).



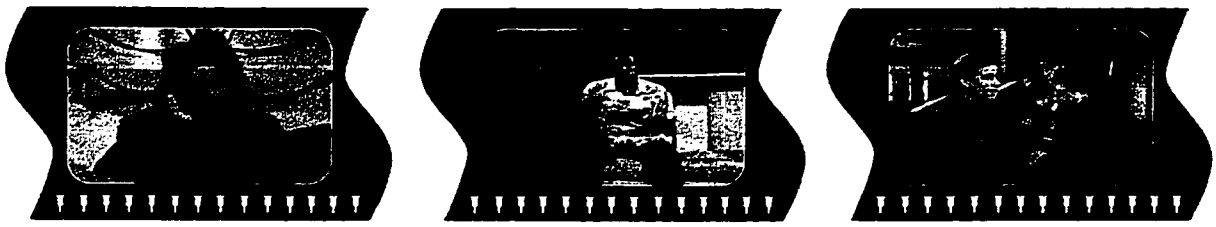
Home Improvement



That 70's Show

Figure 16
SITCOMS AND SPECIAL EFFECTS
Whereas Home Improvement uses special effects to visually reinforce key passages, sitcoms such as That 70's Show use special effects to introduce the characters in the forthcoming scene.

Home Improvement courtesy of Buena Vista Television
That 70's Show courtesy of Carsey–Werner Company



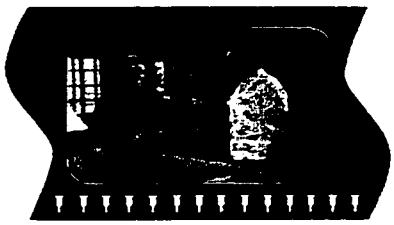
Bust shot

Knee shot

Three–shot

Over–the–shoulder

Cross–shot

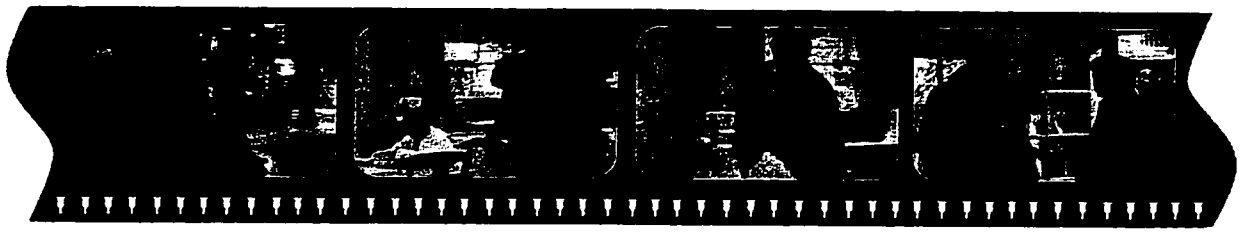


Two–shot

Figure 17
SITCOMS AND SHOT DESIGNATIONS
The shot designations primarily used in sitcoms are the bust shot, knee shot, three–shot, over–the–shoulder shot, cross–shot and two–shot. It should be noted that the bust shot is similar to the medium shot and the knee shot is similar to the long shot.

Courtesy of Columbia–Tristar Pictures

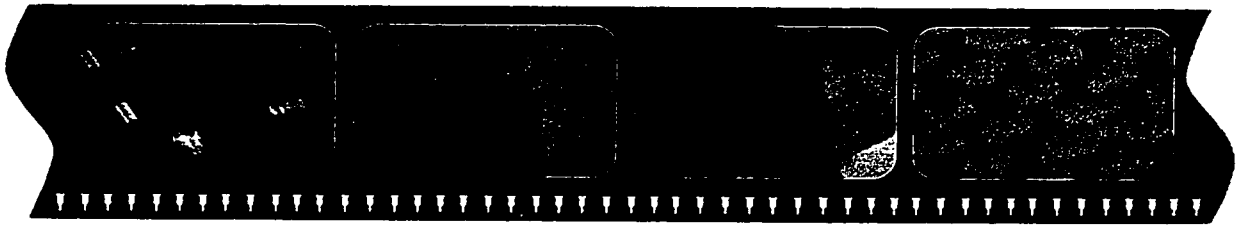
Conversely, the degree of visual stimulation is much greater in documentaries for we are *looking into an event.* By means of a subjective point of view, we are given the opportunity to "scrutinize the event as closely as possible, to look behind its obvious outer appearance, to probe into its structure, and if possible, into its very essence" (Zettl, 1990, p. 212; Figure 19). Therefore, adding special effects to a program which already exudes a high degree of involvement and visual stimulation, may be too demanding for viewers accustomed to watching television programs that require a lower level of information processing.



Behind the scenes of Everybody Loves Raymond

Figure 18
OBJECTIVE POINT OF VIEW
When filming a sitcom, the cameras are being used to report an event from a neutral and objective point of view.

Courtesy of Discovery Communications



Atoms as seen by an electron tunneling microscope

Figure 19
SUBJECTIVE POINT OF VIEW
When filming a documentary, the cameras are looking into the event, thus providing a deeper insight into what is going on.

Courtesy of Discovery Communications

To summarize, in a visual narrative, the camera and lighting angles, as well as the shot designations, are comparable to adjectives in a linguistic narrative (Giannetti, 1982). They modify the content, shaping the connotative meaning that viewers ascribe to pictorial events. Therefore, in light of these current findings, is of critical importance for instructional television producers, and educators alike, to be aware of the cognitive load that message complexity places on the processing demands of the viewer, if optimal learning is to occur.

STATEMENT OF THE PROBLEM

In light of the subjects' formal experiences with instructional television, in addition to the fact that we choose to watch television programs that are analogous to the memory system we employ in our final recognition and appreciation of television pictures, the following questions identify the problem of study:

- Does heavy viewing of content light programming affect an individual's comprehension of documentaries containing attention attracting devices and auditory complex materials?
- Does heavy viewing of content light programming affect the retention of verbal content presented in documentaries?
- Does heavy viewing of content light programming affect the retention of visual content presented in documentaries?

The following operational definitions were used as the basis for exploring the differences between the recall of information of content light and heavy television viewers:

Attention. Selectively attending to one channel at the expense of another (i.e., visual over verbal or vice versa).

Attention attracting devices. Production techniques, such as digital video effects, used to emphasize the key point of a television program.

Auditory complexity. The number of audio tracks in a television program is greater than or equal to two, and the perceived loudness of the musical score is at least half of the narration's intensity.

Comprehension. The capacity for grasping the meaning of an event.

Content heavy television programs. Programs that demand a high level of concentration (i.e., scientific and educational programming).

Content light television programs. Programs that require a low level of concentration (i.e., situation comedies).

Documentary. A program which documents real events, issues and conflicts of any sociopolitical or sociocultural nature to the general public. It can be classified into two categories: thematic and anthology.

Informational television. Audiovisual materials in which the content and form is general in nature, usually serving as an introduction, an overview, a report, or background knowledge. Often uses entertainment, dramatic, or motivational techniques in order to attract and maintain attention.

Instructional television. Television programs whose central theme is to present topics strictly referring to education and to others produced by individual educational stations, networks, or organizations such as the *Discovery Channel, The Learning Channel,* and *The National Geographic Society.*

Long term memory. Memory in which information is represented on a permanent or near–permanent basis.

Memory. The cognitive processes of encoding, storing, and retrieving information.

Perceived interest value. The degree to which viewers perceive visual materials as being more involving, dramatic, accentuated, and interesting than the program's auditory component.

Perceived prominence. The degree to which viewers perceive visual materials as being more predominant, outstanding, powerful, and noticeable than the program's auditory components.

Recall. Remembrance of what has been learned or experienced.

Situation comedy. A short narrative–series comedy, with a story line made up of contrived episodes involving stock characters.

METHODOLOGY

In order to answer the questions outlined above, a one–shot case study design was employed. This chapter discusses the procedures involved, as the descriptions pertaining to the sample, pilot program, instrumentation, data collection, and statistical analyses are presented.

Sample

A sample of 135 undergraduate Communication Studies students at Concordia University participated in this study. The subjects were selected from 5 out of 28 courses offered to students with a second year standing. Each class was drawn from one of the program's four clusters (i.e., Laboratory, Seminar/Practicum, Media Theory, Criticism and History, and Media and Society), in order to allow for a maximum variation of responses, and thus represent the diverse population from which the sample was drawn from. In light of the subject matter presented in pilot program, two television production courses were selected from the Laboratory cluster. Furthermore, the subjects were equally chosen because of: (1) the perceived relevance of the instructional unit to their area of study; (2) their limited experiences with instructional television, since such programs are often used for *informational* purposes rather than *instructional* ones; and (3) their limited knowledge of the concepts presented in the pilot program.

Based on their weekly television viewing habits, in terms of both the type and frequency watched, the subjects were categorized into three distinct groups: content light, content heavy, and other (Table 2). For the purposes of this study, further analysis was only conducted with the content light and heavy groups. The data presented in Table 3 further define the subjects under study. Consisting mostly of second year television production students, the subjects lacked professional television production experience and formal telecourse training. In addition, perhaps the most critical criterion was the subjects' second year standing. In the first year of the program, students are required to take a rudimentary video course, in which they are introduced to the preliminary aspects of the medium. In turn, this basic knowledge enabled them to provide a valid assessment of the pilot program's structural components.

Table 2
TELEVISION VIEWING HABITS OF RESEARCH SUBJECTS (N=135)

	Number of hours spent watching television					
	0	0–3	3–6	6–9	9–12	> 12
Content Light						
PBS	62					
Network					15	47
TLC/Discovery Channel	51	11				
Content Heavy						
PBS					30	15
Network	8	37				
TLC/Discovery Channel					12	33
Other						
PBS			18	10		
Network			12	16		
TLC/Discovery Channel			8	20		

Table 3
FREQUENCY AND PERCENT OF SELECTED DEMOGRAPHIC CHARACTERISTICS OF RESEARCH SUBJECTS (N=135)

	Group							
	Content Light (n=62)		Other (n=28)		Content Heavy (n=45)			
	f_o	%	f_o	%	f_o	%	TOTAL	%
Year of study								
2nd year	48	77.42	17	60.71	12	26.67	77	57.04
3rd year	5	8.06	7	25.00	27	60.00	39	28.89
4th year	9	14.52	4	14.29	6	13.33	19	14.07
Subject major								
Film production	9	14.52	10	35.71	8	17.78	31	20.00
Multimedia production	17	27.42	7	25.00	9	20.00	34	24.44
Sound production	14	22.58	4	14.29	6	13.33	24	17.78
TV production	22	35.48	7	25.00	22	48.89	57	37.78
Professional TV experience								
Yes	4	6.45	3	10.71	4	8.89	11	8.15
No	58	93.55	25	89.29	41	91.11	124	91.85
Enrolled in telecourse								
Yes	1	1.61	4	14.29	3	6.67	8	5.93
No	61	98.39	24	85.71	42	93.33	127	94.07
Watching *Understanding: Television* for the first time								
Yes	62	100	28	100	45	100	135	100
No	0	0	0	0	0	0	0	0
Gender								
Male	34	54.84	10	35.71	25	53.57	69	51.11
Female	28	45.16	18	64.29	20	46.43	66	48.89

Pilot Program

Produced by Cronkite–Ward in 1996 as part of the *Assignment Discovery* series (i.e., cable in the classroom), *Understanding: Television* is a 45–minute documentary that deals with issues of communication, science, and technology. Designed for grade 9 to 12 students (in the United States), the program's objective was to describe and explain how the wondrous invention of television works, from the moment light strikes the lens of the camera to the signal that is received by our television sets.

A 10–minute excerpt was used for this study. This length was deemed appropriate, since the average running time of a network television program, before it cuts to its first commercial, is of the same duration. All instructional design strategies which were not part of the study, and posed a threat to the results (i.e., advance organizers), were edited out of the program, without disrupting its continuity. A storyboard of the program used is presented in Appendix A.

Instrumentation

Four types of measures—subject profile questionnaire, attitudinal survey, and verbal and visual retention tests—were constructed specifically for this study. All materials were pretested using subjects from the same population from which the sample of subjects was drawn. A description of each follows.

Subject profile questionnaire. The subject profile questionnaire was used as an intervening task, in order to ensure that subsequent tests measured long term memory. Two types of construct measures were used: Likert scales and multiple–choice questions.

Likert scales. The subjects' television viewing habits were measured on a five–point Likert scale. Specifically, the subjects were asked to mark one of the following terms which best described the frequency at which they watch specific types of television programs: "Never," "Rarely," " Occasionally," "Usually," or "Always." In order to avoid a situation in which the subjects were forced to either make a choice, or perhaps not to respond at all, a neutral choice was included. This option was exercised for it was anticipated that a forced choice format might have lead to some frustration by the subjects (Heller & Rife, 1987).

Multiple–choice questions. Multiple–choice questions were used to gather data regarding the subjects': (1) preferred types of television programs; (2) experiences, perceptions, and attitudes toward instructional television programs in general; and (3) demographic profiles. In the first case, subjects were asked to select the statements (as many as applicable) which best described the reasons for which they watch their favorite television programs. The same instructions applied to the next set of questions regarding their experiences with audiovisual materials (television in particular) in the classroom. Here, further insight was gained into the types of programs (e.g., news, documentaries, commercials, etc.) that are commonly used by their instructors, the intended purpose of these video programs, and reasons for which such materials are considered to be effective learning tools. Finally, single–response multiple–choice questions were used to gather data

pertaining to the subjects' demographic characteristics, in addition to the number of hours of network, public television, and specialty channel (i.e., *Discovery Channel* and *The Learning Channel*) programming they consume weekly.

The subject profile questionnaire was presented to 10 subjects who viewed the pilot program in order to determine: (1) the duration of the task; (2) the clarity of the wording in both the directions and questions; and (3) to generate response categories regarding their television viewing habits (item 5), and background information (items 2 and 3). The final version of the intervening task used in the study is presented in Appendix B.

Attitudinal survey. Based on Keller's (1987a, b) ARCS model, this questionnaire assessed the subjects' attitudes toward the pilot program. Specifically, it was used to determine: (1) to what element their attention was drawn to (i.e., visual versus verbal); (2) the students' attitudes toward the presented materials; (3) the perceived relevance of the instructional unit; and (4) the perceived level of difficulty of the materials.

As with the previous questionnaire, a five–point Likert scale was used to register the subjects' responses regarding their attitudes toward the pilot program. The subjects based their opinions on 24 statements regarding the program's visual, auditory, and structural components, by selecting one of the following five terms: "Strongly Disagree," "Disagree," "Neither," "Agree," or "Strongly Agree." A neutral choice was also included in this survey.

Moreover, three open–ended questions were appended to the survey in order to gain further insight into the instructional unit's most salient components.

The attitudinal test was pretested with the same group for length and clarity. These results were used to identify the specific attributes which influenced the subjects' comprehension of the pilot program, and to provide suggestions to future producers of instructional television programs. This survey is presented in Appendix C.

Verbal retention test. An objective, 10–item, true or false test was constructed in order to assess the subjects' ability to recall verbal (factual) information; to determine if they have mastered the learning objectives well enough to correctly analyze a given statement. The test was given to 10 subjects who were shown the documentary and to 10 who have not. The purpose of this pretest was to: (1) establish the subjects' prior knowledge of the concepts discussed in the documentary, (2) determine the test's perceived level of difficulty, and (3) ensure the clarity of the true or false statements.

The final form of the verbal retention test was composed of 10 true or false statements representing the key concepts discussed in the pilot program. As well, in order to lessen the test's perceived level of difficulty, the first and fifth statements were based on the subjects' prior knowledge of the television medium. The remaining items were randomly ordered. The verbal retention test used in the experiment is presented in Appendix D.

Visual retention test. Adapted from a freeze frame testing technique used with formative research for *Sesame Street* (Mielke & Chen, 1983), a visual retention test and video were developed. The subjects' ability to retain visual information was determined by their ability to correctly identify the concept depicted. The video contained 10 freeze frames captured from the *Understanding: Television* documentary. Among the 10 stills, 8 were drawn from the pilot program viewed by the subjects. These visuals were used to measure the effects of auditory and visual complexity on visual recall. The remaining two freeze frames were not contained in the pilot program. Instead, these seemingly related visuals (Figure 20), which were captured from the original full–length documentary, were used to examine the effects of auditory complexity on the recall of detailed visual information. The sequence of the stills were randomized. Each image remained on the screen for 10 seconds, at which point the subjects were given 30 seconds to identify its corresponding term. At the 30–second mark, a 1 kHz tone sounded to notify the subjects of the elapsed time, and to advise them of the forthcoming visual.

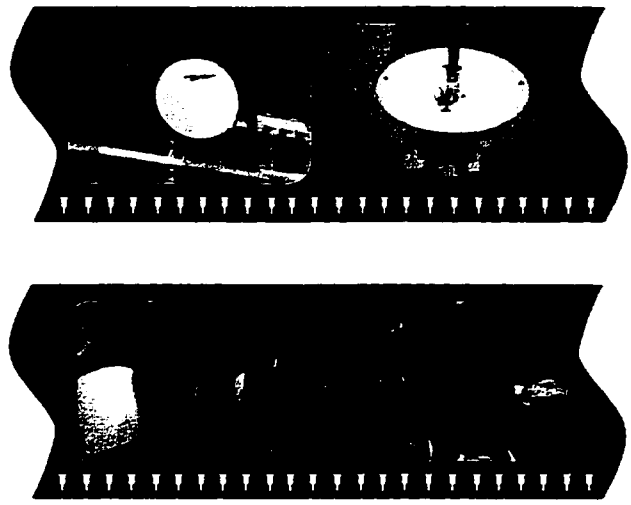


Figure 20
SUBSTITUTED IMAGES IN THE VISUAL RETENTION VIDEO
The images on the left were replaced with the ones on the right to test the effects of auditory complexity on the recall of detailed visual information.

Courtesy of Discovery Communications

The visual retention test was pretested on 10 subjects taken from the same population from which the groups were sampled, in order to assess the difficulty, hence feasibility, of the task. The pretest showed that the subjects' performance was evenly distributed among the 10 visuals used in the retention test. The visual retention test and script/storyboard of the video are presented in Appendices E and F respectively.

Data Collection

Subjects were drawn from among undergraduate students enrolled in Concordia University's Communication Studies program. Over the course of five days, a total of 135 second–, third–, and fourth–year students (five groups consisting of 21, 25, 27, 29, and 33 subjects each) participated in this study.

The subjects were assigned to a pre–designated viewing room where *instructional* television (*informational* in their case) is received, and were seated. In this situation, given that a clear perception of images plays an important part of the learning process, the students were placed in a specific seating arrangement to allow for optimal viewing conditions of a 23–inch television set (Hilliard & Field, 1976; Torrence, 1985; Price, 1991; Heinich, Molenda, Russell, & Smaldino, 1996; Figure 21). At this point, the subjects were told that the researcher is a producer who is in the process of designing a video program which is expected to be integrated into their course's curriculum, and that their contributions would play an imperative role in ensuring its success. The true purpose of the study was not disclosed in order to preserve the nature of the research, thus to determine if there is an authentic relationship between the frequency and types of television programs watched and the comprehension and recall of instructional materials. The subjects completed a consent form (Appendix G), and were given a brief explanation as to what they were going to do. Specifically, they were told that they were going to: (1) see a short television program, (2) answer some questions on what they have seen, and (3) see another short videotape to which they would also answer some questions.

At this point the room was partially darkened and the researcher proceeded with the screening of the pilot program.

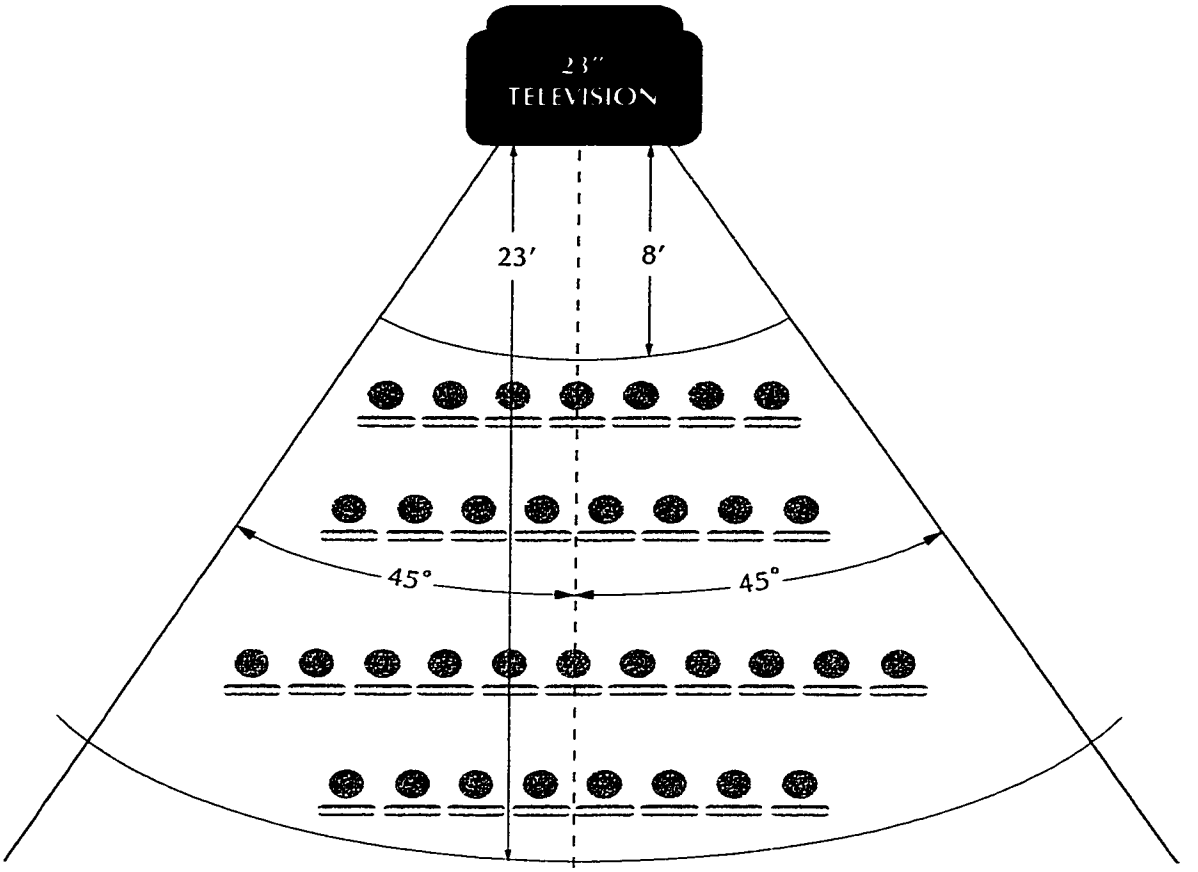


Figure 21
OPTIMAL VIEWING CONDITIONS OF A 23–INCH TELEVISION SET
Subjects were seated 8 to 23 feet away from the television set, within a maximum viewing angle of 45 degrees from the center of the screen.

Immediately after they were shown the first videotape, the room lights were turned on and the subjects were handed the subject profile questionnaire. They were instructed to carefully read the instructions and to answer all the questions. The subjects were given 10 minutes to complete this task.

Following the completion of the first questionnaire, the subjects were given the attitudinal survey. They were asked to indicate the degree to which they agreed or disagreed with each statement, as well as provide self–reported data regarding the most and least preferred elements of the pilot program. As with the previous questionnaire, 10 minutes were allotted to complete this survey.

Once they finished the second questionnaire, the subjects were presented with the true or false test. The subjects were told to read each statement carefully and to select the appropriate response. This test was used to measure verbal retention (Appendix D). They had five minutes to complete this test.

Finally, after the true or false test was completed by all subjects, they received a copy of the visual retention test. From among the visuals contained in the video program, the subjects were asked to select the corresponding term on their test sheets. In order to minimize ambiguity and confusion, the researcher provided the subjects with a hypothetical example. The researcher also emphasized that the sequence of the visual presentation on the tape was timed, so that they should be ready to respond before the next still appears, for any delay in selecting a term would make subsequent choices much more difficult. The room was partially darkened once again, and the screening of the second video program was under way. This test was used to measure visual retention (Appendix E).

The time required to show the video programs and administer the tests was approximately 55 minutes. During these processes there were no noticeable distractions or disruptions which could have posed a problem for the study.

Statistical Analyses

Both Likert scale and multiple–choice items were reported with frequency counts and percentages. Likewise, the binary questions were reported as frequency counts for both true and false response categories. To further analyze the differences between the content heavy and light groups, independent samples chi–square tests were applied to each of the following sets of data:

- Likert scale scores used to measure their attitudes toward the pilot program;
- Verbal retention scores; and
- Visual retention scores.

The 0.05 level of confidence was preset as the level to test for significant differences among the content light and heavy groups.

RESULTS

Subject Profile Questionnaire

Television viewing habits. First examined were differences between content light and heavy groups vis–à–vis the types of programs they watch. Table 4 reports differences in the quantity of sitcoms, science fiction, made for television movies, news and music television programs watched between the content light and heavy groups. These disparities are reflective of the audience profiles associated with these genres. For example, the quick cuts, fast pace and sparse details, which are characteristic of the sitcom genre, are perhaps indicative of the content light group's short attention span. On the other hand, science fiction programs, made for television movies, and news programs are slower paced and provide the viewer with longer and more elaborate plots. As a result, the increased verbal, and at times visual, stimulation contained in such programs, requires a greater degree of concentration and involvement.

Table 4
FREQUENCIES AND PERCENTAGES OF TYPES OF TELEVISION PROGRAMS WATCHED ON A WEEKLY BASIS

		Response Category									
		Never		Rarely		Occasionally		Usually		Always	
	Group	f_o	%	f_o	%	f_o	%	f_o	%	f_o	%
Soap operas	CL[2]	24	38.71	20	32.26	16	25.81	2	3.23	—	—
	CH[3]	29	64.44	9	20.00	7	15.56	—	—	—	—
Detective stories, police– and crime–oriented programs	CL	29	46.77	15	24.19	18	29.03	—	—	—	—
	CH	—	—	16	35.56	19	42.22	9	20.00	1	2.22
Situation comedies	CL	—	—	4	6.45	26	41.94	25	40.32	7	11.29
	CH	29	64.44	13	28.89	3	6.67	—	—	—	—
Talk shows	CL	—	—	10	16.13	26	41.94	23	37.10	3	4.84
	CH	18	40.00	16	35.56	11	24.44	—	—	—	—
Adventure and suspense programs	CL	12	19.35	40	64.52	10	16.13	—	—	—	—
	CH	1	2.22	3	6.67	18	40.00	17	37.78	6	13.33

[2] Content Light (n=62)
[3] Content Heavy (n=45)

Table 4
FREQUENCIES AND PERCENTAGES OF TYPES OF TELEVISION PROGRAMS WATCHED ON A WEEKLY BASIS (CONTINUED)

		Response Category									
		Never		Rarely		Occasionally		Usually		Always	
	Group	f_o	%	f_o	%	f_o	%	f_o	%	f_o	%
Science fiction	CL	25	40.32	26	41.94	10	16.13	1	1.61	—	—
	CH	—	—	3	6.67	17	37.78	19	42.22	6	13.33
Drama series	CL	26	41.94	21	33.87	12	19.35	3	4.84	—	—
	CH	9	20.00	12	26.67	19	42.22	5	11.11	—	—
Game shows	CL	2	3.23	34	54.84	20	32.26	6	9.68	—	—
	CH	8	17.78	24	53.33	11	24.44	2	4.44	—	—
Theatrical feature films and movies made for television	CL	31	50.00	23	37.10	8	12.90	—	—	—	—
	CH	—	—	5	11.11	20	44.44	18	40.00	2	4.44
Music television	CL	—	—	1	1.61	15	24.19	22	35.48	24	38.71
	CH	—	—	24	53.33	15	33.33	4	8.89	2	4.44

Table 4

FREQUENCIES AND PERCENTAGES OF TYPES OF TELEVISION PROGRAMS WATCHED ON A WEEKLY BASIS (CONCLUDED)

		Response Category									
		Never		Rarely		Occasionally		Usually		Always	
	Group	f_o	%	f_o	%	f_o	%	f_o	%	f_o	%
News programs	CL	41	66.13	17	27.42	4	6.45	—	—	—	—
	CH	—	—	17	37.78	16	35.56	7	15.56	5	11.11
Sports programs	CL	26	41.94	26	41.94	6	9.68	4	9.68	—	6.45
	CH	17	37.78	16	35.56	11	24.44	1	2.22	—	—
Cartoons	CL	15	24.19	18	29.03	14	22.58	20	32.26	—	—
	CH	26	57.78	15	33.33	4	8.89	—	—	—	—

Differences were also found when assessing the reasons for which subjects choose to watch these specific types of television programs. As Table 5 illustrates, the most prominent differences were found in terms of script writing, entertainment and information value, and production merits. Again, these findings are consistent with the subjects' characteristics. As previously mentioned, content heavy viewers watch television selectively and sporadically. Therefore, the types of programs they choose to watch are not only intellectually stimulating, but also adhere to superior production standards. Conversely, content light television viewers are drawn to the entertaining or amusing qualities of network programming.

Table 5
FREQUENCIES AND PERCENTAGES OF REASONS FOR WATCHING PREFERRED TELEVISION PROGRAMS

	Group			
	Content Light (n=62)		Content Heavy (n=45)	
	f_o	%	f_o	%
Can relate to the characters portrayed in the TV program	31	50.00	12	26.67
Can relate to the situations portrayed in the TV program	42	67.74	18	40.00
Easy viewing: The content is not too heavy	24	38.71	15	33.33
Good acting/Favorite actor	22	35.48	28	62.22
Good script writing/story lines	5	8.06	30	66.67
They are new/innovative	16	25.81	25	55.56
They are entertaining/funny	51	82.26	11	24.44
They are informative	18	29.03	29	64.44
Well produced in terms of lighting, staging, editing, and sound	12	19.35	32	71.11

Prior instructional television experience. The content light and heavy groups' experiences with instructional television are examined next. Although the results reported in Table 6 were similar across the two groups, differences were found in the quantity of news and video programs (dealing with various aspects of media production) used by their instructors. This difference may be attributed to the types of classes attended by the subjects. With the increased use of news excerpts, one can speculate that the subjects in the content heavy group are drawn to theory laden seminars, whereas individuals in the content light group prefer the practical or creative courses offered by the Department.

Table 6
FREQUENCIES AND PERCENTAGES OF TYPES OF VIDEO PROGRAMS USED DURING CLASS LECTURES

	Group			
	Content Light (n=62)		Content Heavy (n=45)	
	f_o	%	f_o	%
Instructors have never shown videos in class	—	—	—	—
News programs	3	4.84	17	37.78
Documentaries	36	58.06	29	64.44
Video programs on various aspects of TV/audio/film/ multimedia production	28	45.16	7	15.56
Network TV programs (sitcoms, soap operas, etc.)	44	70.97	33	73.33
Commercials	54	87.10	44	97.78
Film excerpts	18	29.03	14	31.11

Similarly, in comparing the subjects' perceptions of the intended purpose of such video programs, the data in Table 7 indicate a consistent response across both groups. They were generally used for reinforcement purposes.

Table 7
FREQUENCIES AND PERCENTAGES OF REASONS FOR INSTRUCTIONAL TELEVISION USE

	Group			
	Content Light (n=62)		Content Heavy (n=45)	
	f_o	%	f_o	%
Fill class time	38	61.29	27	60.00
Introduce a topic	7	11.29	3	6.67
Provide a visual example of a particular topic discussed in class	47	75.81	30	66.67
Replace an entire lecture	42	67.74	34	75.56
Supplement a lecture	21	33.87	16	35.56

Differences were also found in the reasons for which the subjects considered instructional television programs as being effective learning tools (Table 8). The subjects in the content light group maintained that information is easier to understand when it is presented visually, thus suggesting that they are potential visualizers. Conversely, their counterparts, which exuded qualities of verbalizers, were enthused by the additional in-depth analyses provided by these programs. The results provide further evidence suggesting that the content light group supports the use of video programs in the classroom, because

they deliver information with a greater degree of efficiency and tend to be more interesting than their instructors' lectures. In this case, their short attention spans are possibly reflective of the content light group's television viewing habits. However, the need for added stimulation, or yet visual representation of their course materials, may not only suggest a preferred mode of instruction, but rather a need for additional reinforcement: the need to repeat key concepts.

Table 8
FREQUENCIES AND PERCENTAGES OF REASONS FOR WHICH INSTRUCTIONAL TELEVISION PROGRAMS ARE CONSIDERED AS BEING EFFECTIVE LEARNING TOOLS

	Group			
	Content Light (n=62)		Content Heavy (n=45)	
	f_o	%	f_o	%
Easier to understand information when it is presented visually	48	77.42	14	31.11
They cover the course materials in a better prepared and organized manner	20	32.26	28	62.22
They are more interesting than the instructor's lectures	42	67.74	22	48.89
They emphasize what I need to know	57	91.94	36	80.00
They provide concrete examples	42	67.74	24	53.33
They provide an expert opinion from prominent people in the industry	23	37.10	33	73.33
They are entertaining	37	59.68	24	53.33
They are more efficient at conveying information	26	41.94	16	35.56
They provide in–depth analyses of topics covered in class	15	24.19	28	62.22

Attitudinal Survey

This questionnaire was used to determine the *perceived prominence* and *interest value* of the pilot program's visual and auditory components. As Table 9 shows, the observed frequencies indicate that the subjects in the content light group were distracted by, hence easily attracted to, the background music. However, as previous results indicate, their interest values lie in the prominent features presented in the visual channel, while the content heavy group judged the verbal component to be more intensive and heavier, thus overriding the visual. Their detraction from the program's verbal content is not surprising, for the subjects in the content light group may have been overwhelmed by the program's seemingly quick pace, packed narration, and perceived prominence of the visual effects, hence their inability to describe and explain the terms used in the program confidently. Likewise, the content light group's failed attempts to identify the program's key points may be an indication of the difficulty they experienced in organizing, hypothesizing, abstracting, and manipulating stimuli at higher levels. Consequently, this provides further evidence suggesting that this group tends more towards passive learning.

Table 9
FREQUENCIES AND PERCENTAGES OF SUBJECTS' ATTITUDES TOWARD THE PILOT PROGRAM

		Response Category										
		Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		
	Group	f_o	%	f_o	%	f_o	%	f_o	%	f_o	%	χ^2
I already knew the information presented in this video program	CL[4]	38	61.29	19	30.65	3	4.84	—	—	—	—	0.57
	CH[5]	30	66.67	14	31.11	1	2.22	—	—	—	—	
The soundtrack added excitement to the program	CL	2	3.23	14	22.58	20	32.26	26	41.94	—	—	8.23
	CH	5	11.11	9	20.00	22	48.89	9	20.00	—	—	
I can use the information from this video in some of my courses	CL	1	1.61	12	19.35	16	25.81	26	41.94	7	11.29	8.86
	CH	—	—	15	33.33	18	40.00	10	22.22	2	4.44	
The narration attracted my attention more than the visuals	CL	29	46.77	22	35.48	6	9.68	4	6.45	1	1.61	27.21*
	CH	5	11.11	11	24.44	18	40.00	7	15.56	4	8.89	
The program was not interesting	CL	30	48.39	27	43.55	5	8.06	—	—	—	—	5.44
	CH	18	40.00	27	60.00	—	—	—	—	—	—	
The visuals overrided the narration	CL	—	—	10	16.13	16	25.81	31	50.00	5	8.06	61.18*
	CH	23	51.11	14	31.11	8	17.78	—	—	—	—	

* $\chi^2 = 9.49$ is significant at the 0.05 level of confidence.

[4] Content Light (n=62)
[5] Content Heavy (n=45)

Table 9
FREQUENCIES AND PERCENTAGES OF SUBJECTS' ATTITUDES TOWARD THE PILOT PROGRAM (CONTINUED)

		Response Category										
		Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		
	Group	f_o	%	f_o	%	f_o	%	f_o	%	f_o	%	χ^2
The content was too technical	CL	6	9.68	17	27.42	23	37.10	14	22.58	2	3.23	23.78*
	CH	6	13.33	31	68.89	7	15.56	1	2.22	—	—	
The language used in the program was complex	CL	19	30.65	24	38.71	17	27.42	1	1.61	1	1.61	6.64
	CH	21	46.67	17	37.78	5	11.11	2	4.44	—	—	
The music attracted my attention more than the narration	CL	2	3.23	22	35.48	19	30.65	16	25.81	3	4.84	58.57*
	CH	31	68.89	11	24.44	3	6.67	—	—	—	—	
I was able to relate to the narrator	CL	23	37.10	29	46.77	10	16.13	—	—	—	—	2.03
	CH	22	48.89	19	42.22	4	8.89	—	—	—	—	
The narration was unclear	CL	16	25.81	34	54.84	12	19.35	—	—	—	—	7.03
	CH	17	37.78	23	51.11	3	6.67	2	4.44	—	—	
If special effect were not used, my interest would have been lessened	CL	7	11.29	12	19.35	11	17.74	25	40.32	7	11.29	52.32*
	CH	19	42.22	26	57.78	—	—	—	—	—	—	

* $\chi^2 = 9.49$ is significant at the 0.05 level of confidence.

Table 9
FREQUENCIES AND PERCENTAGES OF SUBJECTS' ATTITUDES TOWARD THE PILOT PROGRAM (CONTINUED)

		Response Category										
		Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		
	Group	f_o	%	f_o	%	f_o	%	f_o	%	f_o	%	χ^2
There were too many details	CL	1	1.61	5	8.06	23	37.10	26	41.94	7	11.29	68.74*
	CH	6	13.33	34	75.56	5	11.11	—	—	—	—	
The music was distracting	CL	3	4.84	15	24.19	23	37.10	19	30.65	2	3.23	33.31*
	CH	11	24.44	27	60.00	3	6.67	4	8.89	—	—	
The narrator was a credible person	CL	—	—	—	—	39	62.90	23	37.10	—	—	33.63*
	CH	3	6.67	8	17.78	12	26.67	14	31.11	8	17.78	
Important concepts should be highlighted	CL	—	—	—	—	21	33.87	33	53.23	8	12.90	83.23*
	CH	17	37.78	20	44.44	8	17.78	—	—	—	—	
The pace was too fast	CL	4	6.45	11	17.74	25	40.32	19	30.65	3	4.84	38.72*
	CH	15	33.33	23	51.11	4	8.89	3	6.67	—	—	
More special effects should have been used	CL	3	4.84	27	43.55	20	32.26	10	16.13	2	3.23	17.97*
	CH	11	24.44	26	57.78	7	15.56	1	2.22	—	—	

* $\chi^2 = 9.49$ is significant at the 0.05 level of confidence.

Table 9
FREQUENCIES AND PERCENTAGES OF SUBJECTS' ATTITUDES TOWARD THE PILOT PROGRAM (CONCLUDED)

		Response Category										
		Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		
	Group	f_o	%	f_o	%	f_o	%	f_o	%	f_o	%	χ^2
Overall, the program was difficult to understand	CL	12	19.35	33	53.23	12	19.35	5	8.06	—	—	11.63*
	CH	22	48.89	18	40.00	3	6.67	2	4.44	—	—	
The music attracted my attention more than the visuals	CL	41	66.13	18	29.03	3	4.84	—	—	—	—	9.05
	CH	35	77.78	4	8.89	4	8.89	2	4.44	—	—	
I am confident that I can describe and explain the terms used in the program	CL	25	40.32	27	43.55	9	14.52	1	1.61	—	—	61.76*
	CH	1	2.22	4	8.89	15	33.33	21	46.67	4	8.89	
The video did not present any relevant information	CL	31	50.00	28	45.16	3	4.84	—	—	—	—	1.15
	CH	18	40.00	25	55.56	2	4.44	—	—	—	—	
The visuals appealed to me more than the narrator's voice	CL	—	—	2	3.23	12	19.35	41	66.13	7	11.29	89.46*
	CH	12	26.67	30	66.67	3	6.67	—	—	—	—	
The narration was packed	CL	2	3.23	5	8.06	24	38.71	30	48.39	1	1.61	58.62*
	CH	17	37.78	20	44.44	8	17.78	—	—	—	—	

* $\chi^2 = 9.49$ is significant at the 0.05 level of confidence.

Verbal Retention Test

The purpose of the verbal retention test was to determine whether or not the subjects' television viewing habits would result in differences in correct recall of verbal content. Thus far, the results have indicated that the subjects in the content light group attended to the visual channel more than the auditory. Accordingly, fewer correct responses on the verbal retention test were anticipated. The significant differences between the two groups, as reported in Table 10, are possibly indicative of the more active role undertaken by the content heavy group in interpreting the newly acquired information.

Table 10
FREQUENCIES AND PERCENTAGES OF THE CORRECT NUMBER OF RESPONSES FOR EACH ITEM ON THE VERBAL RETENTION TEST

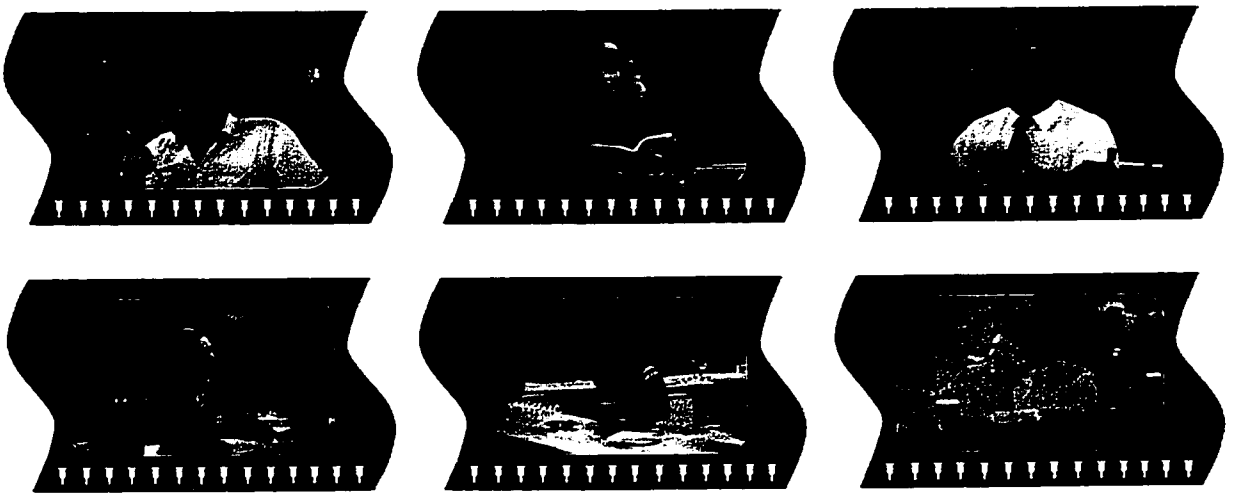
		Group				
		Content Light (n=62)		Content Heavy (n=45)		
Question	Strategy Tested	f_o	%	f_o	%	χ^2
1	Prior knowledge	48	77.42	35	77.78	0.00
2	Distracter	23	37.10	34	75.56	15.49*
3	Auditory complexity	33	53.23	36	80.00	8.16*
4	Auditory complexity & special effects	20	32.26	39	86.67	31.21*
5	Prior knowledge	44	70.97	33	73.33	0.07
6	Special effects	21	33.87	34	75.56	18.14*
7	Special effects	32	51.61	35	77.78	7.63*
8	Distracter	24	38.71	36	80.00	18.05*
9	Auditory complexity & special effects	19	30.65	32	71.11	17.12*
10	Auditory complexity	22	35.48	40	88.89	30.52*

* $\chi^2 = 3.84$ is significant at the 0.05 level of confidence.

Consistent with earlier findings (Table 9), the content light group's inferior scores and inattentiveness to detailed factual information, provides additional evidence suggesting that they perceive visual elements as being more involving, dramatic, hence more interesting than the verbal component. To this effect, the current results suggest an inverse relationship between the degree of auditory and visual complexity and verbal recall: the more complex the visual or auditory stimuli, the lower the test scores (i.e., questions 3 and 7 versus questions 6 and 10 respectively). Similar effects were also observed in scenes containing auditory and visually complex stimuli concurrently (i.e., questions 4 and 9).

The pilot program's pace and perceived level of difficulty (i.e., in terms of information density) may not have allowed enough time for the subjects in the content light group to process the information. Perhaps the large number of images which were created from the video program might have affected the encoding, storing, and retrieving of that information, i.e., the effortful process of self–generated mental images could have required most of the individual's cognitive resources, thus not permitting any additional information to be processed. This further denotes that the memories of these television viewers are at a lower level; one that is analogous to the types of programs they watch. For instance, programs such as sitcoms do not concern themselves with superfluous details. Instead, the audience is carefully fed bits and pieces of information that they need to know (or then again, what the producers want them to know) in order to make coherent sense of the program, and to ensure their viewership the following week. Thus, viewers of such programs are not preoccupied with details, only the necessary facts. The same applies to

the sitcom's visual component. Given that we have a tendency to look at the middle of the screen first, directors have intentionally centered the majority of their shots (Figure 22). Although this is often done at the expense of proper framing, the viewers' attention will be selectively drawn to the middle of the screen and the surrounding events will go unnoticed, and once again, producers have succeeded in designing auditory and visual stimuli which require lower levels of information processing.



The cast of Cheers

Figure 22
SITCOMS AND CENTERING OF SHOTS
Given that we use our central vision when watching television, sitcom producers often center their shots. Although this may be done at the expense of proper framing (e.g., noseroom), this tactic ensures producers that the viewer's attention remains focussed on a specific visual stimulus.

Courtesy of Paramount Pictures

Visual Retention Test

The purpose of the visual retention test was to determine whether or not the subjects' television viewing habits would result in differences in correct recall of the visual content. Table 11 shows the number of subjects from each group who gave correct responses for each test item on the visual retention test. In contrast to the scores obtained on the verbal retention test, the results from this questionnaire provide evidence attesting to the content light group's superior ability to recall visual information. In this case, the pictures were superior to their concrete–noun labels as stimulus terms. In other words, the more likely a stimulus was to arouse imaginal mediators, the more effective it was as a retrieval cue.

Table 11
FREQUENCIES AND PERCENTAGES OF THE CORRECT NUMBER OF RESPONSES FOR EACH ITEM ON THE VISUAL RETENTION TEST

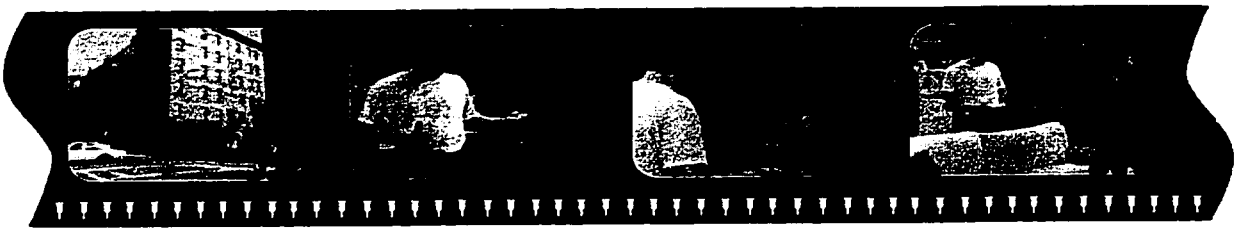
		Group				
		Content Light (n=62)		Content Heavy (n=45)		
Item	Strategy Tested	f_o	%	f_o	%	χ^2
A	Auditory complexity & special effects	12	19.35	10	22.22	0.13
B	No stimulus complexity	38	61.29	17	37.78	5.77*
C	Special effects	45	72.58	15	33.33	16.31*
D	Auditory complexity & special effects	25	40.32	19	42.22	0.04
E	No stimulus complexity	52	83.87	14	31.11	30.71*
F	Special effects	49	79.03	16	35.56	20.67*
G	No stimulus complexity	35	56.45	17	37.78	3.64
H	Auditory complexity	14	22.58	12	26.67	0.24
I	Auditory complexity	12	19.35	12	26.67	0.80
J	Auditory complexity & special effects	19	30.65	11	24.44	0.50

* $\chi^2 = 3.84$ is significant at the 0.05 level of confidence.

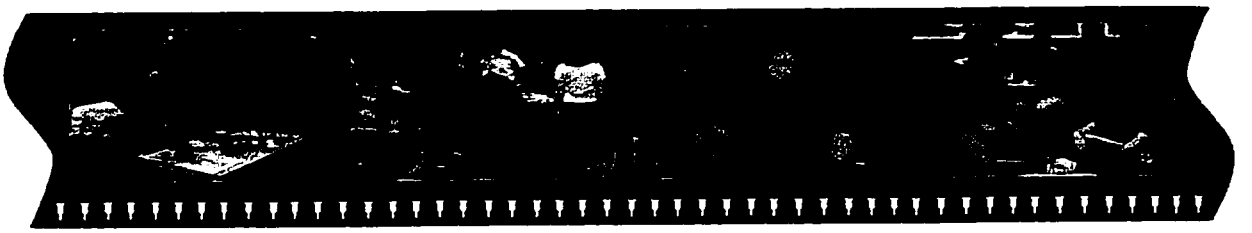
Most importantly, these results provide us with further insight as to how these subjects process televised information. Subjects in the content heavy group store information as conceptual wholes, while their counterparts focus on one aspect (visual stimuli) at the expense of another (detailed verbal content). The added mental effort invested in the visual channel by the content light group may be due to its complexity—a higher level which they are not accustomed to. The types of programs they watch (i.e., sitcoms) are delivered in a familiar setting: one which has already been established in previous episodes and by a long shot preceding the scene in question (Figure 23). Likewise, the content light group's performance was superior given the following circumstances: (1) situations containing familiar scenes, such as the repeated images used to illustrate the relationship between a field and a frame (item E; Appendix A, scene 11); (2) scenes containing animated simulations of an electron beam (item C; Appendix A, scene 14) and ray gun (item F; Appendix A, scene 10) in motion; and (3) events in which the animated or repeated sequences were at least seven seconds in duration. In essence, the repeated visual and animated sequences provided the subjects with a form of visual reinforcement—emphasizing the desired concepts to be retained. It is then suspected that the content light group's understanding and appreciation of television images and sounds are prejudiced by previously stored information.

The combined effect of repetition and scene duration were also observed in events in which auditory complexity was held constant, while the degree of visual stimulation varied (items A and D). However, in this case, the length of the ensuing pause (three to

five seconds) might have equally played a role in the content light group's superior recall of such events. Pauses are psycholinguistic. In turn, this might have provided them with the opportunity to rehearse the newly acquired information, thus facilitating cognitive learning.



Scene in Monica's apartment



Scene at Central Perk

Figure 23
SITCOMS AND FAMILIAR SETTINGS
Although sitcoms such as Friends take place in a familiar setting (i.e., one which has been established in previous episodes), long shots are often used to introduce the location of the forthcoming scene.

Courtesy of Time–Warner Entertainment

Finally, the results also suggest an indifference to the details presented in the visual channel. In order to examine the effects of auditory complexity on the recall of detailed visual information, the visual retention video contained two freeze frames which were not presented in the pilot program, yet they were seemingly related. In this case a significant

number of subjects in the content light group mistook these visuals for the two original ones, and associated them with their respective concepts. Hence, in this case, the degree of auditory complexity had no significant effect on the recall of visual concepts. On the other hand, this lack of attention to perceptual detail may be reflective of the limited number of stimulus dimensions present in the types of programs they watch. Likewise, the observed inverse relationship between graphic complexity and recall further suggests that the memory of these television viewers may be of a lower level, for the recognition of televised images, in this case, may be analogous to the level of the pictures' contextual structure.

Summary

The results obtained by this study indicate that the subjects' viewing habits affect the ways in which they think about, view, and are able to respond to televised information. The content light group found concrete and readily visualized information easier to comprehend and recall, than semantically and acoustically complex details which were mastered by the content heavy group. The results equally suggest that the subjects in the content heavy group had a tendency to see the information presented in the documentary as a whole, and were able to have an overall perspective as well as appreciate its total context. By contrast, the subjects in the content light group viewed the program as a collection of parts, and often focussed on one aspect of a situation to the exclusion of the others.

DISCUSSION

The purpose of this study was to determine if heavy viewing of content light television programs affects an individual's comprehension and recall of events presented in a documentary.

Research evidence confirms that both network and specialty channel programs are produced to reflect the audiences' learning styles, in order to accommodate the individual differences in the ways in which people process audiovisual information.

On the basis of the existing literature, the following assumptions were made:

1. Heavy viewing of content light programming will affect an individual's comprehension of documentaries containing attention attracting devices and auditory complex materials;
2. Heavy viewing of content light programming will affect the retention of verbal content presented in documentaries; and
3. Heavy viewing of content light programming will affect the retention of visual content presented in documentaries.

One hundred and thirty–five (135) subjects participated in this study. Five groups (n=21, 25, 27, 29, and 33) independently viewed a 10–minute documentary (pilot program) pertaining to the technical constructs of the television medium.

Based on the pilot program, four types of measures were constructed to assess the differences between content light and heavy television viewers:

1. A *subject profile questionnaire* was used to gather self–reported data about the subjects' television viewing habits, experiences with instructional television, and demographic profiles;

2. An *attitudinal survey* was used to determine: (1) to what element the subjects' attention was drawn to (i.e., visual versus verbal), (2) the subjects' attitudes toward the presented materials, (3) the perceived relevance of the instructional unit, and (4) the perceived level of difficulty of the materials;

3. A *verbal retention test* was used to measure the retention of verbal content presented in the pilot program; and

4. A *visual retention test* was used to measure the subjects' ability to correctly associate a given visual to its corresponding term.

The data obtained from the attitudinal survey, and the verbal and visual retention tests, were analyzed with independent samples chi–square tests. All tests for significance were made at the 0.05 level of confidence.

Suggestions for Instructional Television Producers

The results of this study provide evidence suggesting that there are individual differences in the ways in which people process visual information: the content light group (visualizers) recalled pictorial information with greater adeptness, while the content heavy group (verbalizers) was more proficient at remembering acoustically complex and unfamiliar passages (Riding & Douglas, 1993). This may be due in part to the fact that content heavy television viewers are characterized as active participants, thus they tend to analyze existing organization and restructure information for meaning as needed. In which case they perform better on tasks which call for disembedding, organizing, and restructuring information (Allen, 1975; Witkin & Goodenough, 1981), and are more likely to perform tasks which require visual processing of information at a higher level, that is, organizing and restructuring information for further retention (Canelos & Taylor, 1981; Joseph, 1987; Reardon, 1987; James, 1989).

Content light television viewers, on the other hand, are seen as being passive and reactive to their environment. They accept the structure of organization as it exists, and tend to perceive information in a holistic manner, often missing the most relevant cues. What implications, then, do these viewing habits have on the design of future instructional television programs? If we are to provide these students with comprehensive, yet effective instructional units, efforts should be made to design programs which will allow them to play a more active role in interpreting the content. Thus, the following instructional and message design strategies are proposed.

Advance organizers. Ausubel (1968) defined advance organizers as "appropriately relevant and inclusive introductory materials introduced in advance of learning and presented at a higher level of abstraction, generality, and inclusiveness" (p. 148). The function of the organizer, then, is "to provide ideational scaffolding for the stable incorporation and retention of the more detailed and differentiated material that follows" (Ausubel, 1968, p. 148). This is accomplished by manipulating "the availability to the learner of relevant and proximately inclusive subsumers" (Ausubel, 1968, p. 136). In short, advance organizers render new materials more familiar and potentially meaningful by relating the materials to what the learner already knows (Ausubel, 1960, 1968; Allen 1970; Schnell, 1973; Gagné, 1978; Mayer, 1979).

As emphasized earlier, viewers of sitcoms are conditioned to store specific bits of information when an explicit cue is present. However, in addition to laugh–tracks, teasers equally guide heavy viewers of content light television programs toward the information they want to see and hear. Whether they precede the show or are seen throughout the week, these 10–, 15– or 30–second commercials (or comparative organizers) which highlight the forthcoming plot have proven to be effective in facilitating viewer comprehension (Schleuder, White, Cameron, 1993; Chang, 1998). As such, we can speculate that the final meaning they assign to television programs are highly influenced by their expectations.

For the purposes of this study, the advance organizer was edited out of the pilot program. Not surprisingly, the subjects in the content light group experienced some difficulty in identifying the program's key points. Moreover, considering that the disruptive

effects of visual and auditory complexity were more pronounced for viewers of content light programs, an expository organizer may have allowed the subjects to create their own meaningful links to successfully reinforce key concepts and ideas.

Advance organizers, therefore, serve three purposes: (1) they encourage the viewer to recall relevant information already stored in his/her memory; (2) they make it more likely that the new information will be well–organized under an appropriately inclusive heading, and therefore easier to retain and recall; and (3) they eliminate rote memorization to which the viewer must resort when learning the details of a new subject matter, because they have an insufficient number of anchoring ideas (Ausubel, 1960, 1968; Ausubel & Fitzgerald 1961, 1962; Ausubel & Youssef 1963; Ausubel, Novak, & Hanesian, 1978).

According to Ausubel (1968), "the acquisition of new materials is highly dependent on the relevant ideas already in cognitive structure, and meaningful learning occurs through an interaction of new information with relevant existing ideas in cognitive structure" (p. 157). To this effect, he maintained that an individual goes through three stages to incorporate new learning into his/her cognitive structure. Initially, the material's relevance is assessed, so it can be properly categorized. Next, the information is integrated with prior knowledge. Last, the data are transformed into a personal set of ideas which correspond to his/her own experiences. However, the key to the acquisition of new knowledge at any step of reception learning is its assimilation into the learner's prior knowledge. Until recently (Ausubel et al., 1978), Ausubel's (1968) notion of assimilation was used to describe how a individual retains new content by anchoring it to an existing

cognitive structure. Mayer's (1979) proposed assimilation theory, on the other hand, suggests that meaningful learning depends upon reception, availability, and activation. To this effect, Driscoll (1994) explains that:

> First, the to–be–learned material must be reviewed by the learner. Then, a meaningful structure of familiar ideas, or relevant schemata, must be available to the learner, which can be used to organize and assimilate the new information. Finally, this meaningful structure must be activated during learning. Moreover, depending on what aspect of cognitive structure is activated by an instructional procedure, different learning outcomes may result. (pp. 135–136)

As instructional television producers, we must recognize that each viewer's existing cognitive structure is the result of his/her entire preceding television viewing experiences. Since these prior frameworks influence all ensuing learning, it is important that we purposely manipulate "the relevant attributes of cognitive structure" (Ausubel, 1968, p. 147). Therefore, as Winn (1993) points out, an advance organizer needs to do two things:

> First, it should include all of the main points the ensuing messages convey. Organizers that are incomplete will fail to draw attention to all of the parts of the message the [viewer] needs to consider. Second, the organizer should show how the parts of the message are related to each other, not just what they are, as their purpose is to let the [viewer] anticipate structure as well as content. (p. 84)

Background music. In light of our limited information processing capabilities, efforts should be made to limit the degree of auditory stimulation. The data from the attitudinal survey (Table 9) show that the soundtrack had little emotional impact on the content light group. Instead, it was perceived as a distracter: Far less attention was given to the narrative component, and greater emphasis was placed on the program's enticing visual effects. This is even more apparent with music videos. Hirsch (1971) found that teenage rock music listeners often do not understand what the songwriter or performer is trying to say, and that most teens are attracted to rock more by the overall sound that by the content of a song's lyrics. Moreover, rock videos impose onto the music a visual overlay that may or may not be any direct relation to the content of the song. We can then speculate that the lyrics are peripheral to the visual and musical accompaniments. Likewise, the use of auditory complex materials in this study had a significant effect on the content light group's recall of detailed verbal information, and limited impact on the recognition of visual concepts. Thus, the television viewing habits they have formed might have affected their comprehension and recall of televised information presented in a different genre.

Therefore, special attention must be given to the number of stimulus dimensions within an audiovisual presentation (Hunt, 1962; Dwyer, 1972). According to Winn (1993), "Sounds form clusters just as sights do, only in this case the proximity of one perceptual unit to another that determines message structure is temporal rather than spatial" (p. 115). Consequently, music should be present in transitory situations where either still images or live shots are accompanied by little narration, to ensure that the viewer's attention is primarily focused on the verbal component. The function of music, therefore, should be analogous to that of a sitcom's leitmotif: to signal a new topic or common theme.

The type of music used must also be considered, as was reiterated by a significant number of subjects. They perceived the *Understanding: Television* soundtrack to be dated, irritating, and unappealing; one that would be more suited for a middle–aged audience. Therefore, given that music artists come as fast as they go, the musical score should be an original one, composed specifically for these learners. In turn, the program will be more appealing, for the audience will perceive it as being personally relevant.

Maintaining the viewer's attention. Earlier findings (Table 4) report that a significant number of subjects in the content light group watch a considerable amount of music specialty programs. Although this type of programming thrives on a shooting style that is highly dynamic and esoteric, it is widely accepted and acclaimed by these subjects, as can be attested by the production techniques used in an increasing number of student productions. Their admiration of such a shooting style is exemplary of their restlessness, which is reflected by the fast–paced nonlinear appearance of music videos, and as Pittman (1985) points out, the ways in which the MTV generation uses time differently:

> People are increasingly pressed for time and more assaulted with demands for their time. Now, instead of finding a use for leisure time, we search for the ways to maximize our use of limited leisure time. That means we get rid of the transitions and connections. We're looking for the meat of the information. We want what we want immediately. (p. 34)

In an effort to time–compress leisure activities, the elimination of connectors and transitions suggests that "many rock videos take on a surrealistic appearance, one of discontinuity and disjunction [in which] gestures, actions, and intentions are nearly always divorced from a systematic context" (Gehr, 1983, p. 39). Kaplan (1987) further refers to "an excited state of expectation" that MTV generates by presenting videos that are no longer than four minutes. This "decentering experience" implies that viewers are "trapped by the constant hope that the next video will finally satisfy and, lured by the seductive promise of immediate plenitude, we keep endlessly consuming short texts" (Kaplan, 1987, p. 4). Most importantly, continued to exposure to such materials, as was demonstrated by the results acquired in the visual retention test (Table 11), indicate that the subjects in the content light group process information from television predominantly from the visual channel and secondarily from the audio: It seems as if they depend upon the visual stimuli for identification of the new concept rather than the verbal stimuli, no matter how detailed, clear, and memorable the verbal stimuli seem to be. Nonetheless, if the integrity of educational programming is to be maintained, such a radical shooting style should not be adopted. Instead, special effects or graphically enhanced visuals should be interspersed with caution and in moderation. As we have seen, the results from the verbal and visual retention tests (Tables 10 and 11) suggest that there is an inverse relationship between the degree of complexity and recall: Scenes high in graphic complexity were less likely to be remembered than those containing graphically enhanced renderings of actual objects. Therefore, if the content light group's attention is to be maintained, special effects should be primarily used to: (1) highlight key points, thus act as positive reinforcers; (2) signal

new themes or topics; and (3) arguably motivate the students' desire to learn. Although this may not be as trend setting or as exciting as seeing the camera zoom–in and –out at various angles, one has not failed to recognize the students' need for a varying degree stimulation.

Narration. Overall, the subjects were unable to identify with the narrator—Candice Bergen, television's *Murphy Brown*. As a result, a small number of subjects in the content light group were preoccupied with immaterial objects: the narrator's coarse voice and the last *Sprint* commercial she appeared on. Overall, Candice Bergen was perceived as reputable actress, who, in order to revive a dwindling career, fell prey to the "big bucks of corporate America." Consequently, a number of television production majors regarded her as one who knew how to *play the camera,* not one who new of the inner workings of one. In both groups, the subjects were looking for an industry professional that they can respect, look up to, or even aspire to follow in his/her footsteps: a mentor. Therefore, future programs should employ a lesser known or identifiable personality, as well as one that is reflective of the target audience.

The data gathered from the subject profile questionnaire (Table 5) indicate that the subjects in the content light group are drawn to specific types of television programs, because they are able to relate to both the characters and situations portrayed in their favorite series. Given that these aspects were neither implemented, or perhaps even taken into account, it can be argued that the absence of these traits might have lead to the content light group's

indifference towards the pilot program. On that account, if we are to effectively communicate with these subjects, Zollo (1995) contends that we must understand them on four distinct levels. We need to understand: (1) their behaviors, thoughts, opinions, and feelings; (2) their preferences and priorities; (3) how they see themselves and those around them; and (4) the attitudes and values which lead to their behaviors. Therefore, if the verbal message elements are to be used for their persuasive powers, while the aspects of the visual message are to be retained for the striking impressions we wish to have viewers associate with that idea, both the narrator's appearance and delivery must be taken into consideration. A brief review follows.

Narrator appearance. The first message we send to anyone with whom we are in contact with is generated by means of our physical appearance. According to McCroskey and McCain (1974) attractiveness can be defined on three levels: (1) *physical attractiveness*, since we usually prefer to talk to individuals who are considered to be good looking; (2) *social attractiveness*, which refers to the degree to which we perceive another person as someone we would like to socialize with; and (3) *task attractiveness*, which concerns itself with type of person with whom we would like to work. Therefore, attractiveness can be considered as an important source of information, since we attribute certain characteristics, predict social behaviors, and make judgments about one's success, failure, competencies, and character from these attributes (McCroskey & McCain, 1974). Hence, the narrator should reflect the values strongly held by the North American society: Physically attractive people are considered as better persuaders, thus maintaining the philosophy that "thin is in."

An individual's body shape corresponds to their own psychological description of themselves. In light of the subjects' insecurities, and the need for the narrator to be accepted as being one of them, his/her ideal body shape would be a cross between a *mesomorph*—which displays qualities of cheerfulness, confidence, energy, impetuousness, enthusiasm, outgoingness and optimism—and an *endomorph*—who is characterized by his/her tolerant, forgiving, sympathetic, soft-hearted, affectionate, kind, sociable nature. A person's hairstyle also has much to do with one's perceived attractiveness and social competence (e.g., Figure 24). As suggested by Festinger (1953), long hair is for the bedroom, whereas short hair is for the boardroom. Therefore, in order to reflect the dynamic nature of these students, a short haired communicator should be used. The color of the narrator's clothing should be considered as well. S/he must appear to be sociable, outgoing, sincere, and compassionate. As such, Compton (1962) recommends that the narrator's wardrobe should consist of saturated colors and deep shades. Likewise, the appropriateness of his/her clothing enhances his/her popularity amongst the students, as it allows the narrator to identify with them, and thus "fit in."

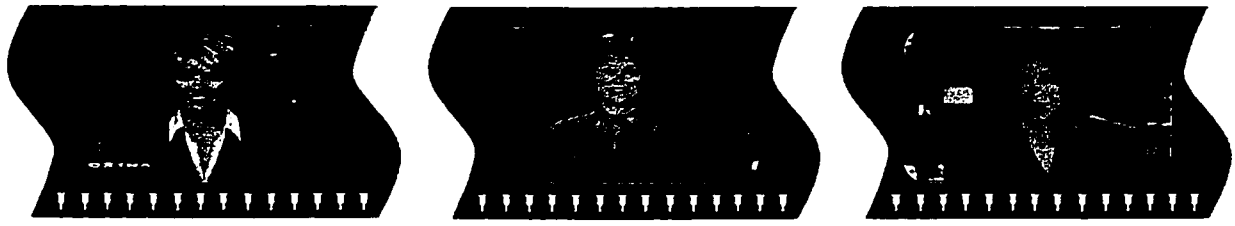


Figure 24
APPEARANCE AND CREDIBILITY
From tabloid television, to current affairs programs, to CNN, short-haired (as opposed to long-haired) female journalists are used as a means to increase communicator credibility.

Delivery of narration. The subjects who participated in this study are highly dynamic, hence the need to consider both the tempo and pitch of the delivery. The narrator should talk using a moderately fast pace, since a person who can speak at quick rates with few or no disfluencies in the stream of speech may seem more sure of what they are saying. As such s/he appears more confident, competent, and credible. The speech must flow continuously, without any utters, hesitation, or repetitions. Otherwise, the narrator's inability to properly articulate will decrease his/her perceived competence, intelligence, and expertise. In order to clarify and accentuate key points, an increase in pitch would also be necessary to avoid monotonous passages. If the narrator is to convey a sense of immediacy, s/he must make use of pronouns such as "we" and "us," for the use of personal language is of relative importance because of its ability to stimulate human interest on the part of the learner (Keller & Burkman, 1993).

The students themselves are generally insecure and in need of constant support, yet they describe themselves as being confident individuals. They are skeptical, so their insecurities should not be played upon. Instead, the narrator must come across as a humanitarian: An individual who is sensitive and understands them and their priorities (i.e., becoming media producers), as well as one who is willing to motivate them, and help them get through the rigors of their courses.

In order to convey a sense of immediacy, instructional television programs should be made with an eye–level camera, since speakers with more eye contact are viewed as more persuasive, truthful, immediate, and credible (Mehrabian, 1969; Mehrabian & Williams, 1969; Jayasinghe et al., 1997). Furthermore, at the exception of the establishing

and closing long shots, efforts should be made to shoot the narrator from an objective point of view. The selective use of medium shots will not only enable the narrator to establish his/her presence on screen, but most importantly, heavy viewers of content light television programs will be less inclined to attend to meaningless details (i.e., narrator's facial features).

The meaning of a visual message is often ambiguous and subject to personal interpretation. As a result, producers of sitcoms ensure that their audiences' attention is drawn to the pertinent verbal information by means of an explicit cue. Therefore, if the final meaning the content light group assigns to television images are highly influenced by their expectations, efforts should be made to incorporate a cue which will gain, as well as direct their attention efficiently towards the specific elements which are to be learned. In this case, short cryptic sentences composed of guiding terms (i.e., here and next) should be used to direct their attention. Here, the use of such an explicit cueing device "does not provide additional information to students but functions primarily to ensure that the intended instructional stimuli are emphasized in such a way so that they will be perceived among all stimuli in the student's total perception" (Dwyer, 1978, p. 160).

Reinforcement. The results from the attitudinal survey (Table 9) provide additional evidence attesting to the content light group's detraction from the program's narrative component: They were overwhelmed by the program's apparent quick pace, density of information, and perceived prominence of the visual effects. In view of the content light group's lack of watching television programs which require more intense and higher

levels of concentration, they have yet to adapt to the volume and complexity of information being presented to them. Therefore, key points should be reinforced by means of embedded questions and repetition.

Embedded questions. Embedded questions should be selectively integrated within instructional video programs to reinforce key concepts, and to make students evaluate their comprehension where they may not have done so on their own (Lofald & Pajares, 1993). In this case, well designed integrative questions might be effective in improving both high–level learning as well as the acquisition of simple declarative knowledge, since such questions encourage more complex processing of instruction, and often serve as subsumers of supporting lesson detail (Glover, Plake, & Zimmer, 1983).

If a learner is exposed to a question prior to reading the relevant text, efforts will be made only to seek the information which pertains to that specific question (Hannafin & Hooper, 1993). This process of selective recall is denotative of the target population's need of an explicit cue to direct them toward the specific elements which they need to know. Considering that chronic viewers of sitcoms are conditioned to store specific bits of information when an explicit cue is present, it was anticipated that the content light group would encounter some difficulty in adapting their skills to a situation that uses less discernible strategies. As noted earlier, an on–screen narrator should act as a visual cue that will stress, as well as guide the viewer to the pertinent details. In turn, this tactic may stimulate content light television viewers to remember more, and apply their knowledge in a greater variety of circumstances.

Embedded questions can be equally used to stimulate curiosity. In regards to the theory of epistemic curiosity, if the answer to a question is presented after it has been posed, it is anticipated that the learner will be motivated to rehearse the response because of its apparent rewarding effects of reducing conflict (Day, 1969; Zillmann & Cantor, 1973). As a motivational concept, epistemic curiosity provides the means by which conceptual conflict is both aroused and reduced by symbolic processes, and is the type of exploration which can lead to learning or permanent storage of information (Berlyne, 1978). In other words, the stimulation of curiosity behaviors enhance the acquisition of knowledge and the development of cognitive structures (Berlyne, 1960, 1967, 1978; Day, 1969; Charlesworth, 1969; Kirkland, 1976; Boykin & Harackiewicz, 1981). Thus, extrinsically, knowledge is prized for the contribution it makes toward the attainment of a practical goal; intrinsically, knowledge is satisfying in itself and for its power to reduce conflict.

Repetition. Finally, reinforcement can also be achieved by means of repetition: a strategy analogous to their behaviorist learning patterns. Hoban and van Ormer (1970) point out that instructional materials should be organized in such a manner that important concepts are repeated to yield increased learning. Considering that these individuals appear to process televised information primarily from the visual channel, a visual approach, such as repeating images, is recommended. As reported earlier, the scores from the visual retention test (Table 11) indicate that the content light group's performance was superior in situations containing familiar scenes, such as the repeated images used to illustrate the relationship between a field and a frame (e.g., Appendix A, scene 11). Therefore, if

cognitive engagement is influenced by the degree to which prior knowledge exists to support the encoding of new knowledge, then the stimulation of previously stored information is essential for learning to occur, particularly if the content may be completely learned if it is presented two or more times in identical or varied forms. This theory is consistent with Anderson's (1983) findings regarding declarative and procedural memory systems. According to his theory of cognitive architecture, procedural knowledge provides the means for transposing knowledge into cognitive or concrete actions. By repeatedly interpreting the same declarative knowledge, facts (declarative knowledge) and procedures (procedural knowledge) are combined. Thus, procedural memory can assimilate new knowledge only when this information is already declaratively existent.

In short, these are a few general recommendations needed to promote an active learning environment. However, if effective learning is to occur, other factors, such as the program's length (i.e., the amount of information that can be presented effectively within a given period of time), and complexity of the subject matter (i.e., idea density) must be considered. Likewise, the three most important functions or purposes television programs serve must be maintained: to explore the issue, present it, and reach a targeted audience.

Conclusion

The findings of the present research provide some evidence indicating that heavy viewing of content light television programs affects an individual's comprehension and recall of events presented in a documentary. Furthermore, this study also suggests that properly executed televised instruction—in terms of the careful selection of visuals and learning strategies—can motivate students, and provide them with personally relevant training which will aid them in their future applications, both academically and professionally.

However, the results obtained from this study should be regarded as a first step towards an understanding of the viability of television production techniques versus instructional design factors as learning strategies. This is of particular importance, for, as mentioned earlier, an individual's inability to interpret or make sense of a particular television stimulus might lead to frustration, hence contribute to his/her indifference to learn. Thus, a thorough longitudinal study investigating the independent effects of each of the proposed strategies should be executed in the developmental stages of any new programs. In addition, to gain further insight into the relationship between the compositional aspects governing the medium of television (i.e., lighting, staging, editing, and sound) and instructional design strategies, we must equally develop an understanding of the perceptual and cognitive effects associated with these production elements. As Metallinos (1996) points out:

> As the brain receives visual and auditory codes and transforms them into cognitive structures, numerous special image and sound television technologies such as character generators, computerized graphics, television switcher effects, sound or music synthesizers, and sound effects generators, receive images and sounds and further manipulate them to create imaginative and unusual sounds and images that often go beyond the original ones, distorting and exaggerating reality or even creating a new, virtual reality. (p. 83)

What are the implications of this new found virtual reality? And how will this affect the storage and retrieval of newly acquired information? There's no doubt that these questions warrant empirical investigation.

Again, perhaps the most important implication of this study may be the establishment of a new direction for media research: One that would attempt to examine the interplay between the formal features of the television medium and instructional design factors, thus enabling us to pinpoint the optimal level of stimulus complexity which will contribute to maximum recall. However, if meaningful results are to be generated from forthcoming research, a constructivist approach is needed to compensate for the shortcomings of cognitive theories.

Research stemming from the ways in which we view newspaper photos, reveals that the content, size, and placement of images on a page are more critical factors than whether or not the illustrations are presented in color (Lester, 1995). To this effect,

Lester (1995) criticizes the Gestalt approach for "describing perceptions rather than giving explanations of how these perceptions actually give meaning to an image... [as] the viewer constructs the scene with short-lived eye fixations that the mind combines into a whole picture" (p. 58). In other words, to the Gestaltist (or cognitivist) internal processing is of importance only to the extent it explains how external reality is understood. Thus, Gestalt theories fall short for they are solely concerned with the past experiences and body of knowledge which exist in long term store, and neglect the process by which visual information is scanned (Lester, 1995).

The constructivist, on the other hand, sees reality as determined by the experiences of the learner. Specifically, these theorists view the mind as a builder of symbols, which are the tools used to represent the learner's reality, and affirm that personal experiences determine reality—not the other way around (Cooper, 1993). Therefore, if reality is personally constructed, television viewers will scan an image based on their previous experiences and current interests, seeing certain parts of an image while ignoring others. As such, further insight into the ways we learn from, and interpret moving images, will only be possible by adopting a holistic (constructivist) approach.

In conclusion, we are continuously overwhelmed by countless visual stimuli, and selectively we add them to our mental repertoire. From our past experiences and knowledge, we create meaning, and thus have better chances of recalling information. However, when television programs are brought into the classroom, the learning experience should be one that is beneficial to all. Therefore, if we are to bridge the learning gap between content light

and heavy television viewers, producers of documentary programs, in general, and instructional television programs, in particular, should design their materials to reflect the learning characteristics of their audiences; to accommodate the individual by tailoring instruction to his/her needs—not to win an art award. Otherwise, these supposedly valuable instructional tools will continue to be regarded as amusing and leisurely forms of entertainment.

REFERENCES

Adler, M. J. (1978). Books, television, and learning. In J. Y. Cole (Ed.), *Television, the book, and the classroom* (pp. 15–25). Washington: Library of Congress.

Alesandrini, K. L. (1982). Imagery–eliciting strategies and meaningful learning. *Journal of Mental Imagery, 6,* 125–140.

Allen, D. I. (1970). Some effects of advance organizers and level of question on the learning and retention of written social studies material. *Journal of Educational Psychology, 61,* 333–339.

Anderson, D. R., & Lorch, E. P. (1983). Looking at television: Action or reaction? In J. Bryant & D. R. Anderson (Eds.), *Children's understanding of television: Research on attention and comprehension* (pp. 1–32). New York: Academic Press Inc.

Anderson, J. R. (1978). Arguments concerning representations for mental imagery. *Psychological Review, 85,* 249–277.

Anderson, J. R. (1983). *The architecture of cognition.* Cambridge, MA: Harvard University Press.

Atwood, G. (1971). An experimental study of visual imagination and memory. *Cognitive Psychology, 2,* 290–299.

Ausubel, D. P. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology, 51,* 267–272.

Ausubel, D. P. (1968). *Educational psychology: A cognitive view.* New York: Holt, Rinehart & Winston Inc.

Ausubel, D. P., & Fitzgerald, D. (1961). The role of discriminability in meaningful verbal learning and retention. *Journal of Educational Psychology, 52,* 266–274.

Ausubel, D. P., & Fitzgerald, D. (1962). Organizer, general background, and antecedent learning variables in sequential verbal learning. *Journal of Educational Psychology, 53,* 243–249.

Ausubel, D. P., Novak, J. D., & Hanesian, H. (1978). *Educational psychology: A cognitive view* (2nd ed.). New York: Holt, Rinehart and Winston.

Ausubel, D. P., & Youssef, M. (1963). Role of discriminability in meaningful paralleled learning. *Journal of Educational Psychology, 54,* 331–336.

Ball, S., Palmer, P., & Millward, E. (1986). Television and its educational impact: A reconsideration. In J. Bryant & D. Zillmann (Eds.), *Perspectives on media effects* (pp. 129–142). Hillsdale, NJ: Lawrence Erlbaum Associates.

Baron, G., & Cautela, J. R. (1983–84). Imagery assessment with normal and special needs children. *Imagination, Cognition, and Personality, 3,* 17–30.

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

Bergfeld, V. A., Choate, L. S., & Kroll, N. E. (1982). The effect of bizarre imagery on memory as a function of delay: Reconfirmation of interaction effect. *Journal of Mental Imagery, 6*, 141–158.

Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. New York: McGraw Hill.

Berlyne, D. E. (1967). Arousal and reinforcement. In D. Levine (Ed.), *Nebraska symposium on motivation* (pp. 1–110). Lincoln, NE: University of Nebraska Press.

Berlyne, D. E. (1978). Curiosity and learning. *Motivation and Emotion, 2*, 97–175.

Bolls, P., Potter, R., & Lang, A. (1996). Television arousal and memory: The effects of production pacing and arousing content on encoding, storage and retrieval of television messages. In N M. Gasser (Ed.), *Online proceeding of the 1996 Midwest Artificial Intelligence and Cognitive Science Conference*. [Online] http://www.cs.indiana.edu/event/maics96/Proceedings/Bolls/bolls.html.

Bower, G. H. (1970). Imagery as a relational organizer in associative learning. *Journal of Verbal Learning and Verbal Behavior, 9*, 529–533.

Bower, G. H., & Karlin, M. B. (1974). Depth of processing: Pictures of faces and recognition memory. *Journal of Experimental Psychology, 103*, 751–757.

Boykin, A. D., & Harackiewicz, J. (1981). Epistemic curiosity and incidental recognition in relation to degree of uncertainty: Some general trends and inter–subject differences. *British Journal of Psychology, 72,* 65–72.

Brock, D., & Goldstein, J. (1985). Sources and kinds of television courses available in the United States. In R. L. Hilliard (Ed.), *Television and adult education* (pp. 113–119). Cambridge, MA: Schenkman Books.

Brooks, L. R. (1967). The suppression of visualization in reading. *Quarterly Journal of Experimental Psychology, 19,* 289–299.

Burling, J. (1992). *The effective use of video in the classroom.* Cambridge, MA: Harvard Graduate School of Education.

Calder, B. J. (1978). Cognitive response, imagery, and scripts: What is the cognitive basis of attitude? In K. Hunt (Ed.), *Advances in Consumer Research* (Vol. V, pp. 630–634). Atlanta: Association for Consumer Research.

Calvert, S. L. (1999). The form of thought. In I. E. Sigel (Ed.), *Development of mental representation: Theories and applications* (pp. 453–470). Mahwah, NJ: Lawrence Erlbaum Associates.

Calvert, S. L., & Scott, M. C. (1989). Sound effects for children's temporal integration of fast–paced television content. *Journal of Broadcasting and Electronic Media, 33,* 233–246.

Canelos, J. J., & Taylor, W. D. (1981). A networking information processing strategy and the learning of field dependents receiving visual instructional information. *Journal of Experimental Education, 50,* 42–46.

Charlesworth, W. R. (1969). The role of surprise in cognitive development. In D. Elkind & J. H. Flavell (Eds.), *Studies in cognitive development* (pp. 257–314). New York: Oxford University Press.

Christ, W. (1985). The construct of arousal in communication research. *Human Communication Research, 11,* 575–592.

Chu, G. C., & Schramm, W. (1967). *Learning from television: What the research says.* Washington, DC: National Association of Educational Broadcasters.

Chute, A. G. (1979). Analysis of the instructional functions of color and monochrome cueing in media presentations. *Educational Communication and Technology Journal, 27,* 251–263.

Clarke, B. (1974). *Graphic design in educational television.* New York: Watson–Guptill Publications.

Coldevin, G. O. (1981, May). Experimental research in television message design: Implications for ETV. *Programmed Learning and Educational Technology, 18* (2), 86–99.

Compton, N. H. (1962). Personal attributes of color and design preferences in clothing fabrics. *Journal of Psychology, 54,* 191–195.

Corporation for Public Broadcasting. (1991). *Summary report of the study of school uses of television and video.* Washington, DC: Corporation for Public Broadcasting.

Craik, F. I. M., & Lockhart, P. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Visual Behavior, 11,* 671–684.

Day, H. I. (1969, February 10). *A progress report on the development of a test of curiosity.* Paper presented at the National Seminar on Adult Education Research, Toronto, ON.

Driscoll, M. P. (1994). *Psychology of learning for instruction.* Needham Heights, MA: Allyn & Bacon.

Dwyer, F. M. (1978). *Strategies for improved visual learning.* State Collage, PA: Learning Services.

Elliot, L. (1973). Imagery versus repetition encoding in short term and long term memory. *Journal of Experimental Psychology, 100,* 270–276.

Enzle, M. E., Hansen, R. D., & Lowe, C. A. (1975). Humanizing the mixed–motive paradigm: Methodological implications from attribution theory. *Simulation and Games, 6,* 151–165.

Ertmer, P. A., & Newby, T. J. (1994). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 6* (4), 50–72.

Festinger, L. (1953). Informal social communication. In D. Cartright & A. Zander (Eds.), *Group dynamics*. Evanston: Row, Peterson and Co.

Fullerton, B. J. (1956). The comparative effects of color versus black and white guidance films employed with and without 'anticipatory' remarks upon acquisition and retention of factual information. *Dissertation Abstracts, 16,* 1413.

Gagné, R. M. (1977). *The conditions of learning*. (3rd ed.). New York: Holt, Rinehart, and Winston.

Gagné, R. M. (1978, March). *Content as related to requirements of instructional design*. Paper presented at the Annual Meeting of the American Educational Research Association, Toronto, ON.

Galin, D. (1976). Educating both halves of the brain. *Childhood Education, 53,* 17–20.

Galin, D., & Ornstein, R. (1972). Lateral specialization of cognitive mode: An EEG study. *Psychophysiology, 9,* 412–418.

Gehr, R. (1983). The MTV aesthetic. *Film Comment, 19* (4), pp. 37, 39–40.

Gerard, R. (1964). Psychosynthesis: A psychotherapy for the whole man. *The Psychosynthesis Research Foundation Report,* 14.

Gerbner, G., & Gross, L. (1979). Living with television: The violence profile. In H. Newcomb (Ed.), *Television: The critical view* (2nd ed.). New York: Oxford University Press.

Gerbner, G., Gross, L., & Melody, W. H. (1973). *Communication technology and social policy.* New York: Wiley.

Geske, J. (1992, August 5–8). *Teaching creativity for right brain and left brain thinkers.* Paper presented at the Annual Meeting of the Association for Education in Journalism and Mass Communication, Montreal, QC.

Giannetti, L. D (1982). *Understanding movies.* Englewood Cliffs, NJ: Prentice–Hall.

Gibson, J. J. (1966). *The senses considered as perceptual systems.* Boston: Houghton Mifflin.

Gibson, J. J. (1979). *The ecological approach to visual perception.* Boston: Houghton Mifflin.

Giltin, T. (1982) Prime time ideology. The hegemonic process in television entertainment. In H. Newcomb (Ed.), *Television: The critical view* (3rd ed., pp. 426–453). New York: Oxford University Press.

Glover, J. A., Plake, B. S., & Zimmer, J. W. (1983). Distinctiveness of encoding and memory for learning tasks. *Journal of Educational Psychology, 74,* 189–198.

Goetz, E. T., & Sadoski, M. (1996). Imaginative processes in literary comprehension: Bringing the text to life. In R. J. Kreuz & M. S. MacNealy (Eds.), *Empirical approaches to literature and aesthetics: Advances in discourse processes* (Vol. 52, pp. 221–240). Norwood, NJ: Ablex Publishing Corporation.

Good, T. L., & Brophy, J. E. (1990). *Educational psychology: A realistic approach* (4th ed.). White Plains, NY: Longman.

Griffith, D., & Johnson, W. A. (1973). An information processing analysis of visual imagery. *Journal of Experimental Psychology, 100,* 141–146.

Guba, E., Wolf, W., de Grot, S., Knemeyer, M., Van Atta, R., & Light, L. (1961). Eye movements and TV viewing in children. *AV Communication Review, 9,* 24–43.

Gupta, S. K. (1988). Artificial memory: Prospects of memory training in education. *Indian Journal of Applied Psychology, 25,* 54–59.

Hannafin, M. J., & Hooper, S. R. (1993). Learning principles. In M. Fleming & W. H. Levie (Eds.), *Instructional message design: Principles from the behavioral and cognitive sciences* (2nd ed., pp. 191–232). Englewood Cliffs, NJ: Educational Technology Publications.

Healy, A. F., Fendrich, D. W., Crutcher, R. J., Wittman, W. T., Gesi, A. T., Ericsson, K. A., Bourne, L. E. Jr. (1992). The long term retention of skills. In A. F. Healy, S. M. Kosslyn, & R. M. Shiffrin (Eds.), *From learning processes to cognitive processes: Essays in honor of William K. Estes* (Vol. 2, pp. 87–118). Hillsdale, NJ: Lawrence Erlbaum Associates.

Harth, E. (1990). *Dawn of a millennium: Beyond evolution and culture.* Boston: Little, Brown & Company.

Holcomb, P. J., Kounios, J., Anderson, J. E., & West, W. C. (1999). Dual coding, context availability, and concreteness effects in sentence comprehension: An electrophysiological investigation. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 25,* 721–742.

Hunt, E. B. (1962). *Concept learning.* New York: Wiley.

James, J. W. (1989). *Effects of imposed visuals and instructions to image on immediate recall in students of varying ages and cognitive styles.* Virginia Polytechnic Institute and State University: Blacksburg, Virginia.

Jayasinghe, M. G., Morrison, G. R., & Ross, S. M. (1997). The effect of distance learning classroom design on student perceptions. *Educational Technology Research & Development, 45* (4), 5–19.

Johnson, J., & Ettema, J. S. (1986). Using television to best advantage: Research for prosocial television. In J. Bryant & D. Zillmann (Eds.), *Perspectives on media effects* (pp. 143–164). Hillsdale, NJ: Lawrence Erlbaum Associates.

Johnson, M. K., & Raye, C. (1981). Reality monitoring. *Psychological Review, 88,* 67–85.

Jonassen, D., & Hawk, P. (1984). Using graphic organizers in instruction. *Information Design Journal, 4,* 58–68.

Joseph, J. H. (1987, February 26–March 1). *Field dependence/independence and the mathemagenic effect of observable visual imagery rehearsal for learning from computer presented text.* Paper presented at the annual conference of the Association of Educational Communications and Technology, Atlanta, GA.

Kahneman, D. (1975). *Attention and effort.* Englewood Cliffs, NJ: Prentice–Hall.

Kanner, J. H., & Rosenstein, A. J. (1961). Television in army training: Color versus black and white. *AV Communication Review, 9,* 44–49.

Kaplan, E. A. (1987). *Rocking around the clock.* New York: Methuen.

Keenan, J. M., & Moore, R. E. (1979). Memory for images of concealed objects: A reexamination of Neisser and Kerr. *Journal of Experimental Psychology: Human Learning and Memory, 5,* 374–385.

Keller, J. M. (1987a). Development and use of the ARCS model of motivational design. *Journal of Instructional Development, 10* (3), 2–10.

Keller, J. M. (1987b). The systematic process of motivational design. *Performance & Instruction, 26* (9), 1–8.

Keller, J. M., & Burkman, E. (1993). Motivation principles. In M. Fleming & W. H. Levie (Eds.), *Instructional message design: Principles from the behavioral and cognitive sciences* (2nd ed., pp. 3–49). Englewood Cliffs, NJ: Educational Technology Publications.

Kieras, D. (1978). Beyond pictures an words: Alternative information processing models for imagery effects in verbal memory. *Psychological Bulletin, 85,* 532–554.

Kirkland, J. (1976). Epistemic curiosity and cartoon preference. *Psychological Reports, 38,* 354.

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

Kounios, J., & Holcomb, P. J. (1994). Concreteness effects in semantic processing: ERP evidence supporting dual coding theory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20,* 804–823.

Lamberski, R. J. (1980, April 21–24). *A comprehensive and critical review of the methodology and finds in color investigations.* Paper presented at the Annual Convention of the Association for Educational Communications and Technology, Denver, CO.

Lang, A., Dhillon, K., & Dong, Q. (1995). The effects of emotional arousal and valence on television viewers' cognitive capacity and memory. *Journal of Broadcasting and Electronic Media, 39,* 313–327.

Lang, P., Bradley, M., & Cuthbert, B. N. (1997). Motivated attention: Affect, activation, and action. In P. Lang, R. Simons, & M. Balaban (Eds.), *Attention and orienting: Sensory and motivational processes.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Langer, E. J., Blank, A., & Chanowitz, B. (1978). The mindlessness of ostensibly of thoughtful action: The role of "placebic" information in interpersonal interaction. *Journal of Personality and Social Psychology, 36,* 635–642.

Lester, P. M. (1995). *Visual communication: Images with messages.* Belmont, CA: Wadsworth.

Levin, J. R., & Divine Hawkins, P. (1974). Visual imagery as a prose–learning process. *Journal of Reading Behavior, 6,* 23–30.

Levin, J. R., & Lesgold, A. M. (1978). On pictures and prose. *Educational Communication and Technology Journal, 26,* 233–243.

Lofald, D. R., & Pajares, M. F. (1993, April 12–16). *The effect of embedded questions on readers' calibration of test readiness.* Paper presented at the Annual Meeting of the American Educational Research Association, Atlanta, GA.

Lorayne, H., & Lucas, J. (1974). *The memory book.* New York: Stein and Day Publishers.

Mandell, L. M., & Shaw, D. L. (1973). Judging people in the news—unconsciously: Effect of camera angle and bodily activity. *Journal of Broadcasting, 17,* 353–362.

Marschark, M., & Hunt, R. R. (1989). A reexamination of the role of imagery in learning and memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 15,* 710–720.

Marschark, M., & Paivio, A. (1977). Integrative processing of concrete and abstract sentences. *Journal of Verbal Learning and Verbal Behavior, 16,* 217–231.

Marschark, M., Richman, C. L., Yuille, J. C., & Hunt, R. R. (1987). The role of imagery in memory: On shared and distinctive information. *Psychological Bulletin, 102,* 28–41.

Mayer, R. E. (1979). Twenty years of research on advance organizers: Assimilation theory is still the best predictor of results. *Instructional Science, 8,* 133–167.

Mayer, R. E., & Anderson, R. B. (1991). Animations need narrations: An experimental test of a dual–coding hypothesis. *Journal of Educational Psychology, 83,* 484–490.

McCain, T. A., Chilberg, J., & Wakshlag, J. J. (1977). The effect of camera angle on source credibility and attraction. *Journal of Broadcasting, 21,* 35–46.

McCroskey, J. C., & McCain, T. A. (1974). The measurement of interpersonal attraction. *Speech Monographs, 41,* 261–266.

McDonald, F. J. (1961). Motivation and the communication process. *AV Communication Review, 9* (5), 57–67.

McIntyre, C. J. (1965). Applying learning theory to television instruction. *NAEB Journal, 24* (6), 54–63.

Mehrabian, A. (1969). *Nonverbal communication.* Chicago: Aldine–Atherton.

Mehrabian, A., & Williams, M. (1969). Nonverbal concomitants of perceived and intended persuasiveness. *Journal of Personality and Social Psychology, 13,* 37–58.

Messick, S. (1984). The nature of cognitive styles: Problems and promise in educational practice. *Educational Psychologist, 19,* 59–74.

Metallinos, N. (1996). *Television aesthetics: Perceptual, cognitive, and compositional bases.* Mahwah, NJ: Lawrence Erlbaum Associates.

Mielke, K. W., & Chen, M. (1983). Formative research for 3–2–1 Contact: Methods and insights. In M. J. A. Howe (Ed.), *Learning from television: Psychological and educational research* (pp. 42–54). London: Academic Press.

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review, 63,* 81–97.

Millerson, G. (1990). *The technique of television production* (12th ed.). London: Focal Press.

Moore, D. W., & Readance, J. E. (1984). A quantitative and qualitative review of graphic organizer research. *Journal of Educational Research, 78,* 11–17.

Mount, R. T., Mount, J. M., & Toplin., A. Z. (1988). The videocassette challenge: Strategies for the foreign language teacher. In B. T. Fryer & F. W. Medley Jr., (Eds.), *New challenges and opportunities. Dimension: Languages '87. Report of the southern conference on language teaching* (pp. 145–159). South Carolina: Defense Language Institute.

Nappe, G. W., & Wollen, K. A. (1973). Effects of instructions to form common and bizarre mental images on retention. *Journal of Experimental Psychology, 100,* 6–8.

Nebes, R. D. (1974). Hemispheric specialization in commissurotomized man. *Psychological Bulletin, 81,* 1–14.

Neisser, U., & Kerr, N. H. (1973). Spatial and mnemonic properties of visual images. *Cognitive Psychology, 5,* 138–150.

Neisser, U., & Kerr, N. H. (1983). Mental images of concealed objects: New evidence. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 9,* 212–230.

Nelson, D. L., & Schreiber, T. A. (1992). Word concreteness and word structure as independent determinants of recall. *Journal of Memory and Language, 31,* 231–260.

Nevitt, B. (1980–81). Visible and invisible bias media. *Canadian Journal of Communication, 7,* 9–42.

Nichols, B. (1991). *Representing reality: Issues and concepts in documentary.* Bloomington: Indiana University Press.

Orey, M. A., Okey, J. R., Jones, M. G., & Stanley, L. S. (1991, February 13–17). *Integrating cognitive theory into Gagné's instructional events.* Proceedings of Selected Research Paper Presentations at the Convention of the Association for Educational Communications and Technology, Orlando, FL.

Paivio, A. (1971). *Imagery and verbal processing.* New York: Holt Rinehart and Winston.

Paivio, A. (1986). *Mental representations: A dual coding approach.* New York: Oxford University Press.

Paivio, A. (1991). *Images in mind: The evolution of a theory.* New York: Simon & Schuster.

Paivio, A., & Csapo, K. (1973). Picture superiority in free recall: Imagery or dual coding? *Cognitive Psychology, 5,* 176–206.

Paivio, A., & Madigan, S. A. (1968). Imagery and association value in paired–associate learning. *Journal of Experimental Psychology, 76,* 35–39.

Paivio, A., Walsh, M., & Bons, T. (1994). Concreteness effects on memory: When and why? *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20,* 1196–1204.

Paivio, A., & Yarmey, A. D. (1966). Pictures versus words as stimuli and responses in paired–associate learning. *Psychonomic Science, 5* (6), 235–236.

Paivio, A., & Yullie, J. C. (1969). Changes in associative strategies and paired associate learning over trials as a function of work imagery and type of learning set. *Journal of Experimental Psychology, 79,* 458–463.

Paivio, A., Yuille, J. C., & Madigan, S. A. (1968). Concreteness, imagery, and meaningfulness values for 925 nouns. *Journal of Experimental Psychology, 76,* 1–25.

Perse, E. M. (1996). Sensation seeking and the use of television for arousal. *Communication Reports, 9,* 37–48.

Pines, M. (1986). Landscapes of the mind. In R. M. Poole (Ed.), *The incredible machine* (pp. 325–377). Washington, DC: National Geographic Society.

Pittman, R. (1985, May). MTV's lesson: We want what we want when we want immediately. *Adweek,* pp. 34, 36.

Powell, G. (1980, December 3–6). *A meta–analysis of the effects of "imposed" and "induced" imagery upon word recall.* Paper presented at the 30th Annual Meeting of the National Reading Conference, San Diego, CA.

Pressley, M. (1977). Children's use of the keyword method to learn simple Spanish vocabulary words. *Journal of Educational Psychology, 69,* 465–472.

Pressley, M., Cariglia–Bull, S. D., & Schneider, W. (1987). Short–term memory, verbal competence, and age as predictors of imagery instructional effectiveness. *Journal of Experimental Child Psychology, 43,* 194–211.

Pressley, M., Levin, J. R., & Delaney, H. D. (1982). The mnemonic keyword method. *Review of Educational Research, 52,* 61–91.

Price, M. A. (1991). Designing video classrooms. *Adult Learning, 2* (4), 15–19.

Pylyshyn, Z. W. (1973). What the mind's eye tells the mind's brain: A critique of mental imagery. *Psychological Bulletin, 80,* 1–24.

Rasco, R. V., Tennyson, R. D., & Boutwell, R. C. (1975). Imagery instructions and drawings in learning prose. *Journal of Educational Psychology, 67,* 188–192.

Reardon, L. B. (1987). *The effects of presentation mode and cognitive style on immediate recall of map information.* Virginia Polytechnic Institute and State University: Blacksburg, VA.

Reich, C., & Meisner, A. (1976). A comparison of color and black and white television as instructional media. *British Journal of Educational Technology,* 2 (7), 24–35.

Richardson, A. (1969). *Mental imagery.* New York: Springer.

Richardson, A. (1977). Verbalizer–visualizer: A cognitive style dimension. *Journal of Mental Imagery, 1,* 109–126.

Riding, R. J., & Ashmore, J. (1980). Verbalizer–imager learning style and children's recall of information presented in pictorial versus written form. *Educational Studies, 6,* 141–147.

Riding, R. J., Burton., D., Rees, G., & Sharratt, M. (1995). Cognitive style and personality in 12–year–old children. *British Journal of Educational Psychology, 65,* 113–124.

Riding, R. J., & Douglas, G. (1993). The effect of cognitive style and mode of presentation on learning performance. *British Journal of Educational Psychology, 63*, 297–307.

Riding, R. J., Glass, A., & Douglas, G. (1993). Individual differences in thinking: Cognitive and neurophysiological perspectives. *Educational Psychology, 13*, 267–279.

Rutherford, R. B., Casey, R. J., Hasterok, G. S., & Howell, K. (1979). Function of color in learning an assembly task by learning disabled adolescents. *Perceptual and Motor Skills, 48*, 1195–1198.

Sackheim, H. A., Greenberg, M. S., Weiman, A. L., Gur, R. C., Hungerbuhler, J. P., & Geschwind, N. (1984). Hemispheric asymmetry in the expression of positive and negative emotions: Neurological evidence. *Archives of Neurology, 39*, 210–218.

Sadoski, M., Goetz, E. T., & Fritz, J. B. (1993a). A causal model of sentence recall: Effects of familiarity, concreteness, comprehensibility, and interestingness. *Journal of Reading Behavior, 25*, 5–16.

Sadoski, M., Goetz, E. T., & Fritz, J. B. (1993b). Impact of concreteness on comprehensibility, interest, and memory for text: Implications for dual coding theory and text design. *Journal of Educational Psychology, 85*, 291–304.

Sadoski, M., Kealy, W. A., Goetz, E. T., & Paivio, A. (1997). Concreteness and imagery effects in the written composition of definitions. *Journal of Educational Psychology, 89*, 518–526.

Saleh, A., & Iran–Nejad, A. (1995, November 8–10). *Wholetheme constructivism and whole–brain education: Educational implications of the research on left and right brain hemispheres.* Paper presented at the Annual Meeting of the Mid–South Educational Research Association, Biloxi, MS.

Salomon, G. (1972). Can we affect cognitive skills through visual media? A hypothesis and initial findings. *AV Communication Review, 20,* 401–422.

Salomon, G. (1977). Effects of encouraging Israeli mothers to co–observe "Sesame Street" with their five–year–olds. *Child Development, 48,* 1146–1151.

Salomon, G. (1984). Television is "easy" and print is "tough": The differential investment of metal effort in learning as a function of perceptions and attributions. *Journal of Educational Psychology, 76,* 647–658.

Salomon, G. (1994). *Interaction of media, cognition, and learning.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Scanlon, T. J. (1970). Viewer's perception of color, black and white television: An experiment. *Journalism Quarterly, 47,* 366–368.

Schnell, T. R. (1973). The effect of organizers on reading comprehension of community college freshmen. *Journal of Reading Behavior, 5,* 169–176.

Schwanenflugel, P. J., & Shoben, E. J. (1983). Differential context effects in the comprehension of abstract and concrete verbal materials. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 9,* 82–102.

Schwanflugel, P. J., Akin, C., & Luh, W. (1992). Context availability and the recall of abstract and concrete words. *Memory and Cognition, 20,* 96–104.

Seels, B. (1989). Instructional design movement in educational technology. *Educational Technology, 29* (5), 11–15.

Seidman, S. A. (1981). On the contributions of music to media productions. *Educational Communication and Technology Journal, 29,* 49–61.

Shepard, J. R. (1967, November 7). *A comparative analysis of production techniques found in randomly selected commercial and educational programs.* Eugene: University of Oregon Institute for Community Studies, Educational Television Project, Preliminary Report.

Singer, J. (1980). The power and limitations of television: A cognitive–affective analysis. In P. J. Tannenbaum (Ed.), *The entertainment functions of television* (pp. 36–42). Hillsdale, NJ: Lawrence Erlbaum Associates.

Skinner, B. F. (1954). The science of learning and the art of teaching. *Harvard Educational Review, 24,* 86–97.

Tannenbaum, P. H., & Fosdick, J. A. (1960). The effect of light angle on the judgement of photographed subjects. *AV Communication Review, 8,* 253–262.

Thompson, A. D., Simonson, M. R., & Hargrave, C. P. (1996). *Educational technology: A review of the research* (2nd ed.). Washington, DC: Association for Educational Communication and Technology.

Thorndike, E. (1969). *Educational psychology*. New York: Arno Press.

Thornton, N. E., Bohlmeyer, E. M., Dickson, L. A., Kulhavy, R. W. (1990). Spontaneous and imposed study tactics in learning prose. *Journal of Experimental Education, 58,* 111–124.

Tiemens, R. K. (1970). Some relationships of camera angle in communicator credibility. *Journal of Broadcasting, 14,* 483–490.

Torrance, E. P., & Rockenstein, Z. L. (1987). Styles of thinking and creativity. *Gifted International, 4,* 37–49.

Torrence, D. R. (1985). How video can help. *Training and Development Journal, 39* (12), 50–51.

VandeMeer, A. W. (1954). *Relative effectiveness of color and black and white in instructional films.* (Contract # N6onr–269). Port Washington, NY: Department of the Navy, Office Naval Research, Special Device Center.

Watt, J. H., & Welch, A. J. (1983). Effects of static and dynamic complexity on children's attention and recall of televised information. In J. Bryant & D. R. Anderson (Eds.), *Children's understanding of television: Research on attention and comprehension* (pp. 69–102). New York: Academic Press Inc.

Williams, R. C. (1964–65). On the value of varying TV shots. *Journal of Broadcasting, 9,* 33–43.

Winn, W. (1993). Perception principles. In M. Fleming & W. H. Levie (Eds.), *Instructional message design: Principles from the behavioral and cognitive sciences* (2nd ed., pp. 55–119). Englewood Cliffs, NJ: Educational Technology Publications.

Witkin, H. A., & Goodenough, D. R. (1981). *Cognitive styles: Essence and origins.* New York: International Universities Press, Inc.

Wurtzel, A. H., & Dominick, J. R. (1971–72). An evaluation of television drama: An interaction of acting styles and shot selection. *Journal of Broadcasting, 16,* 103–110.

Zettl, H. (1990). *Sight, sound, motion: Applied media aesthetics* (2nd ed.). Belmont, CA: Wadsworth.

Zillmann, D. (1982). Television viewing and arousal. In D. Pearl, L. Bouthilet, & J. Lazar (Eds.), *Television and behavior: Ten years of scientific progress and implications for the eighties* (Vol. 2, pp. 53–67). Washington, DC: U.S. Department of Health and Human Services.

Zillmann, D., & Cantor, J. R. (1973). Induction of curiosity via rhetorical questions and its effects on the learning of factual materials. *British Journal of Educational Psychology, 43*, 172–180.

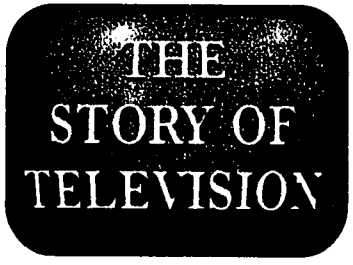
Zollo, P. (1995). *Wise up to teens: Insights into marketing and advertising to teenagers.* Ithaca, NY: New Strategist Publishing.

APPENDIX A

Pilot Program Script/ Storyboard

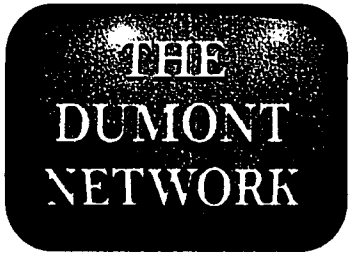
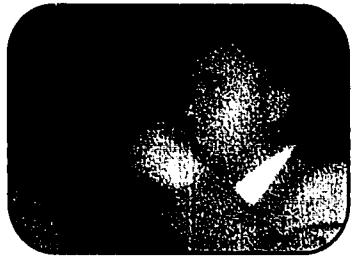
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
	Fade up from black.		10″		
1	Introduction to *Understanding: Television.*		45″	✓	
2	Close–up (CU) of a black and white television set. Fade in/out *THE STORY OF TELEVISION* super.		4″	✓	The story of television.

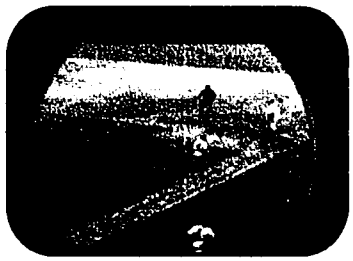
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
2	CU of a black and white television set. Fade in/out *THE DUMONT NETWORK* super.		4″	✓	Forty–five years ago, when there still was a Dumont Network,
2	Long shot (LS) of a baseball game shown on a CU of a black and white television set.		2″	✓	television was the new baby in the family.
2	Truck left to a medium shot (MS) of a man drinking in a bar.		2″	✓	*One day through television,*

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
2	Medium long shot (MLS) of a crowd of people on a busy street.		2″	✓	*the entire world*
2	CU of a man smoking a cigarette.		2″	✓	*will stream into our living rooms*
2	LS of a baseball game shown on a CU of a black and white television set.		2″	✓	*with a velocity of light.*

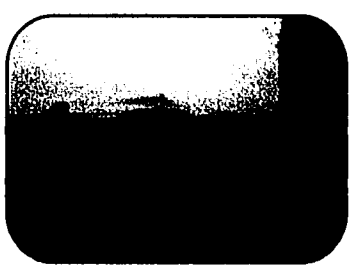
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
2	CU of a man smoking a pipe.		2″	✓	The announcement
2	MLS of people walking into a theater.		2″	✓	of its
2	MLS of a couple watching television while holding a baby.		5″	✓	birth had caused great excitement and curiosity.

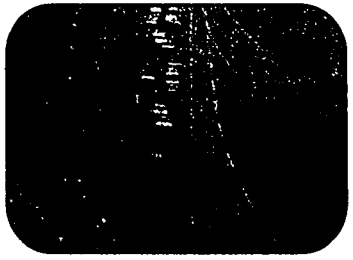
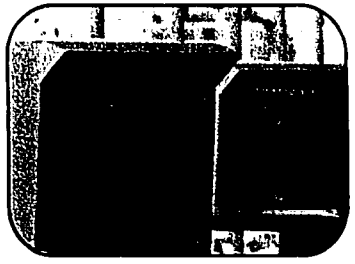
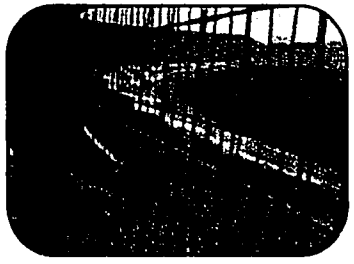
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
2	Mosaic wipe to a two–shot of people having dinner in a restaurant.		10″	✓	Today, television signals thread through our lives: A source of news;
2	Truck right along a row of television sets.		10″	✓	the nation's babysitter. We call it the boob tube but we line up on the couch with boobs from all over to watch the world go by.
3	LS of stock cars on the race track at the Daytona 500.		3″		

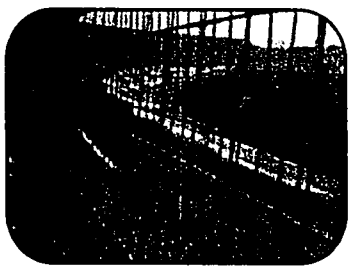
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
3	Extreme long shot (XLS) of stock cars on the Daytona 500 race track.		3″		
3	MS of monitors receiving the Daytona 500 telecast.		3″		Seeing is believing, we say.
3	LS of stock cars on the Dayton 500 race track.		3″		A picture is worth a thousand words.

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
3	XLS of stock cars on the Daytona 500 race track.		4″		Even when people leave the couch for a sporting event,
3	MLS of a man watching the Daytona 500 on his portable television set.		4″		they pack portables so they won't miss a moment.
3	LS of men watching the Daytona 500 on a television set.		3″		Somehow it seems more live when it says

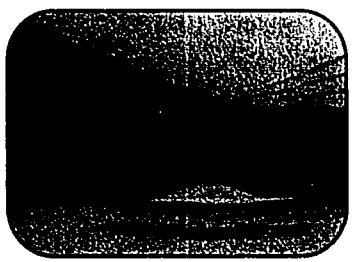
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
3	CU of a television set receiving the Daytona 500 telecast.		8″		live in the corner of the screen. *One of the most violent accidents that we've ever seen at the Daytona International Speedway. 7 or 8 times...*
3	Medium close-up (MCU) of a man watching the Daytona 500 on a television set.		2″		*He's crashed up.*
3	Cross-shot (XS) of a man watching the Daytona 500 on a television set.		3″		

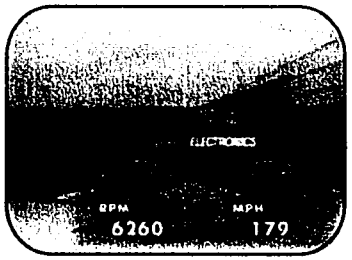
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
4	CU of a spectator watching the Daytona 500 from the bleachers.		2″		
4	MS of a stock car at the Daytona 500, as seen through the spectator's binoculars.		3″		And indeed television gives us views
4	LS taken from a stock car during the race.		3″		we couldn't get any other way:

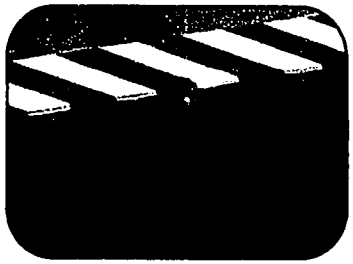
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
4	LS taken from a stock car during the race. Fade in tachometer and speedometer super.		3″		you ride inside the race car with the driver;
4	MS of a young spectator watching the Daytona 500 from the bleachers.		3″		you stand without flinching
4	MLS of stock cars on the Daytona 500 race track.		3″		as they hurdle towards you,

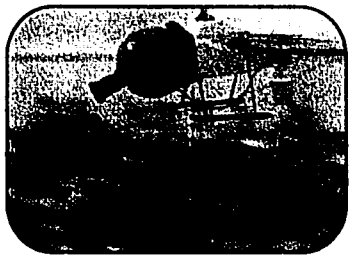
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
4	Extreme long shot (XLS) of the Daytona 500 race track.		5″		and without batting an eye, you float across the track free as a bird.
4	XLS of flying cam.		6″		It seems so easy, we forget that we are looking at a triumph of modern technology.
5	MS of the director in the director's booth on location at the Daytona 500.		3″		*Nice shot. Beautiful. Wait... Wait... Stay on this. Wait...*

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
5	Zoom–in to a MS of the director's booth on location at the Daytona 500.		3″		*Ready 10... and 10.*
5	LS of the Daytona 500 race track.		10″	✓	The triumph
5	MLS of flying cam.		6″	✓	in this particular case, looks like a five foot long metal mosquito.

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
5	XLS of the Daytona 500 race track and flying cam.		9″	✓	You are able to swoop across the field because someone built a remote control helicopter and stuffed a camera up its nose,
5	MS of a man holding a microwave antenna.		3″	✓	and because somebody else figured out how to transform light into electric signals,
5	LS of the director's booth on location at the Daytona 500.		4″	✓	and transmit those signals, and turn them back into light again.

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
5	MS of the director in the director's booth on location at the Daytona 500.		3″		*Take seven... Take seven! Trouble!*
5	LS of a car crash at the Daytona 500.		3″		
6	LS taken from a stock car during the race.		4″		To cover the annual Daytona 500 stock car race,

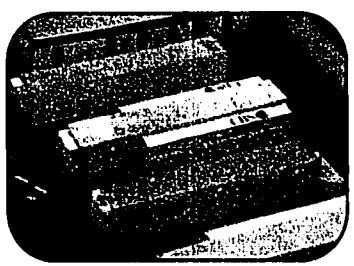
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
6	LS of the microwave antenna holder and flying cam's remote control operator.		3″		the CBS network has shipped in
6	LS of a cameraman at the Daytona 500.		3″		31 cameras,
6	MS of the studio control room.		3″		17 video tape recorders,

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
6	LS of semitrailers used for the broadcast of the Daytona 500.		7″		7 semitrailers stacked with every sort of high tech broadcast television device,
6	MS of cameramen and audio technicians.		4″		141 people including:
6	XLS of the director's booth on location at the Daytona 500.		8″		3 producers who sound like they share one brain; *and 10... 9... 8... 7...*

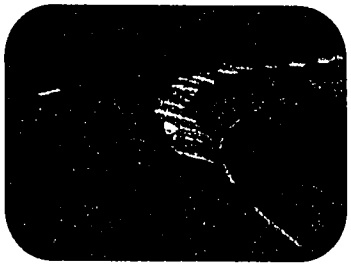
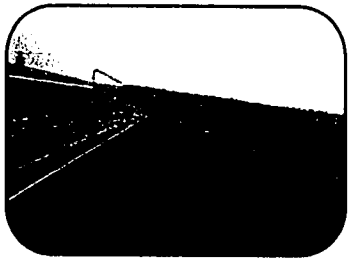
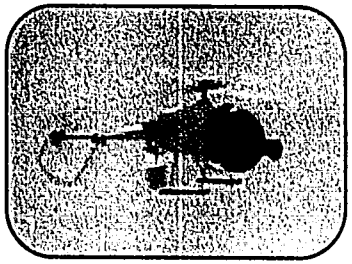
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
6	MS of the director in the director's booth on location at the Daytona 500.		5″		a director who seems to have three brains; *Ready 11... Take 11.*
6	LS of flying cam.		5″		and flying cam with no brain at all.
7	MS of the stock cars on the Daytona 500 race track.		3″		The cars at Daytona are whooping around the oval

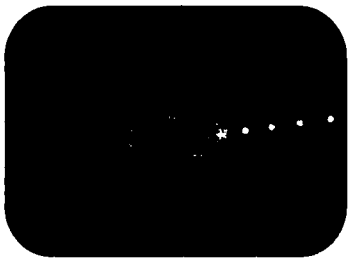
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	LS of the stock cars on the Daytona 500 race track.		4″		at an average speed of 190 m.p.h.—
7	XLS of the Daytona 500 race track.		7″		a mere crawl. The video signals that bring you pictures of the race are traveling
7	LS of flying cam.		12″		at 186,000 miles per second. We'll walk you through the entire television process, but first to get a sense of how complicated that process can be, follow the electronic bobsled ride

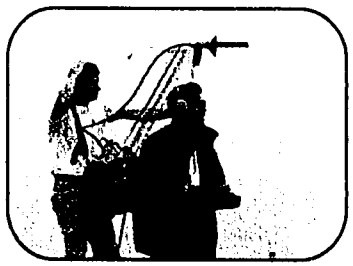
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	LS of light entering through the lens of an animated flying cam.		4″		the video takes on its way to you.
7	LS of light entering through the lens of an animated flying cam, along with a strip of frames depicting a stock car.		17″	✓	First light images are turned into flowing electrons in the aerial camera: the first of many changes for the signal before it finally sees the light.
7	LS of a strip of frames depicting a stock car.		4″	✓	Next, electrons are transformed into microwaves

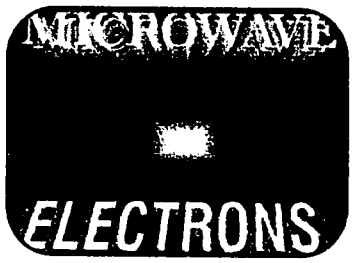
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	LS of an animated video signal captured by a microwave antenna.		4″	✓	beamed from the tiny helicopter to a man holding an antenna on a pole.
7	MLS of the microwave antenna holder and flying cam's remote control operator.		3″	✓	The waves are changed
7	Dolly–in along the camera cables leading to the director's booth on location at the Daytona 500.		5″	✓	back to electrons again and zapped down a wire to television sets in the

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	MS of the director in the director's booth on location at the Daytona 500.		2″	✓	director's booth. *We are going to do a*
7	XLS of the director's booth on location at the Daytona 500.		3″	✓	*pit stop with flying cam. Ready 25.*
7	LS of an animated graphic to demonstrate the conversion of electrons into microwaves.		3″	✓	The signal is beamed up

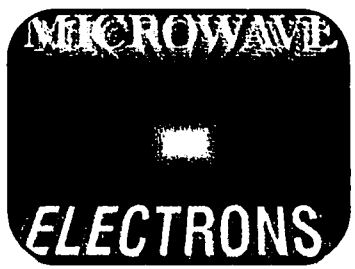
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	LS of a satellite over the Earth.		4″	✓	to a relay satellite and
7	LS of the studio control room.		5″	✓	down to New York. In the network control room commercials are added to the electronic stream.
7	LS of a satellite against a black background.		4″	✓	Then back up into space,

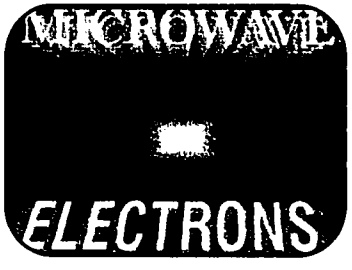
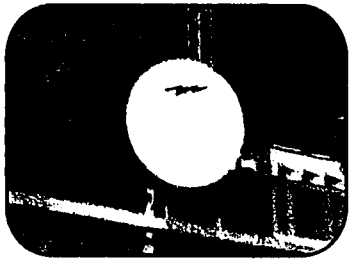
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	XLS of a satellite transmitting signals to various points across the Earth.		5″	✓	through another satellite link and
7	XLS of satellite dishes on top of a local television station.		3″	✓	down to local stations
7	LS of an animated graphic to demonstrate the conversion of electrons into microwaves.		3″	✓	like KCBS

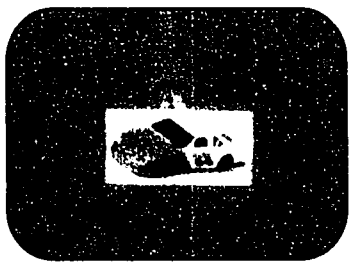
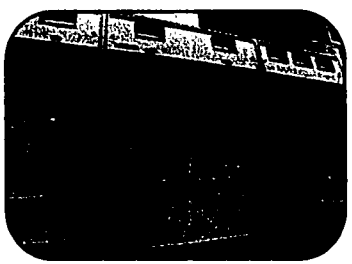
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	MS of a switcher in the master control room.		3″	✓	in Los Angeles, California, which will add its commercials
7	LS of an animated graphic to demonstrate the conversion of electrons into microwaves.		2″	✓	to the stream;
7	LS of a satellite dish located on a mountain top.		2″	✓	a short trip to the top of a nearby mountain

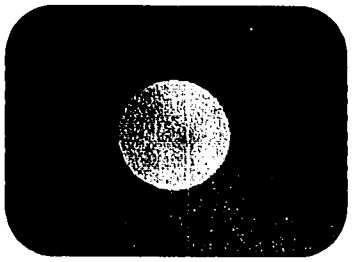
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	LS of a picture of a stock car captured at the Daytona 500 which is about to be converted into a television broadcast signal.		3″	✓	where they are revved up
7	Pan right across various electronic signal processing equipment in the master control room.		3″	✓	into a television broadcast television signal.
7	CU of electronic signals leaving the master control room.		2″	✓	

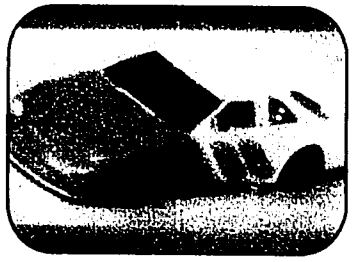
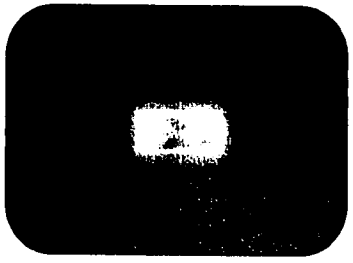
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Smoky orange backdrop.		.12″	✓	
7	White circle rolls onto the centre of the backdrop from screen left.		.06″	✓	
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	

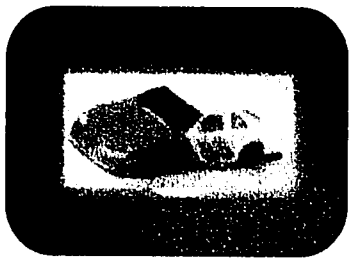
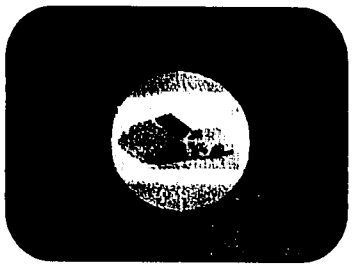
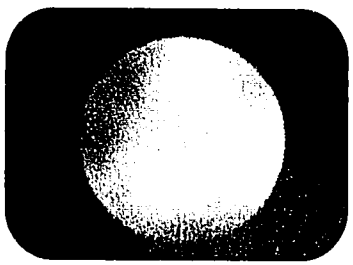
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Soft wipe to a CU of an animated stock car.		.03″	✓	
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	
7	Soft wipe to a XLS of an animated stock car.		.12″	✓	

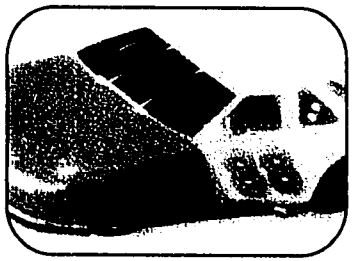
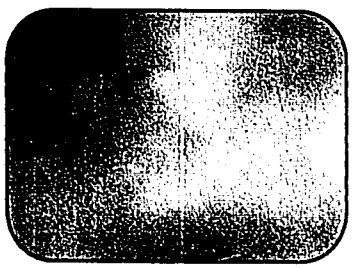
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Soft wipe to a MS of an animated stock car against a white circle.		.03″	✓	
7	Soft wipe to a XLS of an animated stock car against a white circle.		.06″	✓	
7	Circular wipe to white.		.12″	✓	

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Freeze frame of a XCU of a freeze frame of an animated stock car.		.03″	✓	
7	Soft wipe to a LS of an animated stock car.		.03″	✓	
7	Smoky grey backdrop.		.03″	✓	

SHOOTING SCRIPT AND STORYBOARD

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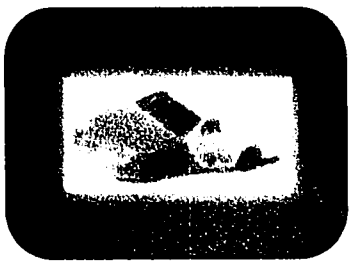
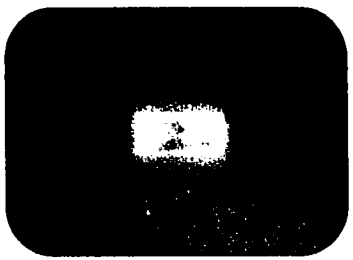
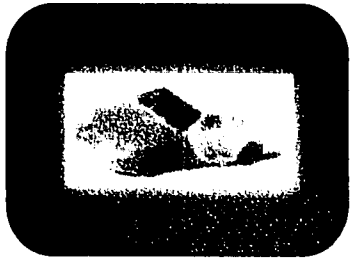
Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Freeze frame of a MS of an animated stock car in a soft wipe.		.03″	✓	
7	Soft wipe to a XLS of an animated stock car.		.06″	✓	
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	

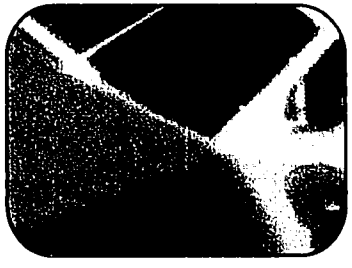
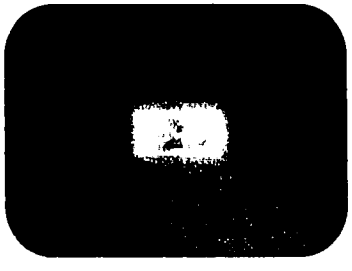
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Soft wipe to a MS an animated stock car.		.06″	✓	
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	
7	Soft wipe to a MS of an animated stock car.		.06″	✓	

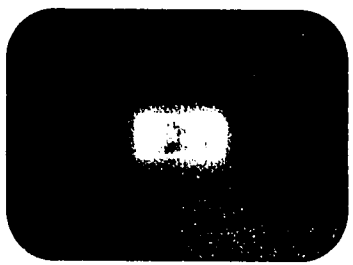
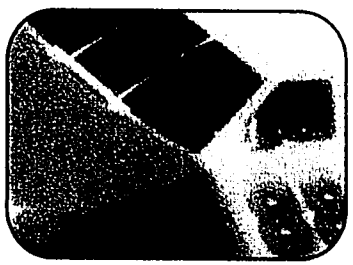
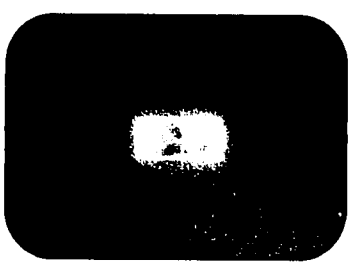
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	
7	Freeze frame of a XCU of an animated stock car.		.12″	✓	
7	Soft wipe to a XLS of an animated stock car.		.03″	✓	

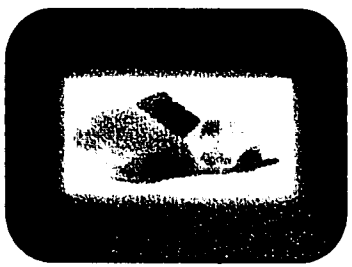
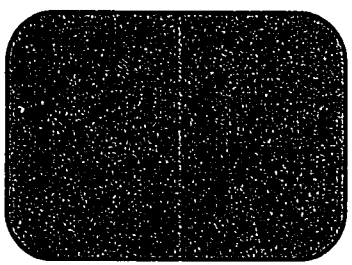
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Soft wipe to a XLS of an animated stock car.		.12″	✓	
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	
7	Soft wipe to a XLS of an animated stock car.		.12″	✓	

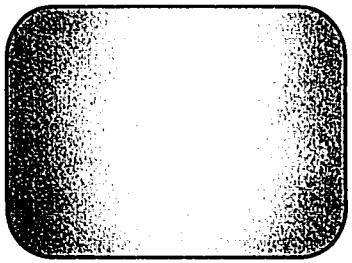
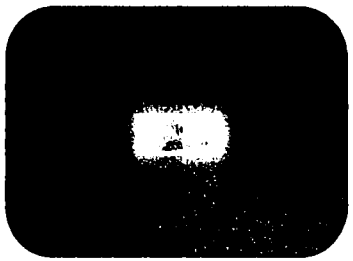
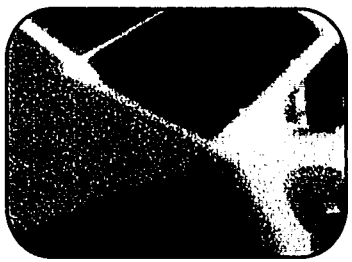
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	
7	Soft wipe to a MS of an animated stock car.		.06″	✓	
7	Light orange backdrop.		.03″	✓	

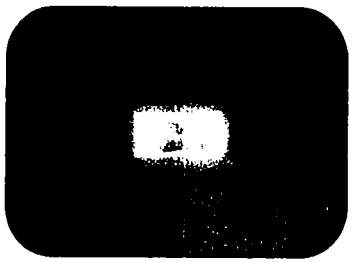
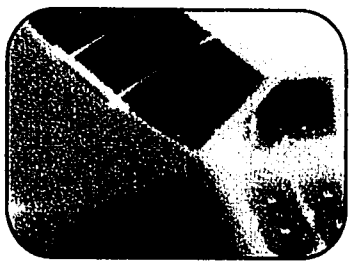
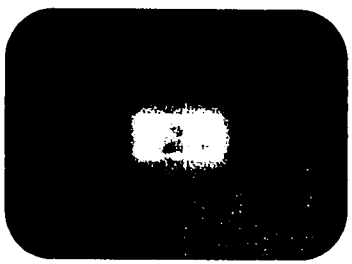
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Dissolve to bright yellow backdrop.		.06″	✓	
7	Soft wipe to a XLS of an animated stock car.		.06″	✓	
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	

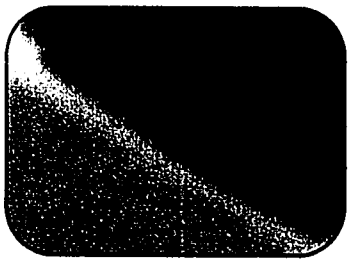
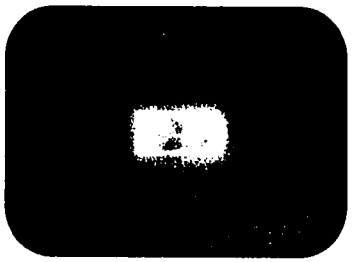
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Soft wipe to a XLS of an animated stock car.		.12″	✓	
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	
7	Soft wipe to a XLS of an animated stock car.		.12″	✓	

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Freeze frame of a XCU of an animated stock car.		.03″	✓	
7	Soft wipe to a XLS of an animated stock car.		.12″	✓	
7	Fade to black.		.5″	✓	

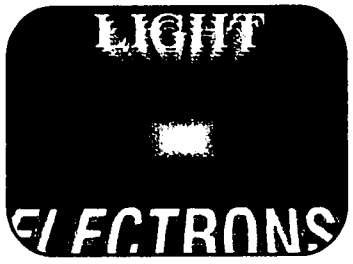
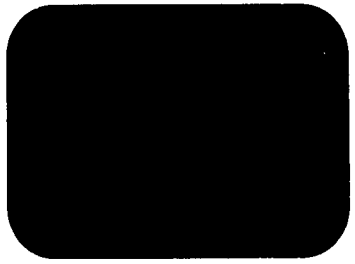
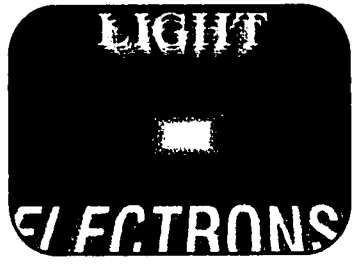
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	Fade up from black to a LS of a transmitter.		3″	✓	That TV signal radiates out
7	XLS of a transmitter.		4″	✓	to over 5 million households in the L.A. area.
7	LS of a strip of frames representing a television broadcast signal.		4″	✓	For viewers hooked up to a cable television service, the signal will be captured and

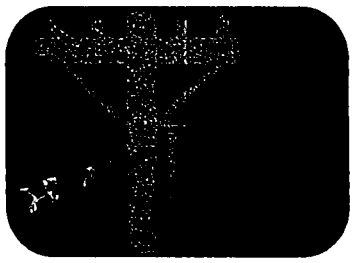
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	LS of an animated graphic to demonstrate the conversion of electrons into laser lights.		4″	✓	temporarily converted into laser light,
7	CU of fiber optic wires.		5″	✓	and fed down long strands of glass called fiber–optic lines, for miles.
7	LS of an animated graphic to demonstrate the conversion of electrons into laser lights.		2″	✓	A final conversion,

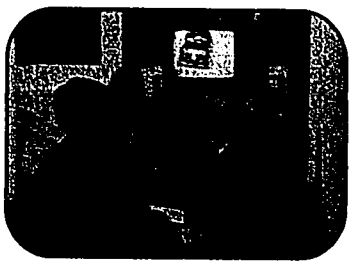
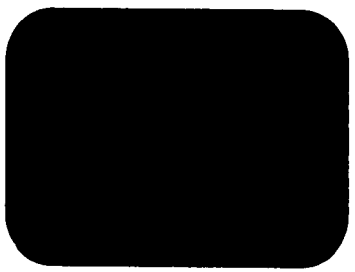
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	XLS of a suburban street.		2″	✓	then,
7	LS of a television signal travelling through trunk and feeder lines.		5″	✓	through a wire to one of thousands of homes in Thousand Oaks, California, where
7	LS of an elderly couple watching television in their living room.		5″		a television set tuned to channel two converts the signal back into light waves that show you what's happening at

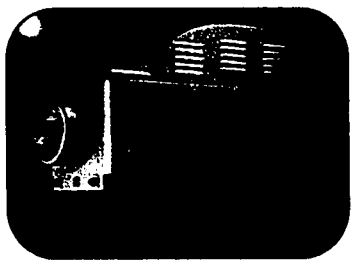
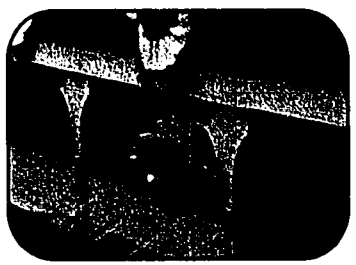
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
7	XCU of an elderly man watching television.		3″		Daytona...
7	MLS of children playing in front of the television set.		4″		If you're watching.
7	Fade to black.		2″		

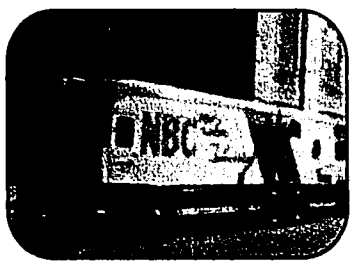
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
8	Fade up from black to a MS of a camera lens.		5″	✓	
8	MS of a television camera.		2″	✓	A color camera
8	LS of a television camera.		2″	✓	is three cameras in one.

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television **Page 43 of 65**

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
8	LS of a semitrailer used to broadcast live events.		3″	✓	
8	MS of a television camera.		4″	✓	In broadcast color cameras,
8	MCU of light entering the camera's lens, at which point it is split in three colors: red, green, and blue.		10″	✓	the light streaming through the lens enters a prism, which does the usual prism thing—splitting light into three colors. Identical images, except that one comes out of the prism

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
8	LS of baseball field as perceived by the camera's red channel.		1″	✓	in red light,
8	Super of a LS of baseball field as perceived by the camera's green channel.		1″	✓	on in green,
8	Super of a LS of baseball field as perceived by the camera's blue channel.		5″	✓	and one in blue: The three basic colors.

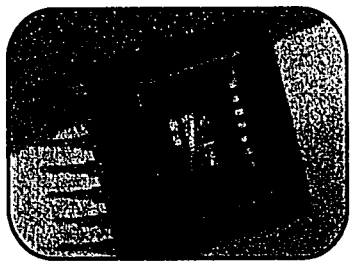
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
8	LS of the combined effect of adding the red, green, and blue hues.		3″	✓	
8	LS of a baseball field.		2″	✓	
8	MS of cameramen.		4″	✓	In modern cameras these separated images

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
8	CU of a charged coupled device.		7″	✓	are sent to three light sensitive computer chips, CCDs, charged coupled devices.
8	LS of the first studio camera: the TK–41.		8″	✓	This is the TK–41, the first color camera, it weighed a half a ton.
9	Two–shot of people talking in a restaurant.		9″		Cameras are so small and light nowadays they can peep through a pin hole in glasses frames.

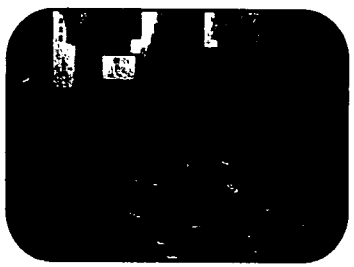
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
9	LS of the investigative reporter. Fade in super of a hand pointing to the wire linking the camera to the CCD chip hidden in her purse.		5″		Fiber–optics link the glasses to a CCD chip hidden in a purse;
9	Three–shot of people in a restaurant.		3″		*So basically this conversation is not going any further than right here.*
9	MS of a man as seen by the camera embedded in the investigative reporter's glasses.		3″		a favorite for producers of tabloid television.

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
9	XCU of the investigative reporter. Fade in super of a hand pointing to the camera embedded in her glasses.		4″		*Just between you and me, what did she say about him?*
9	LS of the Jumbotron in Times Square.		5″		*I came here alone. No one is here with me. It's not going beyond this table.*
9	Zoom–out to a XLS of Times Square.		5″		*She said he was a very poor father. A no good person.*

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
10	LS of the Jumbotron in Times Square. Fade in/out *Dot Your Eyes...* super.		5″	✓	
10	Soft diagonal wipe to a MS of a cowboy riding a horse.		2″	✓	There are guns on your TV,
10	LS of a cowboy riding a horse.		2″	✓	but there is also a gun in your set.

SHOOTING SCRIPT AND STORYBOARD

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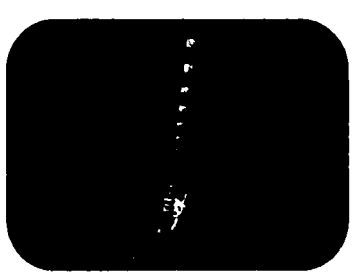
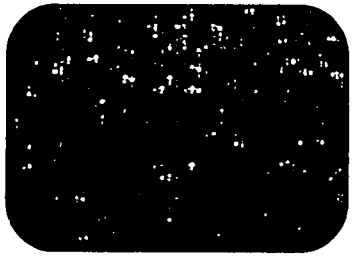
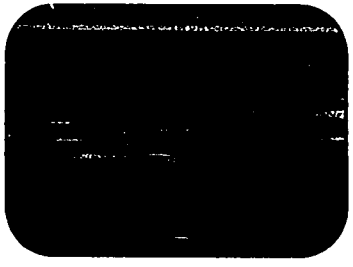
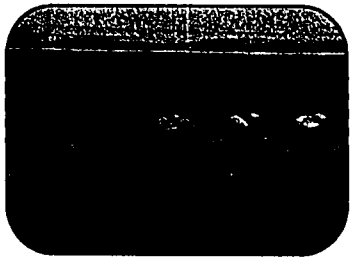
Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
10	MS of a cowboy shooting at his rivals.		2″	✓	
10	LS of the cowboy's rivals.		2″	✓	
10	Soft diagonal wipe to a MS of a ray gun firing a thin beam of light.		5″		There's a ray gun at the back of the picture tube firing a thin beam to light a tiny dot on your screen.

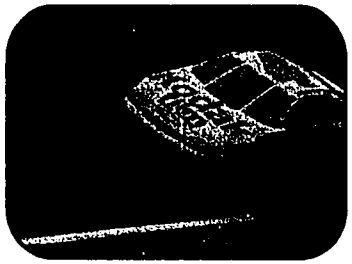
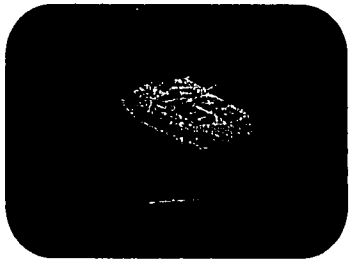
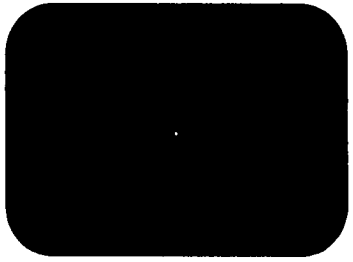
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
10	LS of a television screen depicting a series of crude dots fired by the ray gun.		2″		
11	Dissolve to a LS of a car crash at the Daytona 500.		3″		All the excitement, drama, the death defying thrills on television,
11	MLS of the stock cars on the Daytona 500 race track.		3″		come down to a dot.

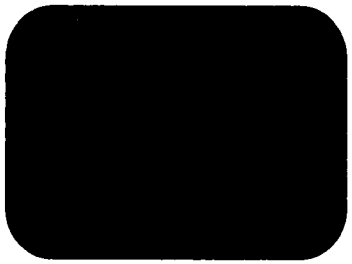
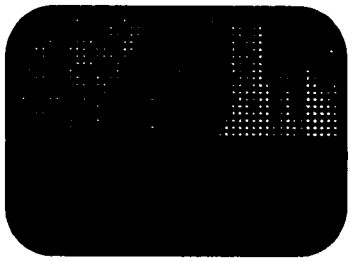
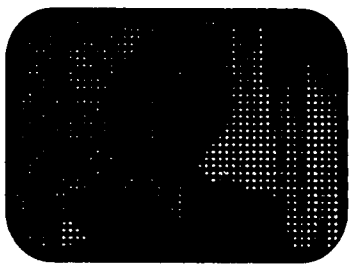
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
11	MS of a stock car on the Daytona 500 race track.		1″		
11	Circular wipe to black.		1″		
11	LS of a flickering dot.		8″		When the beam isn't moving, all we are treated to is a random flickering dot, or so it seems.

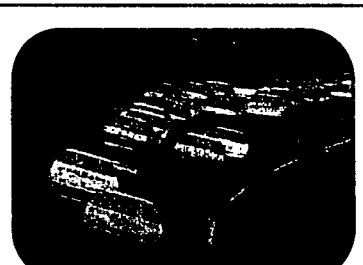
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
11	LS of dots scanning left to right across a television screen.		7″	✓	But, as the dot begins to move, to scan left to right, the dot leaves a glowing line.
11	LS of dots scanning left to right across a television screen.		7″	✓	The lines merge to form a picture, and you are watching television.
11	LS of a picture as seen on experimental television sets.		4″	✓	The first experimental television sets used a dot about this large, which resulted into a very crude picture.

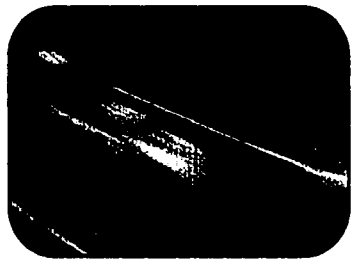
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
11	Circular wipe from black to a MLS of stock cars on the Daytona 500 race track.		3″		A smaller dot can paint more lines,
11	MLS of stock cars on the Daytona 500 race track.		5″		and show more details. In today's television the dot is so small
11	LS of stock cars on the Daytona 500 race track.		5″		that it scans over 500 lines. Each time the dot scans the whole screen

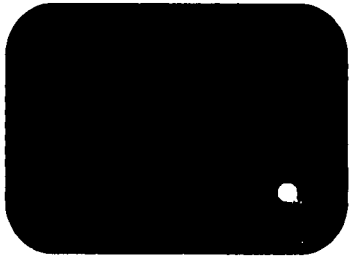
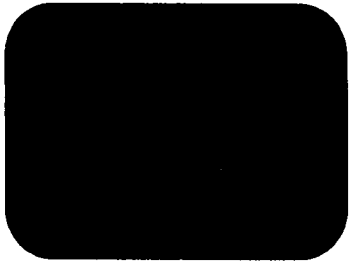
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
11	Freeze frame of a MLS of stock cars on the Daytona 500 race track.		2″		it makes one picture
11	LS of a dot moving diagonally from the bottom screen right to the top of screen left.		1″		and snaps back.
11	Freeze frame of a MLS of stock cars on the Daytona 500 race track shown in one of two fields.		2″		Engineers call

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
11	LS of a dot moving diagonally from the bottom screen right to the top of screen left.		1″		these fields.
11	Freeze frame of a MLS of stock cars on the Daytona 500 race track shown in one of two fields.		2″		Two fields merge
11	LS of a dot moving diagonally from the bottom screen right to the top of screen left.		1″		to create a whole picture

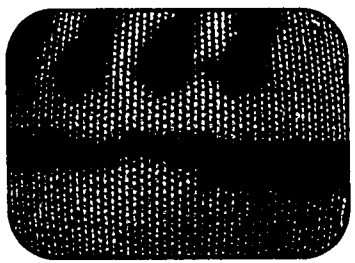
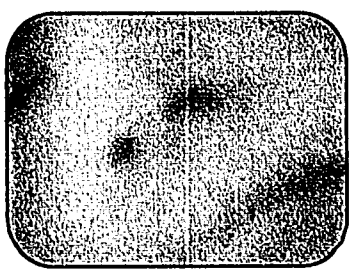
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
11	Freeze frame of a LS of stock cars on the Daytona 500 race track shown in one of two fields.		2″		the engineers
11	Freeze frame of a LS of stock cars on the Daytona 500 race track shown in both fields.		3″		call a frame.
12	XLS of the Daytona 500 race track.		3″		TVs in North America and Japan give you 30 pictures a second.

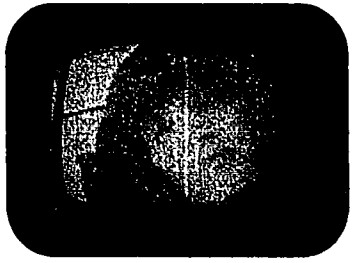
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
12	LS of the Daytona 500 race track.		5″		Other countries have different numbers of lines and frames.
12	XCU of a picture tube.		4″		But all television sets in the world make pictures with flying flickering dots.
12	Zoom–out from a XCU of a picture tube.		3″		You don't see the flicker, because, in this case,

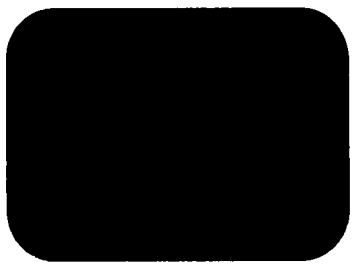
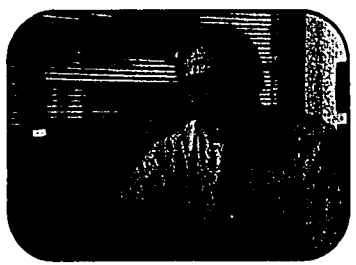
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
12	CU of a television set.		5″		you can't believe your eyes.
12	MS of Dr. Andrew Lippmann.		11″		*Now, there are two facets in human vision that allow that to work. And one of them is, how many pictures do I have to show you in a second flashing before you, before you will see a picture that looks like its constantly on?*
12	LS of a highway flickering against a black screen at a slow rate.		5″		

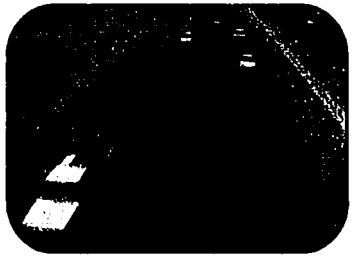
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television **Page 60 of 65**

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
12	LS of a highway flickering against a black screen at a moderate rate.		5″		
12	LS of a highway flickering against a black screen at a faster rate.		3″		*That's called the critical fusion frequency, or the flicker frequency.*
12	MS of Dr. Andrew Lippmann.		4″		*Now the second step is, if I send you still pictures, one after the other,*

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
12	LS of cars on a highway presented at various frame rates (1 to 15 frames per second).		10″		*how quickly do I have to send you those pictures, with a little change in each one, for it to appear as if something is moving, as opposed to just a series of still pictures? And that's a lower number.*
12	LS of cars on a highway presented at various frame rates (16 to 30 frames per second).		11″		*Turns out 16 different pictures is good enough to give you the sensation of smooth continuous motion.*
13	MLS of stock cars on the Daytona 500 race track.		4″		Moving pictures painted by a tiny dot

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
13	LS of young children playing in front of the television set.		3″	✓	scanning sideways across an average TV screen, at the speed of
13	CU of young girl playing in front of the television set.		3″	✓	9,825 miles per hour.
13	Two–shot of an elderly couple watching television, as a dot from the set moves towards screen left.		3″	✓	You probably wouldn't want

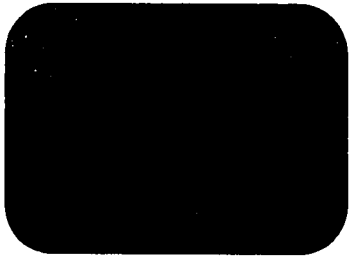
SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
13	CU of an elderly woman watching television, as a dot from the set moves past her on screen left.		3″	✓	anything in your living room
13	CU of an elderly man as he notices the dot move by him on screen right.		3″	✓	traveling at almost 10,000 miles a hour,
13	Two–shot of an elderly couple watching television.		10″	✓	but nothing is moving here except electrons and photons, and an occasional Cheeto.

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
14	LS of the interior of a picture tube.		9″		Inside the picture tube, in a near vacuum, electrons boil off hot metal and are
14	LS of the interior of a picture tube as the screen is coated with a glowing red compound.		5″		propelled and aimed by electromagnets. The screen is coated with a compound that glows when bombarded by the electrons.
14	LS of the interior of a picture tube as the screen is coated with a glowing red compound.		5″		A color tube has three different compounds that glow in three different colors. For instance, what makes you see red is yttrium oxysulfide europium...

SHOOTING SCRIPT AND STORYBOARD

Title: Understanding Television **Page 65 of 65**

Scene #	Scene Description	Visual	Length	Music	Narration, Dialogue
14	LS of the interior of a picture tube as the screen is coated with a glowing red compound.		5″		Imagine that.
14	LS of the interior of a picture tube as the screen is completely coated with a glowing red compound.		3″		
14	Fade to black.		10″		

APPENDIX B

Subject Profile Questionnaire

1 UNDERSTANDING: TELEVISION

TELEVISION VIEWING HABITS

Select the appropriate responses, and fill in the circles with the corresponding numbers, unless indicated otherwise.

1. On average, how many hours of network television (i.e., ABC, NBC, CBS, FOX, etc.) do you watch **per week**?

(1) I do not watch any programs on network television
(2) Less than 3 hours
(3) 3 – 6 hours
(4) 6 – 9 hours
(5) 9 – 12 hours
(6) More than 12 hours

1 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6

2. On average, how many hours of public television *PBS* (cable 20 or 24), do you watch **per week**?

(7) I do not watch any programs on public television
(8) Less than 3 hours
(9) 3 – 6 hours
(10) 6 – 9 hours
(11) 9 – 12 hours
(12) More than 12 hours

2 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12

3. On average, how many hours of *The Learning Channel* (cable 27) or *Discovery Channel* (cable 37) do you watch **per week**?

(13) I do not watch any programs on *The Learning Channel* or *Discovery Channel*
(14) Less than 3 hours
(15) 3 – 6 hours
(16) 6 – 9 hours
(17) 9 – 12 hours
(18) More than 12 hours

3 ○ 13 ○ 14 ○ 15 ○ 16 ○ 17 ○ 18

4. Please indicate how often you watch these types of TV programs by filling in the circles in one of thefollowing columns:

N *(for never)*
R *(for rarely)*
O *(for occasionally)*
U *(for usually)*
A *(for always)*

		N	R	O	U	A
a. Soap operas, both daytime and nighttime (e.g., *Days of our Lives, Melrose Place*)	**a**	○	○	○	○	○
b. Detective stories, police– and crime–oriented programs (e.g., *Law and Order, NYPD Blue*)	**b**	○	○	○	○	○
c. Situation comedies (e.g., *Friends, Seinfeld*)	**c**	○	○	○	○	○
d. Talk shows (e.g., *Oprah, The Late Show, The Tonight Show*)	**d**	○	○	○	○	○
e. Adventure, suspense programs (e.g., *Quantum Leap*)	**e**	○	○	○	○	○
f. Science fiction (e.g., *Star Trek, X–Files*)	**f**	○	○	○	○	○
g. Drama series (e.g., *Beverly Hills 90210, ER*)	**g**	○	○	○	○	○
h. Game shows (e.g., *Wheel of Fortune, Jeopardy!*)	**h**	○	○	○	○	○

N	*(for never)*
R	*(for rarely)*
O	*(for occasionally)*
U	*(for usually)*
A	*(for always)*

		N	R	O	U	A
i.	Theatrical feature films and movies made for television (e.g., *CTV Sunday Night Movie*)	i ○	○	○	○	○
j.	Music television (e.g., *MuchMusic, MusiquePlus*)	j ○	○	○	○	○
k.	News programs (e.g., *The CBS Evening News, Dateline, 60 Minutes*)	k ○	○	○	○	○
l.	Sports programs (e.g., *NFL Football, Wide World of Sports*)	l ○	○	○	○	○
m.	Cartoons (e.g., *The Simpsons, South Park*)	m ○	○	○	○	○

5. Why do you watch these particular TV programs? Select as many as applicable.

5 ○ ○ ○ ○ ○
1 2 3 4 5
○ ○ ○ ○ ○
6 7 8 9 10

(1) Can relate to the characters portrayed in the TV program
(2) Can relate to the situations portrayed in the TV program
(3) Easy viewing: The content is not too heavy
(4) Good acting/Favorite actor
(5) Good script writing/story lines
(6) They are new/innovative
(7) They are entertaining/funny
(8) They are informative
(9) Well produced in terms of lighting, camera work, editing, and sound
(10) Other, please specify _____

BACKGROUND INFORMATION

1. What types of video programs, if any, have your instructors (past or present) used to supplement their lectures? Select as many as applicable.

(1) My instructors have never shown videos in class
(2) News programs
(3) Documentaries
(4) Video programs on various aspects of TV/audio/film/ multimedia production
(5) Network TV programs (sitcoms, soap operas, etc.)
(6) Commercials
(7) Film excerpts
(8) Other, please specify _____

1 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8

2. What was the purpose of these video programs? Select as many as applicable.

(9) To fill class time
(10) To introduce a topic
(11) To provide a visual example of a particular topic discussed in class
(12) To replace an entire lecture
(13) To supplement a lecture
(14) Other, please specify _____

2 ○ 9 ○ 10 ○ 11 ○ 12 ○ 13 ○ 14

3. From the list provided below, select **5** reasons for which you consider video programs to be effective learning tools.

(15) It is easier to understand information when it is presented visually
(16) They cover the course materials in a better prepared and organized manner
(17) They are more interesting than the instructor's lectures
(18) They emphasize what I need to know
(19) They provide concrete examples
(20) They provide an expert opinion from prominent people in the industry
(21) They are entertaining
(22) They are more efficient at conveying information
(23) They provide in–depth analyses of topics covered in class
(24) Other, please specify _____

3 ○ 15 ○ 16 ○ 17 ○ 18 ○ 19 ○ 20 ○ 21 ○ 22 ○ 23 ○ 24

4. What year of study are you currently in?

(25) 1st year
(26) 2nd year
(27) 3rd year
(28) 4th year
(29) Diploma

4 ○ 25 ○ 26 ○ 27 ○ 28 ○ 29

5. What area of study are you majoring in?

(30) Film production
(31) Multimedia production
(32) Sound production
(33) TV production
(34) Other, please specify _____

5 ○ 30 ○ 31 ○ 32 ○ 33 ○ 34

6. Not including your coursework or school projects, do you have any experience (internships or otherwise) in the area of TV production?

(35) Yes
(36) No

6 ○ 35 ○ 36

7. Have you taken any of the telecourses (e.g., EDUC 210, EDUC 305 or ANTH 202) offered at Concordia?

(37) Yes
(38) No

7 ○ 37 ○ 38

8. Is this the first time you have seen *Understanding: Television*?

(39) Yes
(40) No

8 ○ 39 ○ 40

9. What is your gender?

(41) Male
(42) Female

9 ○ 41 ○ 42

APPENDIX C

Attitudinal Survey

2 UNDERSTANDING: TELEVISION

GENERAL INFORMATION (PART 1)

Listed below are a series of statements referring to the video program you have just seen. Each statement represents an opinion, and there are no right or wrong answers. You will probably disagree with some items and agree with others. We are interested in the extent to which you agree or disagree with each statement.

Commonly, first impressions are best in such matters, but your point of reference should be the video program you have just seen. Read each statement carefully. Decide if you agree or disagree, and to what extent (the strength of your opinion). Give your opinion to each statement by filling in the circles in one of the following columns:

SD *(for strongly disagree)*
D *(for disagree)*
U *(for undecided)*
A *(for agree)*
SA *(for strongly agree)*

		SD	D	U	A	SA
1. I already knew the information presented in this video program.	**1**	○	○	○	○	○
2. The soundtrack added excitement to the program.	**2**	○	○	○	○	○
3. I can use the information from this video in some of my courses.	**3**	○	○	○	○	○
4. The narration attracted my attention more than the visuals.	**4**	○	○	○	○	○
5. The program was not interesting.	**5**	○	○	○	○	○

SD	*(for strongly disagree)*
D	*(for disagree)*
U	*(for undecided)*
A	*(for agree)*
SA	*(for strongly agree)*

		SD	D	U	A	SA
6. The visuals overrided the narration.	6	O	O	O	O	O
7. The content was too technical.	7	O	O	O	O	O
8. The language used in the progam was complex.	8	O	O	O	O	O
9. The music attracted my attention more than the narration.	9	O	O	O	O	O
10. I was able to relate to the narrator.	10	O	O	O	O	O
11. The narration was unclear.	11	O	O	O	O	O
12. If special effects were not used, my interest would have been lessened.	12	O	O	O	O	O
13. There were too many details.	13	O	O	O	O	O
14. The music was distracting.	14	O	O	O	O	O
15. The narrator was a credible person.	15	O	O	O	O	O
16. Important concepts should be highlighted.	16	O	O	O	O	O
17. The pace was too fast.	17	O	O	O	O	O
18. More special effects should have been used.	18	O	O	O	O	O

SD	*(for strongly disagree)*
D	*(for disagree)*
U	*(for undecided)*
A	*(for agree)*
SA	*(for strongly agree)*

		SD	D	U	A	SA
19. Overall, the program was difficult to understand.	**19**	○	○	○	○	○
20. The music attracted my attention more than the visuals.	**20**	○	○	○	○	○
21. I am confident that I can describe and explain the terms used in the program.	**21**	○	○	○	○	○
22. The video did not present any relevant information.	**22**	○	○	○	○	○
23. The visuals appealed to me more than the narrator's voice.	**23**	○	○	○	○	○
24. The narration was packed.	**24**	○	○	○	○	○

GENERAL INFORMATION (PART 2)

To follow, are a few questions regarding the video program you have just seen. There are no right or wrong answers. Read each question carefully, and provide a brief written response.

1. What did you like the most about *Understanding:Television*? Why?

2. What did you like the least about *Understanding:Television*? Why?

3. What particular visual image stayed with you the most after watching *Understanding: Television*? Why?

APPENDIX D

Verbal Retention Test

TRUE OR FALSE

Listed below are a series of true or false statements based on the video program you recently saw. Please read each statement carefully, and select the item you think is the answer by filling in the circles in the **T** *(for true)* and **F** *(for false)* column.

		T	F
1. TVs in North America give us 30 pictures a second. In other countries, such as Japan, TVs have different numbers of lines.	1	○	○
2. Sixteen flashes a second is enough to make the picture look like it's constantly on.	2	○	○
3. One day through TV, the entire world will stream into our living rooms with the velocity of light.	3	○	○
4. In modern cameras, separated images are sent to light sensitive computer chips, CCUs, camera control units.	4	○	○
5. Two fields merge to call a whole picture called a frame.	5	○	○
6. Inside the TV's vacuum tube, electrons boil off hot metal, and are propelled and aimed by electromagnets.	6	○	○
7. When the beam is not moving, all we see is a random flickering dot.	7	○	○
8. Forty–one cameras were needed to cover the Daytona 500.	8	○	○
9. In the first step of the TV process, the light images are turned into microwaves by the aerial camera.	9	○	○
10. Networks are the last ones to add their commercials to the electronic stream.	10	○	○

APPENDIX E

Visual Retention Test

VISUAL RETENTION EXERCISE

Recently, you were shown a video program regarding the television medium. From among the visuals contained in the video you will see now, fill in the circles whose numbers correspond with the terms listed below. If you believe that a term does not match any of the images presented in the video, then select the **DNA** *(for does not apply)* circle.

A. Microwave

B. Charged coupled device

C. Electron

D. TV broadcast signal

E. Frame

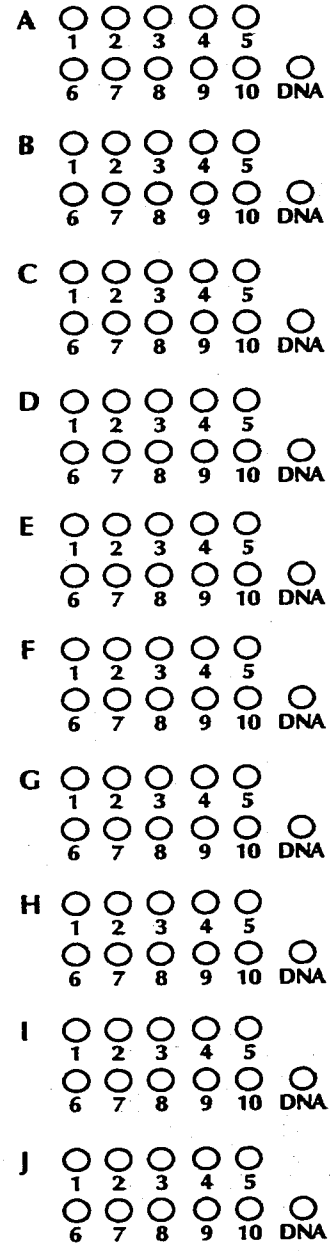
F. Ray gun

G. Fiber–optic

H. A source of news

I. Local TV station

J. Prism

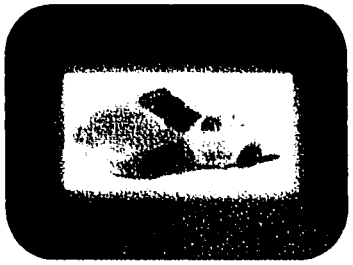


APPENDIX F

Visual Retention Video Script/ Storyboard

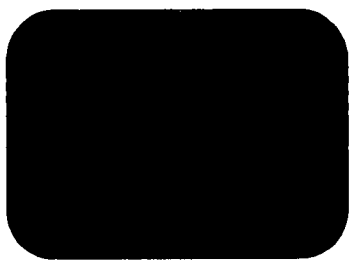
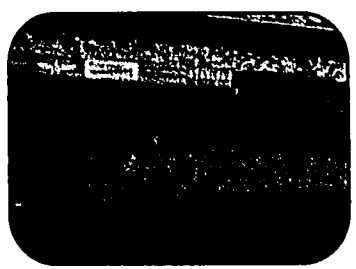
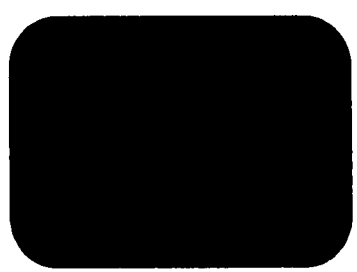
SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
1	Black with a 1/2 second 1 kHz tone.		5″	✓	
2	Fade up from black to a freeze frame of a MS of an animated racing car in a boxed wipe.		10″		
3	Fade to black.		30″		

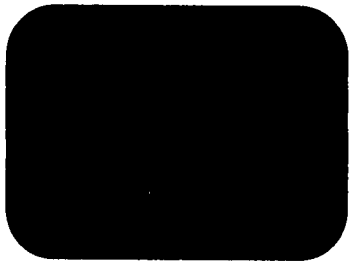
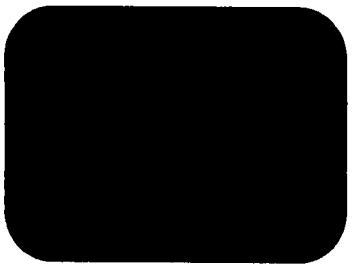
SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
4	Black with a 1/2 second 1 kHz tone.		5″	✓	
5	Fade up from black to a freeze frame of a LS of a baseball field.		10″		
6	Fade to black.		30″		

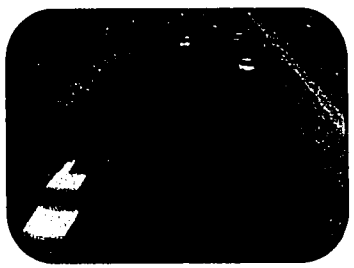
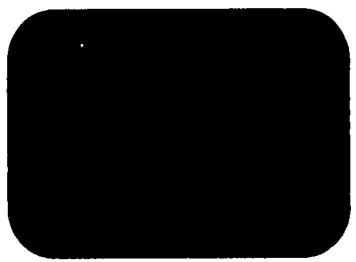
SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
7	Black with a 1/2 second 1 kHz tone.		5″	✓	
8	Fade up from black to a freeze frame of a LS of rows of television sets.		10″		
9	Fade to black.		30″		

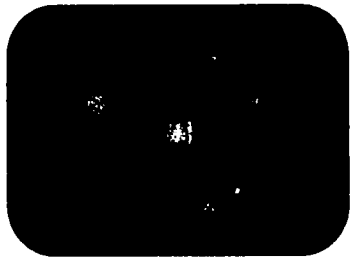
SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
10	Black with a 1/2 second 1 kHz tone.		5″	✓	
11	Fade up from black to a freeze frame of a LS of cars on a highway.		10″		
12	Fade to black.		30″		

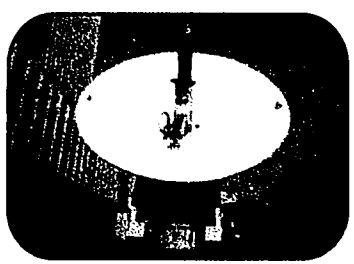
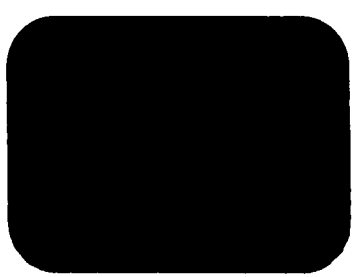
SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
13	Black with a 1/2 second 1 kHz tone.		5″	✓	
14	Fade up from black to a freeze frame of a LS of the interior of a picture tube.		10″		
15	Fade to black.		30″		

SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
16	Black with a 1/2 second 1 kHz tone.		5″	✓	
17	Fade up from black to a freeze frame of a MS of a satellite dish on top of a car.		10″		
18	Fade to black.		30″		

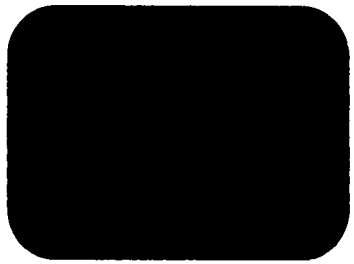
SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
19	Black with a 1/2 second 1 kHz tone.		5″	✓	
20	Fade up from black to a freeze frame of a LS of stock cars on the Daytona 500 race track.		10″		
21	Fade to black.		30″		

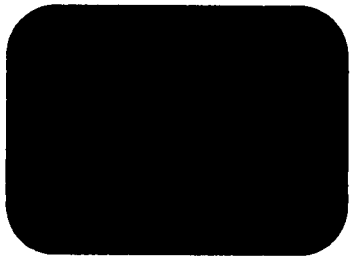
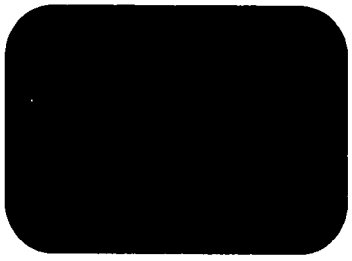
SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
22	Black with a 1/2 second 1 kHz tone.		5″	✓	
23	Fade up from black to a freeze frame of a LS of a strip of frames.		10″		
24	Fade to black.		30″		

SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
25	Black with a 1/2 second 1 kHz tone.		5″	✓	
26	Fade up from black to a freeze frame of a MS of a ray gun.		10″		
27	Fade to black.		30″		

SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
28	Black with a 1/2 second 1 kHz tone.		5″	✓	
29	Fade up from black to a freeze frame of a three–shot of people sitting in a restaurant.		10″		
30	Fade to black.		30″		

SHOOTING SCRIPT AND STORYBOARD

Title: Visual Retention Video

Scene #	Scene Description	Visual	Length	Sound FX	Narration, Dialogue
31	Black with a 1/2 second 1 kHz tone.		5″	✓	

APPENDIX G

Consent Form

CONSENT FORM

This is to state that I agree to participate in this study conducted by an independent television producer.

Procedures

I understand that I will be asked to:

Watch two (2) video programs, complete a few questionnaires, and provide written descriptions concerning my thoughts and feelings.

Conditions of participation

I understand that:

- My participation in this study will last approximately one hour;
- My participation in this study is confidential; and
- The data averaged across many people who participate in this study may be published in a scientific journal.

I have carefully studied and understood this agreement, and therefore freely consent and agree to participate in thus study.

Name (Please print): _____

Signature: _____

Date: _____

Producer's signature: _____