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A STUDY OF RELATIVE EFFECTIVENESS OF VARIOUS TELEVISION PRODUCTION TECHNIQUES USING CONJUGATE ANALYSIS APPARATUS

Arthur Earl Shears

A Thesis

in

The Department

of

Education

Presented in Partial Fulfillment of the Requirements
for the degree of Master of Arts at
Concordia University
Montreal, Quebec, Canada

May, 1978

ABSTRACT

ARTHUR E. SHEARS

A STUDY OF RELATIVE EFFECTIVENESS OF VARIOUS TELEVISION PRODUCTION TECHNIQUES USING CONJUGATE ANALYSIS APPARATUS

A comparison was made between complex and simple video production techniques regarding their ability to draw attention and produce recall and attitude change. The first part of the comparison involved a conjugate analysis laboratory study with 18 sixteen year old students. The results indicated that complex video techniques (slides, film inserts, graphics with pointing) were significantly better ($p \leq .01$) at producing attending behaviour than simple video techniques (presenter talking to the camera). The second part of the comparison utilized 176 sixteen year old students in eight intact classes with a one-way analysis of variance used for analysis. Results indicated complex video techniques did not produce more recall or attitude change when compared with simple video techniques. However, simple video segments integrated with complex segments did produce more attitude change ($p \leq .05$) than simple segments not integrated. Thus, conjugate analysis seems to be a useful technique in determining the attention-getting potential of a television programme, but its ability to forecast the amount of recall and attitude change from a programme was not proven.

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I. THE PROBLEM

INTRODUCTION

A major problem facing today's education is the act of selecting a medium or media of instruction. Many factors need to be considered--characteristics of the learners, costs vs benefits, availability of resources and staff, etc. However, at this general level, the fact which must be foremost in planners' minds is that no one media--radio, TV, CAI or whatever--has overall characteristics that make it the best everytime. Rather, each situation must be analyzed individually to determine what medium or combination of media is likely to be more effective than another.

When looking at the effectiveness of various media, the decision-maker should look within the media:

> *In fact, the conclusion of many researchers is that the chief variance in instructional media effect is within rather than between media...that is, how the media are used rather than what media are used makes the difference. (Schramm, 1973, P. 37)*

CONTEXT OF PROBLEM

Researchers such as Gropper, et al (1961), and Almstead & Graf (1960) have looked at how TV was used in instruction; specifically, whether learning from television was increased 1) by providing motivation in the form of rewards for viewing, or by 2) allowing talkback

during the programmes. The experimentors found that significant differences in learning were produced using these techniques.

Other investigations of television have looked at not only how it is used but also how it is produced. Shephard J.R. (1967), Zettl (1968), Anderson (1972), Chu & Schramm (1973), and Coldevin (1976) have all outlined areas of actual or potential television production variable research. Some of the variables mentioned by these authors, particularly Coldevin, include studies on the effectiveness of film, static pictures, graphics (with cues) vs presenter on camera. One area that has not been the subject of any studies, is the measurement and affect of attention instruction by television. This is surprising considering the number of theorists (Mostofsky (1968), Gagne (1970), and Anderson (1970) among others) who suggest attention is a necessary component of both cognitive and affective learning.

Lindsley (1962) has demonstrated that attending behaviour (ie. attention) can be measured behaviourally. His measure is sensitive, continuous and immediate; it is more subtle and sensitive to moment-to-moment changes in viewing behaviour than are most post-viewing tests and interviews. The method is based on the principle of conjugate reinforcement: the intensity of a continuously available video (or audio) signal varies directly and immediately with the viewing (or listening) response.

There is no way for the subject to watch the video (or listen to the audio) without his response being graphically recorded on a cumulative recorder.

Statement of Problem(s)

Lindsley's conjugate analysis technique provides an analysis of an individual's response to a particular stimulus (eg. a TV programme), and enables the researcher to study the various cues that make up the segments of a programme.

The first problem under review is whether particular production techniques are more effective at eliciting attending behaviour than other segments.

The second problem stems from the individual analysis of behaviour suggested in problem one. Lindsley worked with individual subjects in his experiments, but teachers are often more concerned with classes of students. They want to know whether, for example, a television show will teach most if not all of the students in their class. The question then is whether predictions on attention made from analyzing individual attending behaviour will have any effect on learning in the classroom setting of 30 or 40 pupils.

The third problem to be investigated is identical to the second, except that affective learning (attitude change) rather than cognitive learning (recall) will be investigated.

Importance of Study

As previously suggested in the introduction, a major factor to be considered by decision-makers in selecting media is efficiency and effectiveness in a particular situation. Unfortunately, empirical testing and revision of television programmes have been the exception rather than the rule. The reasons for this are many, not the least of which is that producers tend to mistrust anything empirical. They prefer to revise programmes intuitively, even though research has shown that intuition is not effective. For example, Noble (1976) showed that forty producers of children's television consistently estimated that children would recall twice as much from an instructional television programme than they actually recalled.

Chu & Schramm (1973) suggested that *"showing, testing and revising an instructional programme will...make for more learning by students"* (P. 329). Conjugate analysis may provide a way to carry out empirical revision both cheaply and effectively. It may even be possible to revise TV productions much as programmed instruction is revised--frame by frame. In programmed instruction a 90/90 (90% of students learn 90% of material presented) outcome is always sought.

If a record of social characterisitcs and ability ratings are kept for each participant, these may be related to viewing behaviour and knowledge gained, so that

differences in viewing behaviour between social groups can be identified and studied. The particular emphasis of the present study is to look at some specific production techiques in television and to determine whether using a narrator on camera is better at drawing attention than some other techniques such as film, slides or graphics (or vice versa). Though the answers to this question may be of immediate interest to television producers, its primary importance is in its attempted validation of a procedure to measure attention and thereby forecast (to some extent) the amount of affective or cognitive learning that can result.

Using Lindsley's technique an almost unlimited number of questions may be studied. These might include: What happens to viewing behaviour or attention as length of the programme is increased? Is there a difference in viewing behaviour between colour and black and white versions of a TV programme? Do moving images induce greater viewing behaviour than fixed immages? What is the effect of background music? Can a person, whose viewing behaviour or learning from ETV is inadequate, be trained to increase his efficiency in listening and viewing or in learning? If the technique is validated as a progressive tool for predicting recall and attitude, all the above questions may be reworded to reflect the additional measures. For example, do moving images induce greater recall than fixed images?

What is the effect of background music on recall and attitude change?

II. REVIEW OF THE LITERATURE

Traditionally, studies of educational television have involved either a comparison of television vs some other mode instruction or an analysis of various production variables. In the review of research which follows, a brief overview of studies in these areas will be followed by a look at the concept of attention and how it relates to television. The last section will give an introduction to the concept of conjugate analysis and how it has been used to evaluate television.

Educational Television Research

There have been a plethora of studies of the nature mentioned first above, that is, television vs some other media. Several reviews of research were done by people like Stickell (1964), Reid and McLennan (1967), Chu and Schramm (1968), Saettler (1968), and Schramm (1972). In all these studies, two general conclusions were drawn: 1) that much of the research was defective due to research design weaknesses, and 2) in most cases television was seen to be as good as other methods of instruction.

Some reviewers such as Briggs et al (1967), Chu & Schramm (1967), Ives (1971), and Baggeley (1973) have

suggested more profitable research directions; particularly in the area of production variables. They reached the same conclusion as Hoban (1960) in his review of film research. He said that the study of production variables was important *"both theoretically and practically."* That point was expressed well by Allen--*"the folly of assigning generalized, all inclusive attributes to specific classes of media (eg. TV, film, print, CAI, etc.) under all conditions is finally being appreciated, and we should discover how to design and manipulate the media so as to enhance their effectiveness"* (1971, p. 12).

As a preliminary step to the study of production variables, several researchers identified or proposed categories for variable research. Shephard (1967), Zettl (1968), Anderson (1972), and Schramm (1973) were among the people who suggested categories that ranged from lighting and graphic devices, through camera factors and on to pacing and presenter characteristics. Coldevin (1976) attempted to *"assemble a representative if not exhaustive sweep of empirical studies which have examined two or more production variables in a comparative effectiveness situation."* In his article, he defined a production variable as a definitive process, method, or technique of television production. Coldevin was able to put most variables into three general categories: 1) Presentation Techniques, 2) Content/Subject Matter, and 3) Subject Matter Organization and Performer Characteristics.

Within these three classes, twelve subclassifications were delineated.

A cursory glance at the design of these studies was enough to show that most of them compared two or more television programmes. The various production techniques (variables) in each programme were thereby rated for efficiency in teaching. The major weakness in most of these studies was that only one variable could be studied at a time. Tiemans (1970), for example, looked at the effects of camera angle--a single variable. Yet good programmes, especially on the commercial networks, contain a large number of production techniques all interwoven into the show. For example, one of the skits on a recent Sonny and Cher show lasted only ten minutes but involved about sixty types of camera shots. There were 8 closeups, 28 medium to medium closeups, 12 long or extra shots and 9 zooms. In addition, the skit had three film sequences and one slide sequence. To analyze this skit using the typical programme vs programme format is virutally impossible. Yet somekind of analysis must be done because as Schlater (1970) suggests, *"If instructional television is to make its impact, its producers must be willing to utilize some of the production techniques of commercial broadcasters in order to compete for the attention of the audience."* How is this dilemma going

to be overcome? Conjugate analysis may hold an answer.

Before getting into an explanation of conjugate analysis, it's necessary first to take a look at the concept of attention and how it relates to television.

Attention Studies

The term attention has been defined in different ways by different theorists. Lewis (1973) from his review of research outlined several theories, attention as--a perpetual state, an orientation reaction, a mediating response, and as evidenced by stimulus control (this latter one supported by Skinner and his advocates). Whatever the definition, most learning theorists assume attention or indicate its importance for learning. Many suggest that learning cannot occur without attention. For example, Solley & Murphy (1969) indicate that attention must occur before perception. Krathwohl et al (1966) refer to attention as one of the first steps in the affective learning hierarchy. Travers (1970) states that *"attention can be considered to be a necessary... condition for the efficient intake of information."*

Relating these statements to the medium of television, one can say that if an educational programme or segment within that programme is to teach, it has to first induce looking and listening behaviour. Marks (1974) expressed these sentiments when he said, *"sometimes greater viewer attention to a TV presentation will*

contribute to greater interest in the TV presentation."

Many researchers, especially in the advertising field use the terms attention and interest more or less interchangeably. They speak of attention-interest levels and try by various methods to measure them; generally using some operational definition as a guide. These methods of measurement fall into two broad categories; 1) Subjective, and 2) Objective.

1) Subjective: Methods in this category have a large subjective component; examples include telephone or face-to-face interviews where subjects are asked to recall their reactions to various commercials or segments of a programme. Self-administered rating scales of an individual's perceived interest are also used.
2) Objective: Measures here include use of sophisticated apparatus to study Galvanic Skin Response, or pupillary dilation and eyeball focusing (Hess & Polt, 1960).

However, various types of bias creep into all these procedures. Subjective measures suffer from potential interviewer or interviewee bias. For example, an interviewee may give the answers that he thinks the interviewer wants to hear. Likewise, the interviewer may unconsciously affect the responses of the subjects. In the case of self-administered rating scales, forgetting and problems of recall can make the results

highly questionable. Although the objective measures control for most of the above biases, they have their own weaknesses. Subtle changes in light, drugs, and emotional or physical peculiarities can bias the conclusions.

In the educational sphere other measurements are used. Mielke (1970) in his study on the effectiveness of the interview vs lecture in a television lesson took sequenced photographs of the viewers as they watched the TV screen. He then compared the amount of actual viewing each presentation elicited. Unfortunately, Mielke did not take into account what might be called "Zombie" viewing; that is, a situation where the viewer may be looking at the TV screen but is not seeing what is being shown. In other words the subject is not paying attention. Rust and Watkins (1975) improved on this technique by using a videotape to monitor children's behaviour as they watched two screens. One screen showed the TV programme while the other screen had a series of slides continuously flashed on it. The slide projection screen was intended to draw the subject's attention from the TV screen when they ordinarily could have gone into a "Zombie" state.

Although this latter approach solved a major problem in Mielke's methodology, it still had several drawbacks of its own. Videotaping the viewing behaviour was only part of a more complex procedure which involved time-consuming interviews and questionnaires. The conjugate

analysis measure mentioned previously tends to minimize many of the sources of imprecision found in the methodologies just described, and allows an efficient and precise recording of a subject's response.

Conjugate Analysis

Wolf, Newman, and Winters (1969) give two definitions that come close to the intuitive definition of the term attention. They are: 1) some form of sustained relation between the viewer and the stimulus, or 2) a heightened intensity or increased arousal from some absolute or relative base level. Conjugate analysis is a technique which seems to satisfy the intuitive meaning of attention. Applied in the context of television, it shows how rewarding a TV segment is to a viewer by measuring how hard he will work to see it. This is done without interviews, without recall and without pausing. Lindsley (1962) stated: *"If the response is continuously recorded, it can be used to correct parts of the copy (ie. programme) in order to induce sustained perceptual response. "* This experiment will endeavour to relate this perceptual response to two potentially concurrent events--cognitive and attitudinal learning from television.

The conjugate reinforcement measure relates to other theories of attention presented previously. Lewis (1973) pointed out that this measure is a mediating response since it directly affects the probability that the stimulus

will be presented. It also fulfills the requirements of the orientation response which increases a subject's contact with the stimulus. Lewis also noted that it satisfies the cognitive view of attention since it provides an outside index of the value of the stimulus to the subject, and may therefore provide an experimenter with some idea of the subject's cognitive state.

In this study, although all the former definitions of attention apply, the one which stands out as most illustrative of the thrust of this research is attention as a state of arousal. Subject responses in the laboratory are an overt indication of the degree of arousal. The assumption made for the classroom portion of this study (yet to be described) is that this arousal in viewers is still created by the TV programmes even though it is not overtly measured. Instead, the effects of attention on recall and attitude changes are determined. The rationale is that there must be attention (arousal) before learning.

III. METHOD

HYPOTHESES

OBJECTIVES

The purpose of this study was to test the following theoretical hypotheses:

1. Segments of an educational television programme that use "attention-getting" techniques in production will cause a significant increase in viewer's attending behaviour when compared to those segments that use a

simple presenter format.

2. Segments of an educational television programme identified in the lab as eliciting high attending behaviour will produce a significantly greater amount of recall of factual information from the programme shown in a regular classroom when compared to segments identified as eliciting low attending behaviour.
3. Segments of an educational television programme identified in the lab as eliciting high attending behaviour will produce a significantly greater amount of attitude change compared to those segments identified as eliciting low attending behaviour, when the programme is shown in a regular classroom.

Rationale for Hypotheses

Logical support for Hypothesis 1 can be drawn from a variety of studies. Berlyne (1951) presented cards containing different visual patterns at different rates of presentation to subjects. His findings showed that a recently changed stimulus was more often responded to by the viewer than one which had remained unchanged. Further he found that *"the effect was particularly strong and persistent if the changed stimulus continues to undergo changes."* The overall conclusion was that movement in the form of changes in visual images affects attention.

Similar results were found in a study conducted by Guba et al (1964) in which eye movements were studied during a television lecture. It revealed a phenomenon termed "blooming" which frequently occurs when *"the gaze begins to wander after a long sequence showing nothing but the presenter talking."* Upon the introduction of a new object, or movement of some type or of a scene transition, the blooming ceases abruptly as the eye

shifts to the new centre of attention.

In the advertising research field, several studies have looked at attention and what will induce it. One conclusion they reached was that *"message monologues consistently turn kids off"* (Rust and Williams, 1975). These same authors have said that this conclusion also holds for both high-schoolers and adults.

Specific techniques for getting and holding people's attention have been documented by advertising people. For example, there is the recommendation: *"for attracting and holding children's attention moving pictures are much better than still pictures, and pictures of any kind are better than words"* (Rust and Williams, 1975). The use of graphics with pointing as an attention-getting technique has been documented as well, this time by educationalists. Barrington (1972) compared the use of diagrams and film in a TV production; he found that employing diagrams in a production was significantly more effective in promoting learning than motion pictures. There was no measure of attention taken during the course of the experiment but I would opine that the reason for the increased learning was increased attention. An explanation of the potential effectiveness of graphics was given by Lumsdaine, Sulzer, and Kopstein (in Anderson, et al, 1969). They investigated the effects of animated cues (arrows) on learning from an instructional film and found them to be very effective *"in the way they stress and clarify specific*

informational content, and in the way they direct attention to key aspects of a complex visual scene by precise timing of visual indicators keyed to the narration."

Objections to the use of the conjugately programmed response technique for measuring attention and in the forecasting of recall and attitude change might be based on the argument that the results obtained in the experimental environment may not be generalizable to the classroom situation. Hypotheses 2 and 3 are intended to prove that there is a close correlation between experimental findings and real-life classroom situations.

Substantial justification for these hypotheses lies in the advertising research field, where most of the studies in this area have been conducted.

Nathan and Wallace (1965) reported a study comparing the effectiveness of two types of commercials in both a laboratory and a non-laboratory setting. In the laboratory environmnet, 33 subjects watched part of a football game that was interrupted with several commercials. Their viewing behaviour was studied using the conjugate analysis apparatus, and their preference for one commercial over another was determined by studying the pressing rates during each commercial break. The commercials were then ranked according to how much viewing they induced. In the field portion of the study, 408 subjects who satisfied the selection criteria were interviewed over the phone. All had watched the football game and commercials

at home. They were queried about the commercials so that their recall of them could be determined. The commercials were then rated according to the level of recall each produced. It was found that *"response obtained preference measures for viewing commercials correlated perfectly with the recall of commercials."*

Wolf, Newman, and Winters (1969) carried out a modified experiment using the same technique. A magazine format was put together using various articles from real magazines. Each page was put onto a slide so that the whole "magazine" could be viewed on a screen using the conjugate analysis technique. Three experimental trials were conducted using three groups of women from various social and educational backgrounds. For the three groups the procedures were the same as those described above except that instead of watching a television screen, they viewed the magazine using the medium of slides. The articles were then rated by the amount of pressing behaviour (attention/interest) each evoked. In the field study, 300 women were interviewed by telephone and their recall of the same articles shown in the experimental treatments but read in real magazines at home was determined. These articles were then rated for each treatment according to how much was recalled. It was found that in all the treatment groups there was a good correlation (r_S=.80, $p < .01$) between the response ratings of the articles and the recall ratings derived from the

real life environment.

Finally, from their research on the satiation effects of TV commercials, Grass and Wallace (1969) hypothesized that when a commercial is shown repeatedly to a viewer, the viewer's attention first increases to some maximum level after which it declines to some equilibrium level. Concurrent with an increase in attention, *"there occurs an increase in cumulative learning of the information available in the commercial as well as an increase in attitude levels."* The attitudes here referred to attitude towards the products presented in the commercials. Studies using the conjugate analysis technique showed their hypothesis to be essentially correct, and that the experimental environment could forecast real life results.

Operational Definitions

1. SIMPLE PRESENTER FORMAT: Refers to the use of a medium close-up (chest, shoulders and head) shot of the presenter as he reads the narration.
2. ATTENTION-GETTING TECHNIQUES: Refers to the use of slides, film sequences, or graphics with pointing as the visual element in segments of a television production while the presenter reads the narration off-camera.
3. EDUCATIONAL TELEVISION PROGRAMME: Refers to one of the three programmes to be produced on the topic of forests and fires. Each presentation will be approximately

12 minutes in length and will contain the same narration. Out of the ten instructional sequences in each programme, five will be in an "attention-getting" format, and five in a "simple presenter" format.

4. Order of presentation: Refers to the order and placement of the five "attention-getting" segments and the five "simple presenter" segments. The placement and order of the segments is illustrated in Figure 1.

5. Attending behaviour: For the proposed study, attending behaviour is taken as an overt indication of the person's attention level. It will be measured by recording the rate of response to the stimulus (television programme) as controlled and measured by the conjugate analysis apparatus. The cumulative recorder portion of the apparatus will record the rate of response automatically but in addition an assistant to the researcher will record the numerical rate of response as indicated by the counter on the apparatus.

6. High vs low attending behaviour: There are ten segments in each of the three programmes produced. The five segments that elicit the highest attending behaviour as measured by the response counter, and those five segments that elicit lowest attending

behaviour will be categorized accordingly: high and low.

7. CONJUGATELY PROGRAMMED RESPONSE APPARATUS: Also referred to as conjugate analysis apparatus, is the equipment which relates the response (pressing) to the stimulus (brightness of the television programme), and also maintains an automatic record of the subject's attending behaviour in the form of pressing rates.

8. RECALL: Refers to recall of cognitive information presented in the TV shows as measured by a multiple-choice questionnaire given immediately after the viewing of one of the TV programmes.

9. ATTITUDE CHANGE: Refers to a change at the valuing or more specifically at *"the acceptance of a value"* level (Krathwohl et al, 1964) concerned with the ascribing of worth to a phenomenon, behaviour, or object. For the proposed study, the attitude under investigation is attitude towards the content of various segments of the programme. For example, towards spending more money on forest fire prevention campaigns. It will be measured by a five point (Strongly Agree-Strongly Disagree) Likert type attitude scale.

10. EXPERIMENTAL ENVIRONMENT: Refers to the lab carrel in which a subject's attending behaviour, while viewing a television programme, is measured. It is schematically represented in Figure 2.

11. Regular Classroom: Refers to a normal high school classroom for 30-35 students. Subjects will view a TV monitor placed in the front of the classroom.

Instructional Concept Number	Description	Programme 1	Programme 2
1.	Importance of Forests	Slides	*
2.	Amount of Destruction	*	Film
3.	Types of Forest Fires	Graphics/ Pointing	*
4.	Causes of Forest Fires	*	Graphics/ Pointing
5.	Ways to Fight Forest Fires	*	Film
6.	Lightning Fires	Film	*
7.	Burned Forests	Graphics/ Pointing	*
8.	Benefits to Animals	*	Slides
9.	Conditions for Controlled Burning	Film	*
10.	Methods for Controlled Burning	*	Graphics/ Pointing

NOTE: An asterisk (*) indicates that the presentation format was "presenter only".

Figure 1. Presentation Formats for Programmes 1 and 2

Operational Redefinition of Hypotheses:

The operational redefinition of the three general hypotheses stated previously are:

1. Segments of an educational television programme that use "attention-getting" techniques such as slides, film sequences, and graphics with pointing will cause an increase in attending behaviour (as measured by a conjugately programmed response apparatus in an experimental environment), when compared to those segments that use a simple presenter format (ie. presenter is talking on camera).
2. Segments of an educational television programme indentified by a conjugately programmed response apparatus as eliciting high attending behaviour in an experimental environment will produce a greater recall of factual information when compared to those segments identified as elicitiing low attending behaviour. Recall will be measured in school lessons by a multiple-choice questionnaire given as a post-test after the programme is shown in a regular classroom viewing situation.
3. Segments of an educational television programme identified by a conjugately programmed response apparatus as eliciting high attending behaviour in an experimental environment will produce a greater attitude change towards the content of those segments when compared to other segments identified as eliciting low attending behaviour. Attitude change will be measured by a Likert type (5 point) attitude scale given as a post-test immediately after the recall questionnaire.

Population and Sample

The population from which the sample was drawn for this study consisted of English-speaking high school students from the Montreal area. Tha average age of the subjects was sixteen (16) years and their socio-economic status ranged from the lower to the upper-middle class. However, the programmes could be used with any age group from fourteen upwards. The experiment, which was in two parts, had two sampling procedures.

In Part 1, the students watched a TV programme in an experimental environment where he/she had to press a button repeatedly in order to maintain the picture brightness. Subjects for this portion were drawn from two high schools--The High School of Montreal, and The Study. Guidance Counsellors were asked to provide student volunteers for the study. Students came to the Educational Technology lab in the Educational Department where they went through the procedures and had their responses controlled and monitored by the conjugately programmed response apparatus. Eighteen (18) students participated in this initial portion of the research. Individuals up to a total of nine (9) viewed one of the two television programmes. They were randomly assigned to one or another of the two programmes, thus controlling for selection bias. However, an empirical check on group equivilence was difficult because no measures of scholastic ability were available. In their absence, the only

other measure was the relative numbers of males and females in each group. Each group was found to have five (5) females, and four (4) males. This suggests the object of randomization was achieved--the two groups were equivalent.

Part II of the research took place in two other Montreal high schools--John F. Kennedy, and Lester B. Pearson. Students were allowed to view a particular TV programme in the regular classroom. After the viewing, these students were asked to complete a recall questionnaire and an attitude change scale. Sampling was provided in this case by taking classes in the prescribed category and assigning them on a random basis to one of four programmes tested.

A total of eight (8) classes viewed one or another of the programmes (three treatment programmes and a Hawthorne control), and this involved a total of one hundred and seventy-six (176) subjects.

Selection of Subject Matter

General:

The subject of the three television programmes that were produced was forest fires. The topic and the instuctional content was taken from an earlier piece of research (Edwards, 1974); however, a good deal of editing on the script was done so that the programme length could be reduced from 18 to 10 minutes. The content was of general interest and related to campaigns by such agencies

as Environment Canada for less damage to our forests.

Suitability

The choice of forest fires as the topic for the TV production was based on a number of factors. First, there was the concern over potential bias that might occur due to "history"; that is, the chance that some of the subjects may have already known the content of the programmes before seeing them. A check on the curriculum and discussions with social studies teachers indicated that most of the instructional content would be novel. Second, the level of learning required for the content as presented was relatively low--specifically at the knowledge level (Bloom, 1956)--and therefore, could presumably be handled by high school students.

Relevancy

Besides being relevant to the general campaign for better protection of our forests, the material did fit into the learning scheme of the students' respective schools. All classes involved were either History or Geography classes. The topic was particularly relevant to the latter type of class because part of the instruction involved segments on forest structure and physical geography (how fire burns on hills and valleys). The Hawthorne control was about the history of logging in early Canada. This latter story was novel, well produced

and though of special interest to History classes it did present some general information about Canadian history that most people would find interesting.

FEASABILITY

A source script, as already mentioned, was available. After editing the script, the source materials needed for production were determined. These included slides, graphics and film sequences--the first two of which were time-consuming to make or obtain but were otherwise easy to come by. The film sequences were available from several National Film Board of Canada films--Fighting Forest Fires with Handtools, and Aircraft in Forest Fire Control. Permission was sought and received to use portions of these films. The actual TV production could be done in the studio facilities at Concordia University. In addition, the author was aware of several former or current members of the Educational Technology programme who could act as a production crew; members of the final production crew are named in Appendix K. Therefore, from the point of view of production, there were no insurmountable problems and the project looked feasible.

The first area that might have been a problem was in locating subjects for the study. Due to an overabundance of researchers in the Montreal area, special permission to carry out a research project had to be sought from the appropriate authorities. For those schools in the

Montreal Catholic School Board that were contacted for co-operation, it meant getting permission from the Board's offices.

For Part I of the study, individuals from downtown high schools were needed to interact with the conjugate analysis apparatus. Initial permission to use these subjects was obtained from the principals of the schools concerned.

Preparation of Instructional Materials

Script Origin

As mentioned previously, the script used was the edited version of an earlier one prepared on the same topic. In the edited version, the principles of good script writing, such as proposed by Hilliard (1967) and Willis (1961), were applied. The scripts for the three programmes produced are given as Appendix C.

Script Symbols & Abbreviations

An arabic numeral placed flush with the left margin designates the shot number for both video and audio portions. Shots were sequentially numbered in all three programmes. The shots which corresponded to a particular instructional concept were not necessarily the same in each programme; the exact correspondence is given in Appendix B.

To the right of each arabic numeral is a line. Immediately above the line is the number of the camera taking the video for that particular shot. For example, in Programme 1--

II. CAM 2 / MCU "Presenter" indicates that shot II involved camera 2. The description below the line further indicates that the type of shot in #II was a medium close-up (MCU) of the presenter. Change in shots were indicated by a term in UPPER CASE letters, such as CUT or MIX, between the shots.

Script terminology and general production techniques were based on recommendations by Davis (1975), Millerson (1976), and Zettl (1961).

Instructional Content

The information to be presented consisted of ten instructional concepts, each concept being made up of three instructional units. These concepts and units, based on the topic 'Forest Fires', are presented in Appendix D. As can be seen in the Appendix, the fifth instructional concept is--Ways to Fight Forest Fires. This concept has three subunits:

1) Canada spends over $18 million a year to fight forest fires.

2) Money is spent on lookout towers, bulldozers, and waterbombing aircraft.

3) Prevention is the most effective way to fight forest fires.

Production of Materials

Graphics, Slides, Film Inserts

Twelve graphics were produced for segments in Programmes 1 and 2; in addition, thirty-five slides were made from which twelve were eventually chosen for the same programmes. The slides were made on a copy-stand using reference materials from the Concordia University Science Library. Basic techniques for producing audio-visual materials, as outlined by Kemp (1975), Morlan (1963), and Minor & Frye (1970), were followed in the production of these materials.

The film inserts (VTR) for the programmes had to be dubbed onto one inch videotape at the McGill University studios because of temporary difficulties with equipment at the Sir George Campus. These segments were in turn edited at the Sir George studio to make the final inserts. As a result the final tapes of the production included third or fourth generation inserts. This was seen in the quality of the inserts compared with the actual studio recordings. However, the discrepancy was not large enough to cause concern.

Set & Lighting Arrangements

The arrangement of the set and lighting for the production are shown respectively in Appendices I and J.

EDITING

The major editing was done on the inserts previous to the actual production date. Little editing was required on the product coming out of the studio; the only major work being done after the production date was the dubbing of the master tapes to make two sets of copies. The copies were made on 3/4 inch cassettes for the classroom study and 1/2 inch cassettes for the laboratory portion.

CONJUGATE ANALYSIS

TECHNIQUE

A response, pressing a button, is used as the operant, that is, this behaviour operationally defines attention. In the lab, the subjects individually sat before a TV receiver which was modified so that the brightness of the screen is controlled by a hand-held switch. In order to illuminate the picture, the switch must be pressed several times, in other words, the operant behaviour must be demonstrated. By continuously assessing the degree of attention (defined functionally), it is possible to determine how much attention is paid to the picture.

The recording is done by a pen on a paper graph that moves on a roller drum at about 60 cm/hour, with each response measured on the passing record by an upwards movement of the pen. Appendix A provides an example of the record produced be an individual who watched a ten minute educational programme under the conjugate

analysis conditions. The rate of response is indicated by the upward slope of the line. Steady rates of response are indicated by an upwards sloping line while stoppage can be identified as horizontal portions in the response line. The apparatus and procedures used in this experiment resemble the arrangements made by Lindsley in his original research (1963). Later researchers made some adjustments in the procedure so that the pressing rate could be adjusted to an optimum level for each person prior to the start of the experiment. These refinements by Nathan & Wallace (1965) were not considered necessary for the purpose of this experiment.

However, to provide additional information for statistical purposes, a numerical rate of response was also recorded. Because, a counter was part of the recording apparatus, it was easy for an assistant to note the number of responses during a particular shot. Data obtained in this manner could be used for various statistical tests although it is not necessary in the overall assessment of any particular programme. That is, a television producer could gain valuable programme information simply by looking at the viewing record shown on the cumulative recorder (cf. Appendix A).

Experimental Environment

The viewer's enclosure and relevant recording apparatus is diagrammed in Figure 2. The enclosure was comfortable, but isolated from other persons and unwanted variables

which might have disturbed his viewing behaviour. In the case under study, the television was on a desk about five feet from the viewer. The subject held a small hand-switch which produced a brief, slight increase in the brightness of the image. As in Lindsley's arrangements, the response definer converts each press of the switch to an electrical impulse which operated the conjugate reinforcer. Thus high rates of pressing (above 100 per minute) kept the picture brightly illuminated for comfortable viewing, intermediate rates of response kept the picture at a dimmer but visible level, and during no pressing the tube was dark. The assistant and experimentor monitored the TV programme by having a small TV set in their own room.

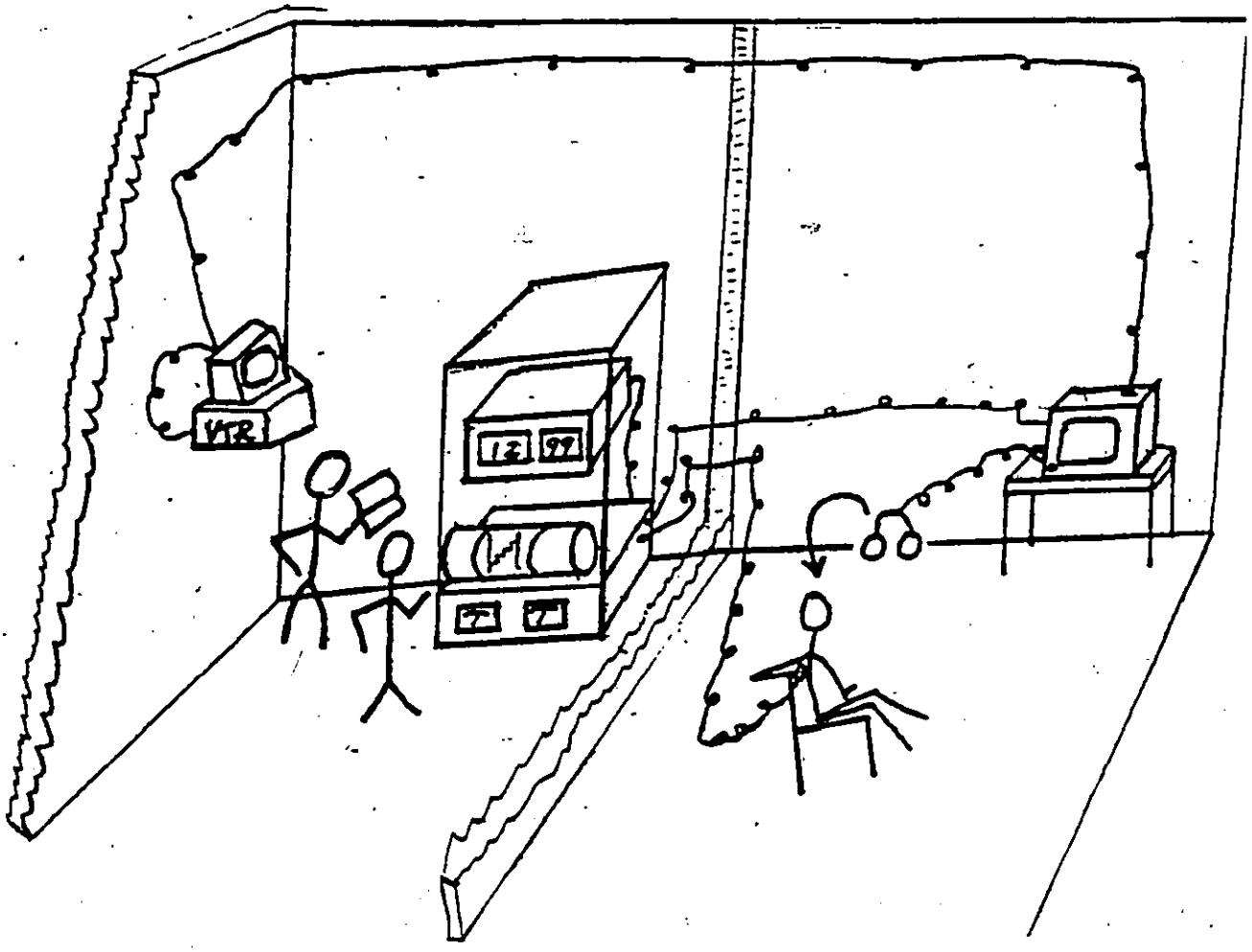

Figure 2. The conjugate analysis laboratory environment showing the experimentor and subject rooms, and associated equipment.

Tryout of Apparatus and Instrutional Materials

Apparatus

The procedure and apparatus/environment just described were in a modified form. These modifications were based on a tryout held previous to the actual experiment.

The initial testing of the conjugate analysis apparatus took place in July, 1977. Ten (10) subjects in all were monitored as they viewed an 18 minute television programme. The TV productions used in the final study were not available for the developmental testing session.

Based on the observations of the researchers and the subjects themselves, the following alterations in the technique and/or apparatus were made:

1. To reduce distracting noise from the recording apparatus, the subject's room was moved further from the experimentor's. In addition, earphones were introduced for use by the subjects.
2. The apparatus itself was altered so that the rate of rotation of the revolving drum on the recording apparatus was changed from about 30 cm/minute to 60 cm/minute. This change made the measurements more likely to reflect subtle (1-2 sec.) changes in attending behaviour.
3. Tha amount of attending behaviour required to maintain a bright TV picture was increased. This alteration was intended to bring the required attending behaviour closer to the average person's optimal level.

Pre-testing of Instructional Materials

There was no pre-testing of the three instructional TV programmes that were produced, nor for the fourth programme--the Hawthorne Control. The major reason for this was that the first three programmes were based entirely on an earlier script, the content of which had

been tested on several hundred subjects. Since the fourth programme was a control, no pre-test was required.

Test reliability and item reliability generally conducted during the pre-test were carried out using the results from the various treatment groups.

Criterion Test

General

This experimental study had two parts. Part I involved individuals in a laboratory setting; Part II involved regular school classes being studied as groups.

Part I - Laboratory Setting

In this section, there was no criterion test involved. Instead, there was a continuing monitoring of and interaction with the individual subjects by the conjugate analysis apparatus. The record of the attending behaviour was also recorded by the research assistant, but in a numerical form (rate/unit time). Details of this arrangement have been given previously in the review of the literature.

Part II - Classroom Setting

Two criterion tests were used in this part of the study, one involved recall, the other attitude change.

A. Attitude Change

An attitude change measure consisting of 40 items using a five point Likert-type scale (Strongly Agree-

Strongly Disagree) was manufactured. This instrument was used to determine the attitude change of the subject towards the topic presented in the TV programmes. Four questions for each of the ten instructional concepts being evaluated were drawn up. To avoid the possibility of a 'halo effect' resulting from the questions all being worded in a positive or negative manner, both positive and negative items were used. For example, referring to instructional concept #1--Importance of Forests--the four corresponding questions were 16, 21 (positively worded), and 1, 36 (negatively worded). The difference in wording is clearly seen below:

Question 1. The forest industry is not important to the Canadian economy.

Question 2. The forest industry is a major contributor to Canada's Gross National Product (GNP).

As one of the two criterion tests, this measure was administered to each class immediately after the programme viewing. A copy of the original test is given in Appendix G.

B. Recall

There were 30 instructional units presented in Programmes 1, 2, and 3. From each of these 30 units a corresponding question, measuring recall of a particular unit, was constructed. Because all the questions were based on one or another of the instructional units presented in the programmes, 'content validity' (Tuckman,

1972) was guaranteed. The original questionnaire, which was administered immediately after the attitude change measure, had 30 items. The test was given a multiple-choice format (A,B,C,D,E) in which there was only one right answer for each of the thirty questions. A copy of the recall questionnaire is given in Appendix G.

In addition, a summary of instructional concepts vs corresponding items in both the recall and attitude change measures is provided in Appendix E.

Validation of Criterion Tests

No reliability studies were conducted on the criterion tests prior to their use in the present study. Instead, the procedure followed was this: after the showing of the programmes and the administration of the tests in the classrooms, the tests were subjected to reliability, item analysis and other checks. 22 subjects from the main group of 176 participants were used to provide the scores for validation of the tests. Items that did not meet the standards for discrimination, difficulty, and/or reliability were dropped before any further analysis of the data was undertaken.

The reason for following this approach and not using a pilot study was to avoid attrition among the subjects who were to participate. Conducting a pilot study means you have 20-30 fewer subjects for the final study.

Attitude Change Measure

For the attitude change measure, inter-item reliability was calculated for each item using the Pearson r. The correlation between scores made by all subjects on the whole test with the scores made by all subjects on each item ranged from a low of -.069 to a high of .696. The overall test reliability was measured using the alpha coefficient--*"the alpha coefficient of internal consistency reflects the degree of reliability among the items of a scale, in terms of overlapping variance"* (Veldman, 1967). The formula used (below) is a generalization of the Kuder-Richardson formula for dichotomous items:

$$\alpha = \frac{K}{K - 1}\left[\frac{\sigma_T^2 - \sum_{2}^{K} \sigma_I^2}{\sigma_T^2}\right]$$

where: I = item number

T = total (or subscale total)

K = number of items in the scale

The coefficient for the original test with 40 items was $\alpha = .76$. Twenty items that did not reach a suitable level of reliability were dropped, leaving the remaining twenty items (used in the final analysis), with an $\alpha = .79$. A summary of the information utilized in the calculations for the item analysis and reliability determination are found in Appendix H.

Recall Measure

Using the results from the same 22 subjects (who received Programme 3), discrimination and difficulty indices for each of the thirty items on the recall questionnaire were determined. The results of these calculations

for the whole test was determined using the K-R_{21} formula (also shown in Appendix H). For the initial 30 items recall questionnaire, r_{xx}= .85. Because several items (Q's 4, 7, 8, 10, 11, 13, 17, 27) had very poor discrimination and/or difficulty ratings, they were dropped and the K-R_{21} formula was recalculated for 22 items; the new value was r_{xx}= .73.

The drop in the reliability coefficient occurred because several of the items left out contributed a large percentage of the test variance in the original calculation. However, since r_{xx}= .73 is an acceptable level, and all the remaining items had relatively good difficulty and discrimination ratings, it was decided to use these 22 items for the final analysis. (These final items are without the asterisk in the recall reliability section (Table 3) of Appendix H).

Experimental Design

The experimental design for this study was in two parts, a laboratory portion and a normal classroom portion.

Part I: Laboratory Study

A one way analysis of variance (1 x 2) was used to evaluate relative attending behaviour. The design can be diagrammatically represented as follows:

	X_1	O_1)	Programme 1
	X_2	O_2)	
R			
	X_1	O_3)	Programme 2
	X_2	O_4)	

Where: X_1= Simple presenter treatment

X_2= Attention-getting treatment

O_1= Measure of attending behaviour

R = Randomly assigned to programme 1 or 2

Note: Each treatment X_1 or X_2 act as the other's control.

FIGURE 3 EXPERIMENTAL DESIGN FOR LABORATORY STUDY

Each programme had ten instructional units. In both programmes, five of these units or segments employed attention-getting techniques (eg. slides, film sequences, and graphics with pointing), while the other five segments employed the 'presenter only' format (presenter talking on camera). Refer back to Figure I for an outline of the arrangement of production techniques with each programme.

To carry out the analysis of variance, O_2+ O_4 (the attending behaviour for attention-getting segments in programmes 1 & 2) and O_1+ O_3 (the attending behaviour for the simple presenter segments in Programmes 1 & 2) were used as the data. Since each programme had five simple-presenter segments and five attention-getting segments, and there were two programmes, the "within" degrees of

freedom will be 18. With only two programmes, the "between" degrees will be 1. Significance was taken at the $p \leq .05$ level.

The procedure used to convert data on attending behaviour into a form suitable for data analysis is given in the Statistical Procedures section.

Part II: Classroom Study

Part II involved showing four programmes to high school classes in their regular classrooms. Each class saw only one of the programmes, and then was given an attitude questionnaire based on the content of the programmes screened.

To control for the effects of history, a Hawthorne control group was used. This group was shown a programme on logging which contained no reference to the content of the treatment programmes. A simple control (containing all simple presenter segments) was added as well so that possible interaction effects between various segments in Programmes 1 and 2 can be studied. As in Part I, an analysis of variance was carried out but the design changed to a 4 x 1 way design because of the extra control groups. The design can be represented as follows:

$X_1\ O_1\ O_9$	Programme 1
$X_2\ O_2\ O_{10}$	
$X_1\ O_3\ O_{11}$	Programme 2
$X_2\ O_4\ O_{12}$	

X_0 O_5 O_{13}

X_0 O_6 O_{14} Programme 3

H_0 O_7 O_{15}

O_8 O_{16} Programme 4

where: X_1= Segments with high attending behaviour

X_2= Segments with low attending behaviour

O_j= Scores on a cognitive questionnaire, scores are made on questions which correspond to the ten instructional segments in each treatment programme. (j = 9 to 16)

O_i= Scores on an attitude change scale, scores are made on items that correspond to the ten instructional segments in each treatment programme. (i = 1 to 8).

H_0= Hawthorne control programme

--------- = Intact classes were used.

FIGURE 4 RESEARCH DESIGN - CLASSROOM SETTING

As the above design illustrates, results in each type of questionnaire will be analysed by comparing the effectiveness of the segments identified as eliciting high attending behaviour with those identified as eliciting low attending behaviour. In other words, for the attitude measure the analysis of variance will be comparing (O_{13}+ O_3) vs (O_2+ O_4) vs (O_5+ O_6) vs (O_7+ O_8). For the

recall measure, the analysis will look at (O_9+ O_{11}) vs (O_{10}+ O_{11}) vs (O_{12}+ O_{13}) vs (O_{14}+ O_{15}). Significance in the statistical tests used will be taken at the $p \leq .05$ level.

VARIABLES

Independent: There is one discrete independent variable: type of visual format in a television programme. There are four levels of this variable:

1) Simple presenter format (X_1)
2) Attention-getting format (X_2)
3) Simple Control Format (X_0)
4) Hawthorne Control (H_0)

The difference between X_1 and X_0 is that X_1 refers to simple presenter segments that are integrated with attention-getting segments, for example, in Programmes 1 and 2, X_0 refers to simple presenter segments that are not integrated with other types of segments, for example, Programme 3 contains all X_0 segments. (In Part I of this experiment, X_1 and X_2 segments act as each other's control).

Dependent: There are three dependent variables (Interval):

1) Attending behaviour (measured by conjugate

analysis apparatus.

2) Cognitive recall of factual information as measured by a multiple-choice questionnaire.

3) Attitude change as measured by a rating scale instrument.

Control:

1) Scholastic ability and sex of the subjects.

2) The total time span of the presentations.

3) The same instructional concepts and the same narration will be used.

4) The same or nearly the same physical conditions, and screen brightness will be maintained in all classrooms similar controls for individuals will be carried out in the experimental environment.

5) The conditions for completing the post-tests, for example--similar instructions given out, no time limit, will be kept the same.

Testing Procedures

Part I - Laboratory Environment:

The setting for Part I of the study will be summarized here for easy reference. The viewer had his own

room in which there was a chair facing a television set atop a table about 5 feet away. The television set used was a Sony 14 inch colour unit. Earphones connected to the TV were used on every individual to cut down on possible extraneous noise. Each taped programme had a 30 second colour bar and tone prior to the beginning of the introductory scenes and music. Subjects controlled the brightness of the screen by using a button-press switch that was held in the hand.

The experimentor had a separate room where all the conjugate analysis apparatus was located. A 12 inch black and white television monitor was used to follow the progress of each programme. The experimentor sat close to the response recorder so that he could monitor the attending behaviour and mark all changes in shots and any other interesting points on the moving graph. The experimentor's assistant was in a position to monitor the TV screen and at the same time record the result from the numerical response counter. In this way, a record of attending behaviour that might be used in statistical analysis was available.

Experimentation took place during after-school hours (4 - 6 p.m.) between the 3rd and 19th of October. Subjects came in small groups of 2 or 3 people and were asked to sit in a waiting room until called. When the appropriate videotape was in the VTR machine and all other equipment was ready, one person was called in and taken to the subject's room. Written instructions were

then read to him (her): the instructions explained what he (she) was to do. Appendix F contains a copy of these instructions. The tape was then started and the subject's attending behaviour recorded in two ways:

1) on the cumulative recorder, and

2) on the response counter after each shot.

After the programme finished, the subject was taken to a nearby room where he was given instructions to complete both questionnaires. While one subject was working on the tests, the next subject was brought into the subject's viewing room and the procedure was repeated. After the tests were completed, each subject was free to go.

Part II - Classroom Study

Experimentation took place on two consecutive school days--October 5, 1977 for Lester B. Pearson School and October 6, 1977 for the John F. Kennedy School.

The equipment and materials used included:

1. 2 Sony 3/4" Videocassette Players
2. 2 Admiral 26" Colour Televisions
3. 2 48" Television Stands
4. 4 3/4" VTR Cassettes (programmes)
5. Attitude Change and Recall Questionnaires
6. Computer Answer Cards
7. Pencils (IBM Electrographic)
8. Sheet Containing General Instructions to Students.

Arrangements were made so that all the rooms used

for the study could be darkened. In addition, the television monitor was located in the classrooms so that the maximum viewing angle was less than 30 degrees for the students nearest the receiver (Gordon, 1970).

Once the students were seated, the experimentor read out an introduction and some instructions. Next, the room was darkened and the programmes screened. The thirty seconds of colour bar and tone was used to adjust the picture quality and sound. After the programme finished, the experimentor read out further instructions and distributed questionnaires, pencils and other required materials. Refer to Appendix F for copies of the various instructions, both verbal and printed, that were given to the subjects.

The students marked their answers on computer cards. When everyone had finished, subjects passed in their answer cards and the experimentor was replaced by a teacher for whatever time was left in the period.

This procedure was repeated for all eight of the classes involved.

Test Scoring

Both attitude change and recall questionnaire answers were marked on computer cards. These cards were then run through a computer, and printout summaries of answers were obtained. Results were hand-checked against the original data to ensure accuracy.

The result from all the subjects who took part in the experiment were not used. Those subjects who

had not completed their questionnaires were immediately discarded from the analysis. Resultant subject group sizes ranged from 22 to 28. Subjects were randomly discarded from the larger treatments until a size of 22 was reached for each. Equal group size was a prerequisite for the type of analysis to be carried out on the data.

Statistical Procedures

Part I

Two types of data were collected in this part of the study--numerical (recorded by the assistant from the counter), and graphical (recorded by the automatic recording apparatus with highlights marked by the experimentor).

The numerical recording was done after each segment in the programmes studied. For example, in Programme 1, there would be a count after segment 1 (Instructional Concept: Importance of Forests) which had a format of slides, also a count after segment 2 (Instructional Concept: Amount of Destruction) which used only the presenter talking, and so on through all the ten segments. The presentation formats for all segments in both Programmes 1 and 2 were provided in Figure A.

The procedure to transform the numerical data from their raw form into a usable format is described below:

1. Each segment (ie. 36-96 seconds or whatever) of the programme shown had the attending behaviour it elicited measured by an assistant from the counter.
2. Attending behaviour for each segment was totalled for all subjects who saw a particular programme. This figure was then averaged to give the mean pressing rate for each segment.
3. The segments in each programme were measured and their length in seconds recorded.

4. A conversion factor for each segment was determined by dividing the length of the segment by a figure which yielded an amount per 10 seconds. For example, if a segment length was 47 seconds, the figure needed to produce 10 seconds is 4.7. This number became the conversion factor.

5. The average pressing rates were then divided by this factor to yield a rate per 10 seconds for each segment.

The figures from Step 5 could be used in an analysis of variance or some other statistical test.

The cumulative records (graphical) for subjects in the lab environment were not analyzed to any depth in this research, and the major reason for this was statistics. This researcher was intent on trying to establish some statistical proofs, and the cumulative records simply did not lend themselves to this approach. That is not to say that these records aren't valuable, in fact, they are very important and would, if analyzed, have shown the same effective or ineffective segments as were pointed out in the numerical data. The usefulness of the cumulative record to researchers generally and television producers in particular cannot be denied.

PART II

Students marked their answers to each questionnaire on one of two computer cards (standard 80-column type).

On the attitude change measure, students marked the 5-item Likert type scale for all forty statements. Positively

worded statements, for example, "The forest industry is important to Canada's economy", were valued at 5 for Strongly Agree (SA) down to 1 for trongly Disagree (SD). Negatively worded statements had the opposite value, 1 for SA and 5 for SD. The maximum score for the original 40 items in the scale was 200; for the 20 items used in the final analysis the best score could be 100.

On the recall measure, students had a choice of four responses, only one of which was correct. A single point was given for each correct answer selected; no points were given for wrong answers. The original recall measure had 30 items but after bad items were dropped only 22 remained. Themaximum score for the items used in the final analysis was 22 x 1 = 22 points.

Analysis

Means and standard deviations for data in Part I (rates of attending behaviour) and in Part II (test scores) were calculated. Data was then submitted to an analysis of variance, which divides the sum of squares into additive parts to which the Newman-Keuls method of multiple comparisons was then applied with a pre-specified significance level of .05. Three sets of comparisons were executed:

1. Comparisons of means (attending behaviour) between the combined attention-getting segments of Programmes 1 and 2 (Treatment 1), and the combined simple presenter segments in the same programmes (Treatment 2).

2. Comparison of attitude changes scores generated from the above combinations with the scores generated from Programmes 3 and 4. In other words, four sets of scores were compared.

3. Comparison of recall scores for the same groups in 2 above.

For each set of comparisons, means were ranked from low to high, studentized ranges (applicable for equal treatments and equal numbers of subjects) were computed for ordered pairs of means, and the criterion values for sequentially adjacent means for the specified degrees of freedom were determined. The Newman-Keuls method used followed the steps in Ferguson (1971, pp. 271-272).

RESULTS

ATTENDING BEHAVIOUR

Part I (laboratory setting) of the experiment sampled nine subjects for each treatment group (N = 18). Since no measures of scholastic ability were available, the only measure of equivalence of groups was the number of males and females in each. The distribution of sexes among the groups, as well as the means and standard deviations for each group on the measure of attending behaviour (expressed as responses/10 seconds) are given in Table 1. The numbers presented in this table show that the groups who watched Programmes 1 and 2 were well balanced in terms of sex.

The analysis of variance in Table 2 indicates significant effects ($p \leq .01$) between the two treatments; Treatment 1 consisting of segments utilizing complex production shots from Programmes 1 and 2 (complex video), while Treatment 2 consisted of simple segments using only the presenter talking (simple video). Examination of the means revealed that the complex production segments ($\bar{X}_1 = 20.7$) produced significantly more attending behaviour than the simple production segments ($\bar{X}_2 = 17.5$). Since an important difference between Treatments 1 and 2 was found, the Newman-Keuls test was applied to validate significant mean differences (Table 3). The complex production segments (complex video) were found to be significantly better ($p \leq .01$) at eliciting attending behaviour than the simple

presenter segments (simple video).

The attending behaviour means of the segments in Programmes 1 and 2, and their degree of effectiveness in eliciting attending behaviour are given in Table 4. In both Programmes 1 and 2, the attention-getting segments--those with slides, graphics, and film sequences as visual elements (complex video)--elicited a higher responding rate than the corresponding segments that had only the presenter talking (simple video) as the visual element.

The ranked effectiveness of various production techniques in eliciting attending behaviour, as shown in Column 3 of Table 5, indicates a rather marked similarity between programmes. The relative advantages of complex video vs simple video techniques is also apparent in this table.

Recall

Part II (classroom setting) of the experiment sampled forty-four subjects for each treatment and the control group (N = 176). No standardized measures of scholastic ability were available for all groups; however, in the two schools from which the sample was drawn the students had been randomly assigned to their classes. In Part I, the attention-getting segments in both Programmes 1 and 2 were shown to be the most effective in eliciting viewing behaviour. Means and standard deviations for the recall scores corresponding to combinations of these segments are displayed in Table 5.

TABLE 1

MEANS AND STANDARD DEVIATIONS OF ATTENDING BEHAVIOUR FOR EXPERIMENTAL GROUPS
(Expressed as R/10 sec.)[1]

Treatment	n	Sex	Mean	S.D.	[2]Segments Comprising Treatment
1	9	5 F 4 M	20.7	1.46	Prog. 1(Att) - #1,3,6, 7,9 + Prog. 2(Att) - #2,4,5, 8,10
2	9	5 F 4 M	17.5	1.63	Prog. 1 (Simple) - #2,4,5, 8,10 + Prog. 2 (Simple) - #1,3,6, 7,9

N = 18 (no. of subjects)

$\bar{X}$ = 19.1

σ = 1.51

1 See Statistical Procedures Section.

2 See Figure 1 for description of these segments.

TABLE 2

ANALYSIS OF VARIANCE OF ATTENDING BEHAVIOUR MEANS FOR SIMPLE/COMPLEX VIDEO

Source of Variation	Degrees of Freedom	Sum Squares	Mean Squares	F - Ratio
Between	1	48.36	48.36	
Within	18	43.09	2.39	20.20**
Total	20	7383.83		

**Significant at the $p \leq .01$ level.

TABLE 3

APPLICATION OF NEWMAN-KEULS TEST TO DETERMINE SIGNIFICANT DIFFERENCES BETWEEN TWO TREATMENT MEANS FOR ATTENDING BEHAVIOUR

		Means	X_1	X_2	
Simple presenter Segments	X	= 17.5	-	3.2	Differences
Attention-Getting Segments	X	= 19.3	-	-	Between Means

		X_1	X_2	
Simple Presenter	X_1	-	6.5**	
Attention-Getting Segments	X_2	-	-	Q-TABLE

Critical Value of Studentized Range Statistic	Q_2= 2.95	.05 level	where n = 18, k = 2
	4.02	.01 level	

Q-Table formed by dividing the mean differences by

$S_{\bar{X}} = \sqrt{S_w^2/n} = \sqrt{2.39/10} = \sqrt{.24} = .49$

** Significant at $p \leq .01$

TABLE 4

TV SEGMENT ABILITY TO ELICIT ATTENDING BEHAVIOUR RANKED ACCORDING TO MEAN ATTENDING BEHAVIOUR / 10 SECONDS

Programme	Programme Segment Number	Programme Segment Description	Mean Attending Behaviour/10 sec.	Ratings of Means	Type of Video Segment	Mean
1	4	Graphics	22.8	1	Complex	21.3
	8	Slides	21.5	2		
	5	VTR	21.4	3		
	10	VTR	20.8	4		
	2	Graphics	19.8	5		
	1	Presenter	19.6	6	Simple	18.6
	3	Presenter	19.4	7		
	6	Presenter	18.2	8		
	9	Presenter	18.1	9		
	7	Presenter	17.9	10		
2	3	Graphics	22.8	1	Complex	20.0
	1	Slides	20.0	2		
	6	VTR	19.5	3		
	9	VTR	19.4	4		
	7	Graphics	18.8	5		
	5	Presenter	18.5	6	Simple	16.4
	10	Presenter	16.7	7		
	2	Presenter	16.5	8		
	4	Presenter	15.2	9		
	8	Presenter	15.0	10		

TABLE 5

MEANS AND STANDARD DEVIATIONS FOR RECALL SCORES FROM FOUR TREATMENTS (CLASSROOM)

Treatment	Treatment Description	n	Means	S.D.	Segments	n^1	Means
1	Complex Video (P_1(Att) Segs. + P_2(Att) Segs.)	88	6.1	2.15	Prog.1(Att) #1,3,6,9,7	44	6.5
					Prog.2(Att) #2,4,5,8,10	44	5.8
2	Simple Video (P_1(Pres) Segs. + P_2(Pres) Segs.)	88	5.7	2.72	Prog.1(Att) #2,4,5,8,10	44	6.3
					Prog.2(Pres) #1,3,6,7,9	44	5.2
3	Simple Control	88	5.9	2.17	-	-	-
4	Hawthorne Control	88	3.1	1.23	-	-	-

N = 352 (No. of subjects)

$\bar{X}$ = 5.15

σ = 2.07

Using the top five segments in each of Programmes 1 and 2 as one group, taking the lowest five segments in these two programmes as a second group, a one-way analysis of variance (1 x 4) was carried out between these two combinations and the means generated from Programmes 3 and 4. This analysis (Figure 6) indicates significant effects ($p \leq .01$) between the four treatments. To validate significant mean differences the Newman-Keuls test was applied (Table 7). Examination of the results of this test revealed that Treatments 1, 2, and 3 were significantly better ($p \leq .01$) on the recall measure than the Hawthorne control group. In other words, subjects who watched the complex video segments, the simple video segments, or the simple control programme did significantly better on the recall measure than those who watched the irrelevant programme.

Treatment 1 (complex video) was not significantly better ($p \leq .05$) than Treatment 2 (simple video) at producing recall; nor was Treatment 1 significantly better than Treatment 3 (simple control) on this measure. However, as seen from Table 7, the difference between Treatments 1 and 2 was close to significance. No statistically significant differences were found between the simple video of Treatment 2 and the simple control presentation of Treatment 3. The right-hand columns of Table 7 indicate that Programme 1 seemed to outperform Programme 2 generally, and that Programme 1's simple video portion was numerically greater than the corresponding complex video portion in Programme 2. No attempts to determine the statistical proof of

this point were attempted because it was beyond the parameters set for the original research. However, some further comments will be made in the discussion section on this observation.

TABLE 6

ANALYSIS OF VARIANCE OF RECALL MEANS
FROM FOUR TREATMENTS

Source of Variation	Degrees of Freedom	Sum Squares	Mean Squares	F-Ratio
Between	3	535.3	178.4	
Within	348	1578.	4.53	39.4**
Total	352	11721.		

**$p \leq .01$

TABLE 7

APPLICATION OF NEWMAN-KEULS TEST TO DETERMINE SIGNIFICANT DIFFERENCES BETWEEN FOUR TREATMENT MEANS

Description	Treatment	Means	$\bar{X}_4$	$\bar{X}_2$	$\bar{X}_3$	$\bar{X}_1$	
P_4 Hawthorne Control	4	$\bar{X}_4 = 3.1$	-	2.4	2.8	3	
P_1 (Pres) + P_2 (Pres)	2	$\bar{X}_2 = 5.5$	-	-	.4	.6	DIFFERENCE BETWEEN MEANS
P_3 (Simple Control)	3	$\bar{X}_3 = 5.9$	-	-	-	.2	
P_1 (Att) + P_2 (Att)	1	$\bar{X}_1 = 6.1$	-	-	-	-	

			$\bar{X}_4$	$\bar{X}_2$	$\bar{X}_3$	$\bar{X}_1$	
P_4 Hawthorne Control	4	$\bar{X}_4$	-	10.4**	12.2**	13**	
P_1 (Pres) + P_2 (Pres)	2	$\bar{X}_2$	-	-	1.7	2.6*	Q-TABLE
P_3 (Simple Control)	3	$\bar{X}_3$	-	-	-	.87	
P_1 (Att) + P_2 (Att)	1	$\bar{X}_1$	-	-	-	-	

Critical Value of Studentized Range Statistic	$Q_2 = 2.95$ 4.02	$Q_3 = 3.31$ 4.12	$Q_4 = 3.63$ 4.40	.05 level .01 level

Q-table is formed by dividing the mean differences by

$$S_X = \sqrt{S_W^2/n} = \sqrt{4.53/88} = .23$$

** Significant at $p \leq .01$
* Significant at $p \leq .10$

TABLE 8

MEAN AND STANDARD DEVIATIONS FOR ATTITUDE CHANGE SCORES

Treatment	Treatment Description	n	Means	S.D.	Segments	n	Means
1	Complex Video (P_1 (Att) Segments + P_2 (Att) Segments)	88	37.8	5.50	Prog. 1 (Att) #1,3,6,9,7	44	38.5
					Prog. 2 (Att) #2,4,5,8,10	44	37.1
2	Simple Video (P_1 (Pres) Segments + P_2 (Pres) Segments)	88	38.1	4.99	Prog. 1 (Pres) #1,3,6,9,7	44	38.0
					Prog. 2 (Pres) #2,4,5,8,10	44	38.1
3	Simple Control Programme	88	36.4	5.67	- -	-	-
4	Hawthorne Control Programme	88	32.5	4.35	- -	-	-

N = 352 (No. of Subjects)

$\overline{X}$ = 36.2

σ = 5.13

Attitude Change

Means and standard deviations for scores on the attitude change scale are presented in Table 8. As in the arrangement for recall scores, the attention-getting segments from the first two programmes (complex video) were analyzed vis a vis the corresponding simple-presenter segments (simple video), and the results from Treatments 3 and 4 (Programmes 3 and 4). The analysis utilized was a one-way analysis of variance (1 x 4), and the results are given in Table 9. A significant difference ($p \leq .01$) between the means generated from each treatment was found. Since a significant difference between the four means was found, these means...complex video ($\bar{X}_1 = 37.8$), simple video ($\bar{X}_2 = 38.1$), simple control ($\bar{X}_3 = 36.4$), and the Hawthorne control ($\bar{X}_4 = 32.5$), were subjected to the Newman-Keuls test.

All treatment groups ($\bar{X}_1$, $\bar{X}_2$, $\bar{X}_3$) were found to be significantly greater ($p \leq .01$) than the Hawthorne control group ($\bar{X}_4$). All three programmes on forest fires were found to be effective teaching instruments for attitude change towards the subject presented. The simple video treatment was signifcantly better ($p \leq .05$) than the simple control programme (treatment 3). The combination of attention-getting segments (complex video) was not signifcantly greater than either the simple video treatment or the simple control treatment. However, the difference between these latter treatments was large enough to suggest a trend ($.01 \leq p \leq .01$). Tuck man (1972, p. 224) noted, "*While confidence levels*

are usually set at 5% or 1%, findings which attain a degree of confidence between the 10 and .5 levels are often interpreted as trends." Practically, this means that further investigation is needed to see if there is indeed a statistically significant difference between the effectiveness of complex video segments and a simple control on this measure of attitude change.

TABLE 9

ANALYSIS OF VARIANCE OF ATTITUDE CHANGE SCORES

Source of Variation	Degrees of Freedom	Sum Squares	Mean Squares	F-Ratio
Between	3	1707.3	569.1	
Within	348	8679.2	24.9	22.8**
Total	352	471922		

**Significant at $p \leq .01$

TABLE 10

APPLICATION OF NEWMAN-KEULS TEST TO DETERMINE SIGNIFICANT DIFFERENCES BETWEEN MEANS BETWEEN FOUR TREATMENT MEANS (ATTITUDE CHANGE)

Description	Treatment	Means	$\bar{X}_4$	$\bar{X}_3$	$\bar{X}_1$	$\bar{X}_2$	
P_4 Hawthorne Control	4	$\bar{X}_4 = 32.5$	-	3.9	5.3	5.6	
P_3 Simple Control	3	$\bar{X}_3 = 36.4$	-	-	1.4	1.7	DIFFERENCE BETWEEN MEANS
P_1 (Att) + P_2 (Att)	1	$\bar{X}_1 = 37.8$	-	-	-	5.3	
P_1 (Pres) + P_2 (Pres)	2	$\bar{X}_2 = 38.1$	-	-	-	-	

			$\bar{X}_4$	$\bar{X}_3$	$\bar{X}_1$	$\bar{X}_2$	
P_4 Hawthorne Control	4	$\bar{X}_4$	-	7.35**	10**	10.6**	
P_3 Simple Control	3	$\bar{X}_3$	-	-	2.64@	3.2*	Q-TABLE
P_1 (Att) + P_2(Att)	1	$\bar{X}_1$	-	-	-	.51	
P_1 (Pres) + P_2(Pres)	2	$\bar{X}_2$	-	-	-	-	

Critical Value of Studentized Ranged Statistic	Q_2= 2.77 3.64	Q_3= 3.31 4.12	Q_4= 3.63 4.40	.05 level .01 level

Q-table formed by dividing mean differences by

$$S_{\bar{X}} = \sqrt{S_w/n} = \sqrt{24.9/88} = \sqrt{.28} = .53$$

**Significant at $p \leq .01$
*Significant at $p \leq .05$
@Significant at $p \leq .10$

V. DISCUSSION, CONCLUSIONS, RECOMMENDATIONS

Discussion

The results that were outlined in the previous chapter will be discussed here. Only one of the three hypotheses put forward was found to be supported statistically ($p \leq .05$). This was Hypothesis 1 which dealt with the relative efficiency of different types of presentation formats in eliciting attending behaviour. The other two hypotheses, which suggested that segments of a television production that were looked at more produced respectively either more attitude change, or recall, were not supported. These latter two hypotheses were also dealing with the validation of the conjugate analysis apparatus as a tool in forecasting recall and attitude change in the classroom. Because the laboratory environment is different from the classroom and it was with the classroom in mind that this study was conducted, the rather more obvious test of measuring recall and attitude change for those in the laboratory environment was not encorporated into any of these hypotheses.

Hypothesis 1

It was hypothesized that in an educational television show the attention-getting segments (complex video) would produce more attending behaviour than segments which involved only the presenter talking on camera (simple video). This hypothesis was supported with a significance level of $p \leq .01$.

If one takes the view of Jeffrey (1968) that a subject's

attention to audiovisual materials is controlled by the salience of cues within the materials, the results supporting Hypothesis 1 might be explained this way. A person talking on camera would cause most people's attention to be quickly satiated because there are few novel cues and none which are particularly salient. Slides, film sequences and graphics with pointing, on the other hand, do provide a succession of novel cues, and if one accepts Travers' (1970) view that the visual system gives priority to anything that moves, this means they also provide moving and more salient cues. More salient cues are attended to more than less salient ones.

A further observation made by Travers (1970) on the apparent workings of the human perceptual system suggests an explanation for the dominance of the more salient cues over less salient ones:

> *What appears to happen on ... a dull routine task (eg. watching a narrator speak) is that the detection of signals at the higher levels of the nervous system becomes inhibited, but that the signal detection still takes place at the lower levels where a crude analysis of incoming information takes place. The higher levels of the nervous system do not permit themselves to be occupied for long with routine repetitive tasks.*

In terms of the conjugate analysis technique, it may be that when the detection of signals (originating from a TV via the eye) at the higher levels of the nervous system becomes inhibited, the attending behaviour also becomes inhibited and either slows or stops completely. A slow rate of attending behaviour which keeps a dull but visible image, or no rate which only allows an audio protion, may provide enough information for a crude analysis by the lower levels of the

nervous system. When the more salient cues (slides, film sequences, etc.) begin and are identified as novel by the monitoring action of the lower perceptual system, the higher levels are activated and there's a corresponding increase in attending behaviour.

There is some indirect support from various sources for this explanation. LeFrancois (1972, p. 26) noted that the RAS (Reticular Activating System), *"appears to act as a kind of traffic control system, stopping the flow of some impulses from the receptors to the cortex, and facilitating the flow of others."* Those that get facilitated have particular properties--*"meaningfulness, intensity, surprisingness, novelty, complexity, and incongruity"* (Berlyne, 1960); properites not unlike those exhibited by the attention-getting segments (complex video) of the programmes tested.

The results in Table 4 of the previous chapter, that showed the relative degree of success for each television segment in eliciting attending behaviour, suggest that the conjugate analysis technique may be useful in determining the degree of cue salience present in various parts of an instructional television programme.

HYPOTHESIS 2 AND 3

Before going into a discussion about these two hypotheses, a restatement of results relating to them will be made: Hypothesis 2: It was hypothesized that segments in an educational television show, which induced high attending behavior in lab subjects, would be more effective at producing recall

of the material presented to classes of students, than segments which were shown to produce low attending behaviour. Identification of high vs low attending behaviour eliciting segments was made using the results from Hypothesis 1. There was no statistically significant evidence ($p \not< .05$) to support the claim that the attention-getting format for television was better than the simple presenter format. This was the case whether the comparison was between: a) Treatment 1 (Complex Video) and Treatment 2 (Simple Video), or b) Treatment 1 and Treatment 3 (the Simple Control programme).

It should be reiterated that the subjects who watched the Tv programmes in the lab environment and whose attending behaviour was recorded were not the same subjects who saw the television programmes in the classroom and whose recall and attitude change were recorded. Also of note is the fact that all the information required to answer the questionnaires was provided on the audio track; the video portions appeared to provide no new questionnaire-relevant information. In other words, rather than providing multiplied learning opportunities, it would appear that the information provided in the video channel was redundant at least as far as recall was concerned. Wagner (1974, p. 45) noted that, *"when information is redundant and is transmitted through two sensory modalities, nothing appears to be gained by doing so."*

Hypothesis 3: This hypothesis is the same as the previous one except that the dependent variable was attitude change rather than recall. No statistically significant evidence ($p \leq .05$) was found to support the contention that the attention-getting segments in an educational television programme produce more attitude change than segments that feature only the narrator talking on camera.

Although Hypothesis 2 and 3 were not supported statistically, it should be noted that Treatments 1, 2, and 3, those that presented the story on forest fires, produced means on both the recall and attitude measures that were significantly greater ($p \leq .01$) than the means generated by the Hawthorne Control programme. Any programme format on forest fires would be expected to produce higher scores than another presentation which did not mention the topic.

For both recall and attitude change, Treatment 1 (Complex Video) appeared better than Treatment 2 (Simple Video) and/or Treatment 3 (Simple control). This observation is illustrated in the following table:

Treatment	Description	Recall Mean	Attitude Change Mean
1	Complex Video	6.1	37.8
2	Simple Video	5.7	38.1
3	Simple Control	5.9	36.4
4	Hawthorne Control	3.1	32.5

Table II: Mean Scores on Attitude Change and Recall Measures vs Treatments

Although the results in this table did not show statistically significant differences, there was enough evidence to support a trend ($.05 \leq p \leq .10$). In other words, there is some hope that the use of complex video, ie. attention-getting segments, in an educational television programme can be proven to produce higher scores on recall and attitude change measures. However, the benefits of using complex video towards this end has not been proven in this research.

Other Factors that Affect Mean Scores

Other factors that seem to affect the recall and attitude change capabilities of the programmes include: 1) the type of measure used, and 2) integration of simple presenter segments with attention-getting segments. The effectiveness of the simple presenter segments seems to vary according to whether recall or attitude change is measured. In addition, simple presenter segment effectiveness appears to be a function of whether the segments are integrated with the attention-getting segments (Treatment 2) or with other simple presenter segments (Treatment 3). These two observations are illustrated in the following table.

Measure	Description	Treatment (T_i)	$\bar{X}$	Difference	Significant
Recall	P_1(Sim) + P_2(Sim)	2	5.7	.2	
Recall	P_3(Simple Control)	3	5.9	($T_3 > T_2$)	No
Attitude Change	P_1(Sim) + P_2(Sim)	2	38.1	1.7	
Attitude Change	P_3(Simple Control)	3	36.4	($T_3 < T_2$)	Yes ($p \leq .05$)

Table 12: Effectiveness of Simple Presenter Segments

On the recall measure, the means score for Treatment 3 segments (Simple Control Programme) was $\bar{X} = 5.9$, while the mean score for Treatment 2 segments (Simple Video) was $\bar{X} = 5.7$. The difference here was not significant, that is, it could be explained as a chance phenomenon. However, it might be interesting to speculate on what might cause such a difference if it were not due to chance. One explanation might be drawn from this statement by Travers (1970):

> *An especially interesting finding is that the more a person is motivated to learn from the main task, the less he learns from the subsidiary tasks.*

In their review of research, Chu & Schramm (1973) suggested that special production techniques could increase motivation to watch a programme. This point has been supported in this study by the results of tha attending behaviour trials (Hypothesis 1). If the subjects watching Programmes 1 and 2 were more motivated to watch the attention-getting segments and considered them to be the main task, then the relatively low scores (for the recall measure) on the simple presenter format segments of the same programme would be explained. These latter segments would be the subsidiary tasks that produce less learning than the main task. Higher scores on the simple presenter format segments in Programme 3 (Simple Control) could result from the subjects considering the whole programme as the main task. There were no *"more motivating"* segments in Programme 3 to draw attention away from the simple presenter segments.

On the attitude change measure, the pre-eminence of Treatment 3 segments was reversed. In fact, on this measure

Treatment 2 is significantly greater ($p \leq .05$) than Treatment 3. This suggests that rather than act as an inhibitor for simple presenter segments in Programmes 1 and 2 (at least on the recall scores), the attention-getting segments in these programmes somehow improve the former's ability to change attitude. In other words, those simple presenter segments produced more attitude change than the non- integrated simple presenter segments.

This phenomenon may be related to the type of measurement instrument used. The recall measure was a multiple-choice questionnaire made up of dichotomous items (Ferguson, 1971), that is, items for which there was only one right answer. The attitude scale, on the other hand was a five point Likert type. For these items there are no right or wrong answers, the score is based on a rating. On this attitude change measure there was only a small difference in the means between Treatment 2 (Simple Video) and Treatment 1 (Complex Video); Treatment 2 was $\bar{X} = 38.1$, and Treatment 1 = 37.8. But the mean for the complex video was close to being significantly greater than Treatment 3 (Simple Control) where $.05 \leq p \leq .10$. Therefore, it was possible for some kind of positive spillover to occur, whereby the complex video segments create a halo effect over the other simple video segments. This could then be reflected in higher scores on the Likert scale for Treatment 2 simple video segments when compared with Treatment 3 simple control segments.

The beneficial effects of integrating simple presenter (Simple Video) segments with attention-getting segments (Complex Video) might also be explained by research evidence which suggests that special television techniques may improve attitudes if not recall. For example, Miller (1968) in his study on the beneficial effects of motion in film found that positive effects were found only for attitude change about the content and not the recall of subject matter. Differential effects on wither recall or attitude change could simply be explained because of inherant differences between them.

The "leap of faith" that attempted to connect the study of responses in the laboratory setting to measures of recall and attitude change in school classrooms might be queried. It did not allow "direct" comparisons between viewer responding (in the lab) and results by the same viewers on the questionnaires. Such an an analysis is essential if for example a TV programme is to be evaluated not only on attention-getting potential but also on teaching capabilities (ie. producing recall and attitude change). Once this is done, the results in school classrooms can be more profitably investigated. The data for the type of direct comparison mentioned above was gathered during the course of the experiment and could be used to conduct a "post hoc" analysis along this vein.

With regard to the type of items built into the Likert attitude scale, some appear to reflect more on recall than attitude change. Perhaps five or six questions relating to the basic themes of the TV programmes would provide a more accurate assessment of attitude change than forty individual items.

Conclusions

Attending Behaviour

An important conclusion of this study is that conjugate analysis apparatus can be used to pre-test educational television shows. This pre-test can provide information on which portions of a programme attract the most attention simply by deterimining the average attending rates for each. The acceptance of Hypothesis 1 indicates that techniques such as film sequences, slides, and graphics with pointing are useful as attention-getting production techniques.

A cusory review of the cumulative records (graphical) provides some interesting points for educational television producers. Several techniques apart from video variables seemed to play a part in what parts of the programme induced more viewing behaviour. These included the following:

1. Mention of interest arousing or novel words such as 'logging slash' or 'drip torch'.
2. Sections that suggest images of power, for example, 'total destruction' or 'intense heat'.
3. Music when played towards the end of the programme caused most people to attend more.
4. Rhetorical questions such as: Why do forest rangers use controlled burning? What's the advantage of controlled burning?
5. Where there are built in oganizers: First...second... and...

Also of note is the apparent differences in viewing styles among several people. Some students were very selective in what they watched and looked only when the presenter was not on camera. Other viewers maintained their attending behaviour without much change throughout much of the programme. Unfortunately, no data regarding home tele-viewing behaviour, socio-economic background, scholastic abilities or aptitudes were available. It should be possible to find a relationship among these factors. A representative attending behaviour record is found as Appendix A.

Recall and Attitude Change

The ability of the conjugate analysis procedures to forecast results on recall and attitude change was not demonstrated. However, results from the investigation of Hypotheses 2 and 3 did suggest that there was some hope in this direction. For example, the apparatus predicted that attention-getting segments (complex video) would produce more recall and attitude change than segments that used only the simple presenter (complex video). On the measure, this prediction was not supported statistically but at least a trend was indicated ($.05 \leq p \leq .10$). On the attitude change measure the prediction was found to be only partially accurate.

The use of special production techniques per se were shown to be only one factor which affected the results. In addition, the effects of the simple presenter segments seemed to vary according to whether or not they were integrated with attention-getting segments. Scores on the attitude

change measure were increased when this integration was carried out (eg. in Programmes 1 and 2), but scores on the recall measure were negatively affected by such an integration. However, no generalizable conclusions can be drawn because these findings were not all statistically significant. The only thing one might say with some certainty is that use of various production technique seems to have differential effects on attitude change and recall.

The overall scores on recall and attitude change showed that Programme 2 was less effective than Programme 1. Recall and attitude change score means for Programme 1 were 6.4 and 38.25 respectively; for Programme 2 on the same measure the results were 5.7 and 37.6. Also attending behaviour means for Programme 2 were lower than for Programme 1. It might be tempting to try and link these two observations but there is no statistical support to do so.

Recommendations for Further Research

It is the feeling of the author that this experiment should be repeated. However, to ensure homogeneity of groups, a test to measure general ability should be given to each group prior to or after the administration of the experiment. In the research being described there might be some question as to the randomness of the subjects between treatments because intact classes were used. This problem could be overcome if some measure of comparative ability were available.

The production of a programme that would use all attention-getting segments could be used to answer several questions. (The master tape for Programmes 1 and 2 could be edited to make this programme format). For example, in the discussion of Hypothesis 2 it was suggested that the reason for the higher scores in recall on the simple control versus the simple video was because the latter was considered by viewers as a subsidiary task (compared to the complex video segments). If one looked at the corresponding segments in the new programme, and found they produced higher scores, the previous explanation would not be disproven. In addition, questions relating to the overall advantages of using entirely complex, partly complex or simple video could be more easily addressed. This might include an investigation into whether the Likert-type scale was allowing a halo effect to complicate the measure of attitude change such as semantic differentials or Thurstone scales might be tried instead.

Although the conjugate analysis apparatus described in this article has shown its usefulness, there are some refinements which might be made. These could include:

1. The addition of attatchments to monitor audio as well as visual stimuli. The arrangement might be similar to that described by Nathan and Wallace (1965).
2. One could modify the present equipment to make it capable of being adjusted to the individual pressing rates.

The object of these alterations would be to increase resolution of differences in attending behaviour that are due to both audio and visual stimuli.

Just based on the statistically significant findings in this study, areas of future research could involve:

1. Analysis of television production techniques for their ability to gain and hold viewer attention. Virtually any production technique could be studied; colour vs black and white, slow vs fast pacing, camera angle, narrator acceptability, etc. However, the most exciting thing about this procedure is that these production techniques need not be studied in isolation; programmes which combine all or some of these production techniques can be studied as an entity. The relative effectiveness of its constituent parts can be evaluated without difficulty from the cumulative recorder.
2. A study of viewer characteristics--age, sex, social background, TV viewing habits--in relation to attention levels on actual or proposed educational television programmes.
3. Investigation of the attention-getting characteristics of other audiovisual materials; for example, films, filmstrips, slides, etc. Using similar apparatus, Lewis (1973) investigated the effects of colour vs black and white and degree of realism on learning from pictures.
4. Studies to determine whether some production techniques are better for changing recall as opposed to attitude change.

In summary, the conjugate analysis technique offers a new approach for formative and summative evaluation of television and other audiovisual materials. It might be used instead of or in conjunction with other techniques and/or apparatus. This technique certainly warrants further study, refinement, and application.

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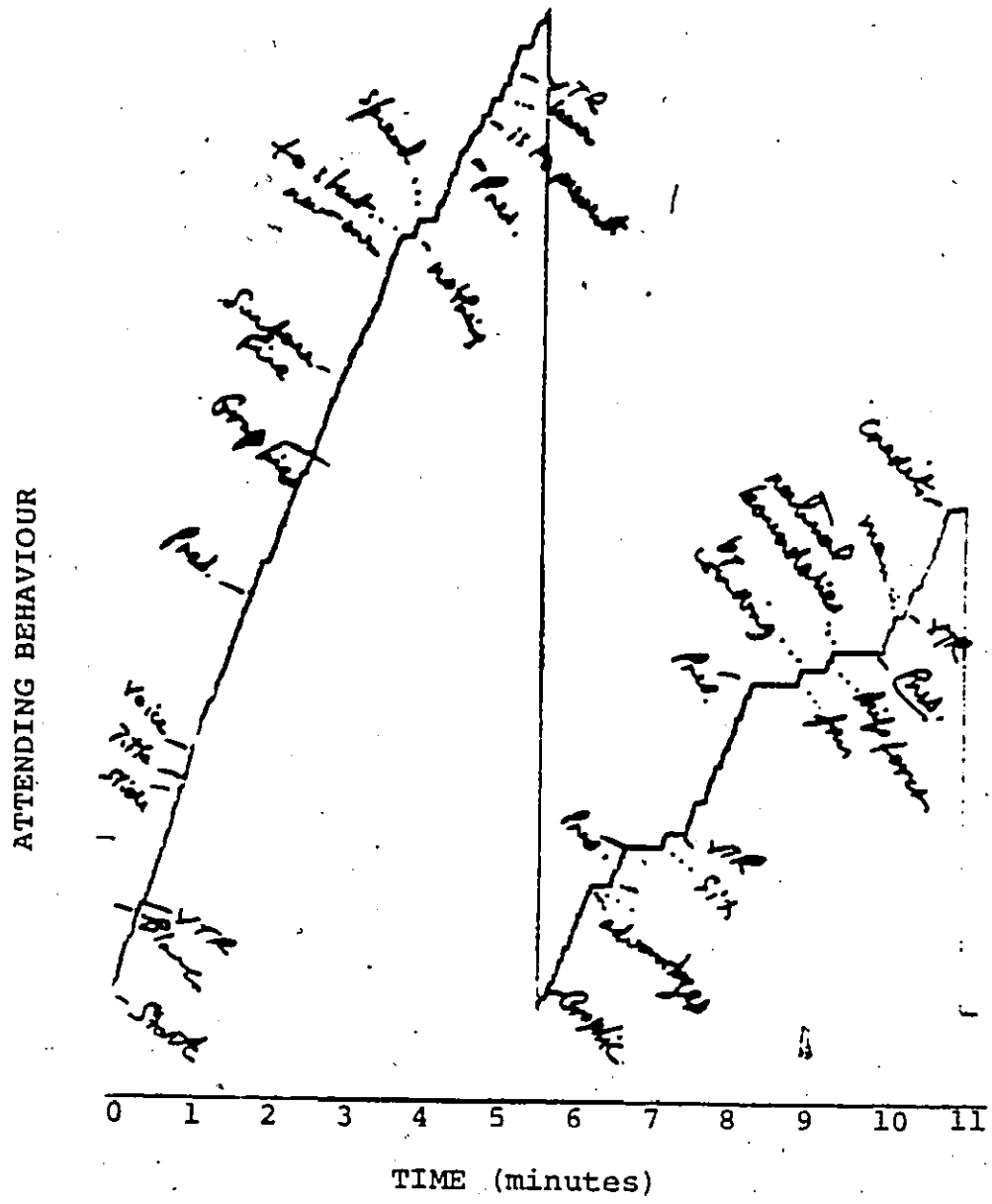
APPENDIX A

INDIVIDUAL RECORD OF ATTENDING BEHAVIOUR



APPENDIX B

DETAILED OUTLINE OF PROGRAMME FORMAT

INSTRUCTIONAL CONCEPT	PROGRAMME 1	PROGRAMME 2	PROGRAMME 3
Introduction	1. VTR (Colour Bar, Black, Forest Scenes, and Fire)	1. VTR (Colour Bar, Black, Forest Scenes, and Fire)	1. VTR (Colour Bar, Black, Forest Scenes, and Fire)
	CUT	CUT	CUT
	2. CAM 1 - Slide 1	2. CAM 1 - Presenter	2. CAM 1 - Presenter
	SUPER	SUPER	SUPER
	3. CHAR GEN - Title "Forests, Fires, and Man"	3. CHAR GEN - Title "Forests, Fires, and Man"	3. CHAR GEN - Title "Forests, Fires, and Man"
	FADE SUPER	FADE SUPER	FADE SUPER
1. Importance of Forests	4. CAM 1 - Slides 1 to 6	4. CAM 1 - MCU of Presenter	4. CAM 1 - MCU of Presenter
	CUT	CUT	CUT
2. Destruction Caused by Forest Fires	5. CAM 2 - MCU of Presenter	5. VTR	5. CAM 2 - MCU of Presenter
	CUT	CUT	CUT
3. Types of Forest Fires	6. CAM 1 - Graphic	6. CAM 2 - MCU of Presenter	6. CAM 1 - MCU of Presenter
	CUT		
	7. CAM 2 - Graphic		
	CUT		
	8. CAM 1 - Graphic		
	CUT		
	9. CAM 2 - Graphic		

4. Causes of Forest Fires	MIX 10. CAM 1 - MCU of Presenter	MIX 7. CAM 1 - Graphic CUT 8. CAM 2 - Graphic	MIX 7. CAM 2 - MCU of Presenter
5. Prevention of Forest Fires	CUT 11. CAM 2 - MCU of Presenter	CUT 9. VTR	CUT 8. CAM 1 - MCU of Presenter
6. Lightning Fires	CUT 12. VTR	CUT 10. CAM 1 - MCU of Presenter	CUT 9. CAM 2 - MCU of Presenter
7. Characteristics of Regularly Burned Forests	MIX 13. CAM 2 - Graphic CUT 14. CAM 1 - Graphics	MIX 11. CAM 2 - MCU of Presenter	MIX 10. CAM 1 - MCU of Presenter
8. Benefits to Animals	MIX 15. CAM 2 - MCU of Presenter	MIX 12. CAM 1 - (Slides) Slides 1 to 6	MIX 11. CAM 2 - MCU of Presenter
9. Conditions for Controlled Burning	MIX 16. VTR	MIX 13. CAM 1 - Graphic Presenter	MIX 12. CAM 1 - MCU of Presenter
10. Methods of Controlled Burning	MIX 17. CAM 1 - MCU of Presenter	MIX 14. CAM 1 - Graphic MIX 15. CAM 2 - Graphic	MIX 13. CAM 2 - MCU of Presenter

		MIX	
		16. CAM 1 - Graphic	
		MIX	
		17. CAM 2 - Graphic	
	CUT	CUT	CUT
Closing	18. CAM 2 - MCU of Presenter	18. CAM 1 - MCU of Presenter	14. CAM 1 - MCU of Presenter
	MIX	MIX	MIX
	19. VTR - Forest Scenes and Fire	19. VTR - Forest Scenes and Fire	15. VTR - Forest Scenes and Fire
	CUT	CUT	CUT
	20. CAM 1 - Credits	20. CAM 1 - Credits	16. CAM 1 - Caption
	FADE PICTURE	FADE PICTURE	FADE PICTURE

APPENDIX C

FORESTS, FIRES, AND MAN

PROGRAMME 1

VIDEO	AUDIO
1. Fade Up VTR "Colour Bar"	Fade Up Tape: Tone (30 sec)
Black (ON VTR)	Fade Out Tone
VTR--Forest Scenes and Fire	Fade Up Tape: Music
CUT	
2. CAM 1 - Slide 1	
SUPER	
3. CHAR GEN - Title	
FADE SUPER	Crossfade: Music/Presenter
4. CAM 1 Slide Sequence	Presenter
(Slide 1)	When forests are burned, everybody suffers. Forests are homes for thousands of animals and birds, plants and trees.
(Slide 2)	And Canada's forests are important to her economy.
	The forest industry employs over three hundred thousand people.
(Slide 3)	Also, Twenty percent of Canada's total exports are forest products, for example, timber, wood pulp, etc.
(Slide 4)	In fact the forest industry is the second most important industry in Canada, after tourism.
(Slide 5)	Even tourism is somewhat dependent on forests. Canada is, in fact, and nation of forests.

(Slide 6)

Although it's hard to believe when you live in the city, about fifty percent of Canada's land mass is covered by forests. And many things you use every day like papers and pencils, come from trees.

CUT

5. CAM 2
MCU "Presenter"

Presenter

So when forests are burned, plants and animals lose their homes, people lose places for recreation, and Canada's economy loses valuable income.

Such losses occur when six to eight thousand forest fires a year burn in Canada.

These fires burn more than two million acres of forests.

That's a yearly loss of over eighteen million dollars worth of trees.

What's worse, these fires also destroy ten percent of the forest areas used by the forest industry.

And forest fires also destroy property, damage the soil, and kill and injure wildlife--which is also a loss to trappers. When a severe fire occurs the forest soil can be so damaged that it may be generations before it can again support a productive forest.

CUT

6. CAM 1 / Graphic "Types of Forest Fires"

Presenter

There are three general types of forest fires: the ground fire, the surface fire and the crown fire.

CUT

7. CAM 2 / Graphic "Ground Fire"

The ground fire usually smolders beneath the surface of the forest where it burns deeply in thick deposits of moss, peat, decomposed leaves and other debris. A ground fire can even survive an entire winter under the snow and break out in the spring.

CUT

8. CAM 1 / Graphic "Surface Fire"

The surface fire is the most common type of forest fire. It starts on the surface of the forest floor where it feeds on dead leaves, branches, and other vegetation. The fire can burn on the chips caused by saws, chips known as logging slash, in areas where lumber men have been at work, or on tree stumps and fallen trees.

CUT

9. CAM 2 / Graphic "Crown Fire"

The crown fire is the most dangerous and destructive partly because it usually occurs in dense dry forests when there is a strong wind.

It's so instense and spreads so rapidly that it doesn't stay on the surface but reaches up to the tops or crowns of the trees. The fire then feeds on the branches and leaves of the living trees causing more fire and destruction than if it had stayed on the forest floor. The heat and updraft produced by a crown draft are tremendous so that flying embers are often carried by the wind to start new fires far away from the main one.

Although the first two types of fires can be put out, nothing can be done to the crown fire except to let it burn itself out and to make sure it doesn't spread.

MIX

10. CAM 1
MCU "Presenter"

Presenter

You may be surprised to learn that over seventy-five percent of forest fires are started by people.

Of this seventy-five percent, Thirty-four percent are caused by the carelessness of people using the forest for recreation: campers, hunters, fishermen, hikers, and other casual visitors.

Their weapons are simple and known to everyone--a carelessly discarded cigarette or match or a campfire that hasn't been properly extinguished.

But a few are set on purpose for wilful destruction. Still others are accidentally set by railroads and forest industries in the normal course of their work.

CUT

11. CAM 2
MCU "Presenter"

Presenter

And Canada spends over eighteen million dollars a year to prevent or put out forest fires. Much money is spent on equipment such as lookout towers, bulldozers, and water-bombing aircraft, and thousands of men risk their lives fighting forest fires.

But the most effective way of fighting forest fires is to prevent them from happening in the first place because forest fires can be dangerous and destructive.

If you don't know how or if you don't remember how to prevent forest fires then you can learn.

And it's important. Next year the forest you visited this year may not be there.

CUT

12. VTR "Natural Fires"

Presenter

But not all forest fires are bad. In fact, some are beneficial for plants, animals, and people. Some smaller ones are necessary for the inhabitants of the forest. nature has a way of making all the natural elements of a forest work together for the benefit of the forest. And fire is one of the natural elements of a forest.

Twenty-five percent of all forest fires in Canada are caused naturally; that is, they are not caused by man.

Most of these natural fires are caused by lightning--fires which usually occur before and after a rainstorm when the ground is still wet.

These fires are usually surface fires which aren't severe and don't spread rapidly.

MIX

13. CAM 2
Graphic "Dense Forest"

Presenter

When can nature live with fires? The only way to answer this question is to consider the nature and structure of forest.

As the years pass, a great deal of clutter gathers on the forest floor. First, there's what's known as deadfall. This is litter caused by dead leaves, plants and trees. Then, there's underbrush caused by the growth of small plants.

The result of a fire in such a dense forest can be total destruction. The litter, the underbrush, and the trees are all destroyed. The forest is dead.

CUT

14. CAM 1
Graphic "Regularly Burned Forest"

Presenter

On the other hand, a forest that's been regularly burned by small lightning fires has certain advantages. First, the litter doesn't accumulate as much and the underbrush doesn't grow as much. Second, the big trees are strong because there's less competition for nourishment from the soil and the fires have killed off attacking insects.

The small fires, instead of killing off everything, have just cleared off excessive growth and deadfall.

Thus if a fire starts in this type of forest, it tends to stay near the surface.

MIX

15. CAM 2 /
MCU "presenter"

Presenter

In fact, in many ways the forest plant and animal life may be healthier because of the small fire.

If a forest's too dense, animals can't forage through the forest to find food or a place to stay.

One study showed that there were two and a half times more deer in an area that had been burned than in a neighbouring area that had gone unchecked by fire.

And game birds, such as partriges or quail aren't able to find food in the forest when the litter's deeper than six inches.

Water birds such as ducks living on the lakes also need cleared areas in the forest shoreline to nest and feed in.

This fact is supported by another study which found over three times as many birds living in a burned area than in an area that hadn't been burned.

MIX

16. VTR /
"Fires and Controlled Burning"

Presenter

As you can see then, not all fires are bad. Some are essential for a forest to flourish. It's important to remember that fires are just as much a part of nature as man. Both have the potential for hurting and for helping the forests.

It's usually the responsibility of forest rangers to put out fires for the benefit of forests and people. But sometimes, they actually start them for the same reason.

Controlled burning is the name of the process forest rangers use to deliberately plan and set fires in a controlled area. A controlled burn is started only under the proper conditions.

First the area to be burned should be damp as it is after a recent rain. The burn should never be started when the forest's dry.

Second, the wind should be very calm since high winds tend to spread a fire.

And finally, the burn should be started in the late afternoon because nightfall brings coolness, dew and ideal fire-spotting conditions.

MIX

17. CAM 1
MCU "Presenter"

Presenter

Although formerly, controlled burns were started by simply using matches or rakes with buring embers, the most modern method is to use the drip torch.

The drip torch is a can with a long spout, containing a mixture of gasoline and fuel oil. The oil sticks to the vegetation and makes the burning more effective.

The techniques of controlled burning vary according to the nature of the land.

To burn a canyon or valley, it's best to start from the top and work down. If a fire were started at the bottom, the whole side would quickly burn because fires cause upward winds--upward winds which could fan a fire over the rim and out of control. By working from the top down, only a small part of the area is burned at a time.

Hills and mountains should be burned in a downward direction for the same reasons, one horizontal belt at a time. For example, if two upper belts of a mountain are burned off, they can then act as barriers to a third fire started by a drip torch on the horizontal belt just below the first two.

The most common and spectacular artificial or controlled burns begin from natural boundaries--such as roads, streams, or barren ground. Such fires merge to a common centre, where powerful updrafts speed up the burning and form a towering mushroom cloud of smoke--a fire which can be put out within an hour.

The cooler snowy forested regions act as natural firestops. Later, when the forests are free of snow, they can be burned. So the open spaces also take their turn in halting the fires spread.

CUT

18. CAM 2 / MS "Presenter"

Presenter

What's the advantage of controlled burning? Experts can choose the The proper weather and soil conditions and can restrict the burning to a pre-defined area; they can keep the fire from burning out of control.

Controlled burning is the most effective method man has yet devised for keeping fires in harmony with the balance of nature.

MIX

19. VTR / Forest Scenes (20 sec)

Fade Up Music: Signal/Fade Out Presenter

CUT

20. CAM 1 / Caption - "Film Sequences Provided Courtesy National Film Board" (5 sec)

FADE PICTURE

FADE MUSIC

ENDS

PROGRAMME 2 - SCRIPT

SHOT	VIDEO	AUDIO
1.	Same	Same
	CUT	
2.	CAM 1 - MCU of Presenter	Same
	SUPER	
3.	Same	Same
	FADE SUPER	
4.	CAM 1 - MCU of Presenter	Same
	CUT	
5.	VTR	Same
	CUT	
6.	CAM 2 - MCU of Presenter	Same
	MIX	
7.	CAM 1 - Graphic	Same
	CUT	
8.	CAM 2 - Graphic	Same
	CUT	
9.	VTR	Same
	CUT	
10.	CAM 1 - MCU of Presenter	Same
	MIX	
11.	CAM 2 - MCU of Presenter	Same
	MIX	
12.	CAM 1 - (Slides) Slides 1 to 6	Same
	MIX	
13.	CAM 2 - Presenter	Same

(Prog. 2)

SHOT	VIDEO	AUDIO
	MIX	
14.	CAM 1 - Graphic	Same
	MIX	
15.	CAM 2 - Graphic	Same
	MIX	
16.	CAM 1 - Graphic	Same
	MIX	
17.	CAM 2 - Graphic	Same
	CUT	
18.	Same	Same
	MIX	
19.	Same	Same
	CUT	
20.	Same	Same
	FADE PICTURE	

PROGRAMME 3 - SCRIPT

SHOT	VIDEO	AUDIO
1.	Same	Same
	CUT	
2.	CAM 1 - Presenter	Same
	SUPER	
3.	Same	Same
	FADE SUPER	
4.	CAM 1 - MCU of Presenter	Same
	CUT	
5.	Same	Same
	CUT	
6.	CAM 1 - MCU of Presenter	Same
	MIX	
7.	CAM 2 - Same	Same
	CUT	
8.	CAM 1 - MCU of Presenter	Same
	CUT	
9.	CAM 2 - MCU of Presenter	Same
	MIX	
10.	Same	Same
	MIX	
11.	Same	Same
	MIX	
12.	CAM 1 - MCU of Presenter	Same
	CUT	
13.	Same	Same

(Prog. 3)

SHOT	VIDEO	AUDIO
	MIX	
14.	Same	Same
	CUT	
15.	Same	Same
	FADE PICTURE	

APPENDIX D

INSTRUCTIONAL UNITS:

There were a total of ten instructional concepts in each programme. Each concept was composed of three related instructional statements of units, each unit constituting a single presentation of information within the programme. Each instructional group, though conceptually identified below after the group number, was not identified per se in any of the programmes.

1. Importance of the forest inductry
   a. The forest industry employs over 300 thousand people
   b. 20 percent of Canada's exports are forest products
   c. 50 percent of Canada's land mass is covered by forests.

2. Destruction caused by forest fires
   a. There are 6 to 8,000 forest fires yearly in Canada
   b. Forest fires burn more than 2 million acres or 10 percent of all productive land
   c. Over 18 million dollars worth of trees are lost yearly through forest fires.

3. Types of forest fires
   a. A ground fire smoulders and burns beneath the surface
   b. A surface fire starts and burns on the surface
   c. A crown fire burns the tops of trees and is the most dangerous.

4. Causes of forest fires
   a. Over 75 percent of all forest fires are started by man
   b. 34 percent of man caused fires result from carelessness
   c. Some man caused fires result from railway and forest industry accidents; others are intentionally set for willful destruction.

5. Ways to fight forest fires

   a. Canada spends over 18 million dollars a year to fight forest fires .
   b. Money is spent on water bombing aircraft, bull-dozers, and look-out towers
   c. Prevention is the most effective way of fighting fires.

6. Characteristics of lightning fires

   a. 25 percent of all forest fires are started by lightning
   b. Lightning fires usually occur during the presence of rain
   c. Lightning fires are usually surface fires which do little damage.

7. Characteristics of a regularly burned forest

   a. Litter and underbrush accumulate less in a regularly burned forest
   b. Insects that attack trees are killed off in a regularly burned forest.

8. Benefits to animals in a regularly burned forest

   a. 2½ times as many deer live in a regularly burned forest
   b. Game birds are unable to find food in litter that is deeper than six inches
   c. 3 times as many birds live in a regularly burned area.

9. Conditions for controlled burning

   a. The area should be damp when starting a controlled burn
   b. For controlled burning, the wind sould be calm
   c. The burn should be started in the late afternoon.

10. Methods for controlled burning

   a. Valleys and hills should be burned from the top down
   b. Open areas are burned from natural boundaries
   c. The drip torch method using a mixture of gas and oil which sticks to the vegetation is used and makes burning more effective.

APPENDIX E

INSTRUCTIONAL CONCEPTS	ATTITUDE QUESTIONS		RECALL QUESTIONS
	POSITIVE / NEGATIVE		
1. Importance of Forests	16, 21	1, 36	1, 2, 3
2. Destruction Caused by Forest Fires	17, 22	2, 37	4, 5, 6
3. Types of Forest Fires	19. 39	4, 24	7, 8, 9
4. Causes of Forest Fires	18, 23	3, 38	10, 11, 12
5. Ways to Fight Forest Fires	20, 25	5, 40	13, 14, 15
6. Lightning Fires	11, 26, 31	6	16, 17, 18
7. Characteristics of a Regularly Burned Forest	7	12, 27, 32	19, 20, 21
8. Benefits to Animals	8	13, 28, 33	22, 23, 24
9. Conditions for Controlled Burning	14, 29	9, 34	25, 26, 27
10. Methods of Controlled Burning	15, 35	10, 30	28, 29, 30

Negative: Refers to a statement that is weighted towards a negative response, ie. Disagree of Strongly Disagree

Positive: Refers to a statement that is weighted towards a positive response, ie Agree of Strongly Agree

APPENDIX F

INSTRUCTIONS TO BE READ IN EXPERIMENTAL SETTING

BEFORE STARTING, ENSURE THAT THE COLOUR TELEVISION SET IS TURNED ON AND THAT THE BRIGHTNESS CONTROL SWITCH IS WORKING.

RESEARCHER READS:

Please sit in this chair. (WHEN SEATED) I shall now read you some instructions but first let me thank you for coming and participating in this experiment. You will soon be watching a television programme and then will be asked to fill out some questionnaires on the programme you see.

You can see a television set on the table in front of you. This switch (SHOW TO SUBJECT) controls the brightness of the picture on this television set.

DEMONSTRATE THE FOLLOWING PROCEDURE AS YOU EXPLAIN -

1) You must press this button at a certain rate in order to maintain the picture's brightness;
2) If you press at a slower rate the picture dims,
3) And below a certain rate the screen goes black.

However, no matter how slow or fast you press this switch, the sound from the TV set will remain constant. It will be unaffected by this switch.

When you are watching the programme feel free to change the switch from one hand to another if one hand happens to get tired. (DEMONSTRATE)

Please note that it is not necessary for you to press the switch all the time. You may only want to watch portions of the TV show. Press only when you feel like watching the picture.

Now please put on these headphones and adjust them until they're comfortable. Take this switch.

A programme that is about 10 minutes long will begin shortly. Start pressing when you hear the tone.

I shall come back in with further instructions when you're finished.

AFTER SUBJECT VIEWS PROGRAMME AND IS LEAD INTO A NEARBY ROOM,

Here are two questionnaires to complete; please do the attitude change scale first, then the recall questionnaire.

WHEN SUBJECT COMPLETES QUESTIONNAIRES

Thank you for your co-operation in this experiment, but please do not discuss what you have done with any of your friends. It may affect their behaviour if they are asked to participate at a later date. In the next few weeks, you'll receive a written explanation of the experiment that should answer any questions about what you were doing.

Thank you again and good-bye for now.

INTRODUCTION TO STUDENTS IN THE CLASSROOM

Good morning, my name is _____ and I'm working on a research project for the Department of Education at Concordia University.

You will be participating by watching a 10 minute long TV production and afterwards complete two questionnaires. Although individual results will not be reported back to the school, I hope that you will, none the less, try to do your best when completing these questionnaires.

Let's start now by watching the TV show.

SHOW TELEVISION PROGRAMME

Now here are the questionnaires, two computer cards, and a set of instructions. Please use these special pencils when you mark the computer cards.

HAND OUT MATERIALS

Please put your name on the back of both computer cards and the two questionnaires. When you have finished, please put your cards, pencil, and questionnaires on this desk. Then return to your seats and remain quiet until everyone has finished.

Right now you may read the instructions and begin.

STUDENTS COMPLETE QUESTIONNAIRE AND MARK CARDS

(NOTE TO MONITORS: Do not help students to answer any questions on the questionnaires; however, you may give assistance to students having difficulty in completing the computer cards. Before accepting questionnaires or cards, ensure that all questions have been marked.)

TO STUDENTS WHEN EVERYONE IS FINISHED AND MATERIALS COLLECTED

Before you go, I'd like to thank you for your co-operation.

GENERAL INSTRUCTIONS TO STUDENTS

You will be given two questionnaires, two computer answer cards, and these instructions.

Please complete the two questionnaires as explained at the beginning of each one. Do the attitude scale first.

When you have done this, transfer the answers from the questionnaires on to the computer answer cards. Use one card for each questionnaire.

Now here are some instructions on how to complete the answer cards.

COMPUTER ANSWER CARDS

1. Carefully print your surname and initials in the boxes provided on the back of each card.
2. Use only the special pencils provided. Ordinary pen and pencil marks cannot be detected.
3. In using the special pencil, mark the boxes in completely. The entire box should be blackened.
4. Never mark two choices for any question. Otherwise your card will be rejected.
5. Erase if you want to, but erase completely.
6. Do not look for any sequence of right answers, and do not worry if you seem to have too many 1's or 2's etc. This may be how the right answers come out.
7. Make sure that the question number on the card corresponds to the question number on your questionnaire before you mark.

8. Ensure that your cards have no stray pencil marks on either side. Such marks can force the rejection of your answer cards.

APPENDIX G

ATTITUDE SCALE

Below are 40 statements which you are asked to rate. The ratings are given on a scale from strongly agree (SA) to strongly disagree (SD) as shown below: -

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
SA	A	N	D	SD

For example, if you like pets, you would probably mark A for the following statement:

I like pets. SA (A) N D SD

If you dislike pets alot, you would mark SD.

Please circle the rating which corresponds closest to your own personal attitude towards the following statements:

1.	The forest industry is not important to the Canadian economy.	SA A N D SD
2.	Relative to the amount of forests considered productive by the forest industry, forest fires do not do much damage.	SA A N D SD
3.	Most forest fires occur from natural causes.	SA A N D SD
4.	One type of forest fire is as bad as another.	SA A N D SD
5.	Canada wastes too much money on fighting forest fires.	SA A N D SD
6.	All forest fires are bad.	SA A N D SD
7.	Forests are sometimes better off after a fire.	SA A N D SD
8.	Animals and birds may benefit from forest fires.	SA A N D SD
9.	Forest rangers should never set forest fires.	SA A N D SD

10.	If someone wants to start a controlled burn, one part of ground is as good as another	SA	A	N	D	SD
11.	Not all forest fires are bad.	SA	A	N	D	SD
12.	After a fire, forests are never in better condition.	SA	A	N	D	SD
13.	Forest fires are never good for birds and animals.	SA	A	N	D	SD
14.	In special circumstances forest rangers should start fires.	SA	A	N	D	SD
15.	Controlled burns should only be started in certain parts of a forested area.	SA	A	N	D	SD
16.	The forest industry is a major contributor to Canada's Gross National Product (GNP).	SA	A	N	D	SD
17.	Forest fires are very destructive to Canada's forests.	SA	A	N	D	SD
18.	Most forest fires are not caused naturally.	SA	A	N	D	SD
19.	One type of forest fire may not be as destructive as another.	SA	A	N	D	SD
20.	Canada should spend more money fighting forest fires.	SA	A	N	D	SD
21.	A large number of people would be out of work if there was no forest industry.	SA	A	N	D	SD
22.	Canada loses millions of dollars of potential income through forest fires.	SA	A	N	D	SD
23.	Man's carelessness with fire is the forest's worst enemy.	SA	A	N	D	SD
24.	The same part of a forest is destroyed in all fires.	SA	A	N	D	SD
25.	More money given to "Smokey the Bear" campaigns would be well spent.	SA	A	N	D	SD

26.	Naturally occuring fires are often less destructive than others.	SA	A	N	D	SD
27.	Dense forests are healthier than forests with little underbrush.	SA	A	N	D	SD
28.	Forest fires are always bad for wildlife.	SA	A	N	D	SD
29.	A good way of helping a forest is to use controlled burning,	SA	A	N	D	SD
30.	Everyone should use fire to help a forest get rid of excess growth.	SA	A	N	D	SD
31.	Naturally occuring fires are different from other forest fires.	SA	A	N	D	SD
32.	Forests with little underbrush are not better off than forests with a lot of underbrush.	SA	A	N	D	SD
33.	Wildlife never thrives after forest fires.	SA	A	N	D	SD
34.	Controlled burning should never be used in the forest.	SA	A	N	D	SD
35.	People who have not been trained should avoid setting fires in the forest.	SA	A	N	D	SD
36.	Not many Canadians would be affected if the forest industry collapsed.	SA	A	N	D	SD
37.	Forest fires are not that destructive.	SA	A	N	D	SD
38.	Forest fires are generally not caused by man.	SA	A	N	D	SD
39.	Forest fires do not always destroy the same part of a forest.	SA	A	N	D	SD
40.	Costly advertising on T.V. about the causes of forest fires should not be continued.	SA	A	N	D	SD

QUESTIONNAIRE

INSTRUCTIONS:

Each of the incomplete statements or questions below is followed by several possible answers.

In the space provided, put a check next to the answer you think is most correct.

EXAMPLE

The population of Canada is slightly greater than_____.

_____ a. 14 million
_____ b. 18 million
__x__ c. 22 million
_____ d. 26 million

PLEASE ANSWER THE FOLLOWING ITEMS:

1. How many people are employed by the forest industry in Canada?

_____ a. 100 thousand
_____ b. 200 thousand
_____ c. 300 thousand
_____ d. 400 thousand

2. What percentage of Canada's exports are forest products?

_____ a. 20 percent
_____ b. 40 percent
_____ c. 60 percent
_____ d. 80 percent

3. What percentage of Canada is covered by forests?

_____ a. 20 percent
_____ b. 35 percent
_____ c. 50 percent
_____ d. 65 percent

4. How many forest fires burn each year in Canada?

_____ a. 2-4 thousand
_____ b. 4-6 thousand
_____ c. 6-8 thousand
_____ d. 8-10 thousand

5. What percentage of productive land is destroyed by forest fire in Canada each year?

_____ a. 10 percent
_____ b. 15 percent
_____ c. 20 percent
_____ d. 25 percent

6. What is the value of trees lost yearly through forest fires in Canada?

_____ a. 9 million dollars
_____ b. 12 million dollars
_____ c. 15 million dollars
_____ d. 18 million dollars

7. Which type of forest fire can smolder throughout an entire winter and break out again in the spring?

_____ a. Ground fire
_____ b. Surface fire
_____ c. Crown fire
_____ d. Controlled fire

8. Which type of forest fire burns on logging slash?

_____ a. Ground fire
_____ b. Surface fire
_____ c. Crown fire
_____ d. Controlled fire

9. Which type of fire is the most dangerous and destructive?

_____ a. Ground fire
_____ b. Surface fire
_____ c. Crown fire
_____ d. Controlled fire

10. What percentage of forest fires result from man?

_____ a. 55 percent
_____ b. 65 percent
_____ c. 75 percent
_____ d. 85 percent

11. What percentage of man caused fires result from carelessness?

_____ a. 24 percent
_____ b. 34 percent
_____ c. 44 percent
_____ d. 54 percent

12. Which of the following is not a major cause of forest fires?

_____ a. Campers
_____ b. Spontaneous combustion
_____ c. Forest Industries
_____ d. Railroads

13. How much does Canada spend each year to fight forest fires?

_____ a. 9 million dollars
_____ b. 12 million dollars
_____ c. 15 million dollars
_____ d. 18 million dollars

14. On which of the following is money to fight forest fires not spent?

_____ a. Bulldozers
_____ b. Railroads
_____ c. Lookout towers
_____ d. Water bombing airplanes

15. What is the most effective way of fighting forest fires?

_____ a. Controlled burning
_____ b. More men
_____ c. More equipment
_____ d. Prevention

16. What percent of forest fires are caused by lightning?

_____ a. 15 percent
_____ b. 35 percent
_____ c. 45 percent
_____ d. 25 percent

17. Lightning fires often cause little damage because _____

_____ a. They usually occur in the presence of rain and remain on the surface.
_____ b. They are started by lightning when the forest is damp.
_____ c. They occur in non-dense forests when the wind is calm.
_____ d. They usually occur in dense forests when there is a slight breeze.

18. Lightning fires are usually which type of fire?

_____ a. Ground fire
_____ b. Surface fire
_____ c. Crown fire
_____ d. Controlled burn

19. In a regularly burned forest, what happens to litter and underbrush?

_____ a. Litter and underbrush accumulate less.
_____ b. Litter and underbrush accumulate more.
_____ c. Litter accumulates less but underbrush accumulates more.
_____ d. Litter accumulates more but underbrush accumulates less.

20. In a regularly burned forest, what happens to large trees?

_____ a. They are weakened.
_____ b. They are destroyed.
_____ c. They are strengthened.
_____ d. They are not affected.

21. What happens to insects in a regularly burned forest?

_____ a. They breed faster.
_____ b. They are killed off.
_____ c. They become healthier.
_____ d. They become weaker.

22. In areas which have been burned, the deer population is likely to increase _____

_____ a. 2½ times.
_____ b. 4½ times.
_____ c. 6½ times.
_____ d. 8½ times.

23. Gamebirds are unable to find food when litter is deeper than _____

_____ a. 3 inches.
_____ b. 4 inches.
_____ c. 5 inches.
_____ d. 6 inches.

24. In areas that have been burned, the bird population is likely to increase _____

_____ a. 2 times.
_____ b. 3 times.
_____ c. 4 times.
_____ d. 5 times.

25. What wind conditions are necessary for starting a controlled burn?

_____ a. Gusty winds blowing in the direction of the area to be burned.
_____ b. Updrafts for burning a limited area at a time.
_____ c. Wind conditions are not important.
_____ d. A calm wind or no wind.

26. What is the best time of day to start a controlled burn?

_____ a. Early morning.
_____ b. Mid-day.
_____ c. Late afternoon.
_____ d. Early afternoon.

27. What kind of forest condition is best for starting a controlled burn?

_____ a. In the early spring when the snow has melted.
_____ b. In the summer when the forest is dry.
_____ c. After a rain when the forest is damp.
_____ d. In the winter when snow is on the ground.

28. Why is the oil and gasoline drip torch a good method for starting controlled burning?

_____ a. Oil is the most economical fire starter.
_____ b. Oil causes the least smoke in controlled burning.
_____ c. Oil from the drip torch sticks to the vegetation.
_____ d. Oil causes the least damage to healthy trees.

29. If you were using controlled burning to burn a hill would you

_____ a. Start from the bottom and burn up.
_____ b. Start in the middle and burn up.
_____ c. Start from the top and burn down.
_____ d. Start in the middle and burn down.

30. If you were burning an open area, where would you not start from?

_____ a. A road.
_____ b. A stream.
_____ c. A snowy area.
_____ d. A thick bush.

APPENDIX H

TABLE 1

ITEM ANALYSIS FOR ATTITUDE SCALE

Question		Reliability	Question		Reliability
1.	4.81	.086	21.	4.1	.157
2.	4.54	.013	22.	4.1	.008
3.*	3.81	.561	23.	4.72	.027
4.*	3.86	.632	24.	3.68	.536
5.*	3.72	.511	25.*	3.63	.364
6.*	3.31	.217	26.	3.22	.301
7.*	3.54	.362	27.	3.09	.284
8.*	3.23	.523	28.*	2.81	.509
9.	3.63	.256	29.	4.13	.182
10.*	4.04	.519	30.	3.81	.103
11.*	3.45	.325	31.	3.31	-.057
12.*	3.45	.512	32.	3.50	.457
13.	3.09	.304	33.	3.32	.419
14.*	3.63	.475	34.*	3.73	.591
15.	4.04	.423	35.*	4.14	.696
16.*	4.22	.218	36.*	3.91	.394
17.*	3.95	.316	37.*	4.04	.367
18.*	4.13	.173	38.	4.09	.175
19.*	3.90	.496	39.	3.59	-.034
20.	3.63	.069	40.	4.63	.114

The reliability is determined by using the Pearson r to measure the correlation between the scores made by all subjects on each item with the scores made by all subjects on the whole test. The coefficient for the whole test is .76. For the twenty items used in the final analysis, α = .79.

$$\alpha = \frac{K}{K - 1} \cdot \frac{\sigma_T^2 - \sum \sigma_I^2}{\sigma_T^2}$$

K = number of items
I = item
T = total (ie. test)

*Questions used in final questionnaire

TABLE 2

DISCRIMINATION AND DIFFICULTY INDICES FOR THE RECALL QUESTIONNAIRE

ITEM	DISCRIMINATION INDEX	DIFFICULTY INDEX	ITEM	DISCRIMINATION INDEX	DIFFICULTY INDEX
1.	.45	.68	16.	.45	.41
2.	.18	.18	17.	.27	.41
3.	.36	.64	18.	.64	.50
4.	.18	.45	19.	.36	.73
5.	.36	.27	20.	.73	.55
6.	.55	.45	21.	.27	.86
7.	.18	.91	22.	.36	.64
8.	.18	.91	23.	.36	.73
9.	.36	.82	24.	.64	.41
10.	.18	.73	25.	.36	.82
11.	0	.27	26.	.45	.77
12.	.18	.55	27.	.27	.86
13.	0	.55	28.	.86	.82
14.	.73	.55	29.	.55	.73
15.	.55	.64	30.	.45	.50

Discrimination = $\frac{\text{(No. passing in high-scoring group)} - \text{(No. Passing in low-scoring group)}}{\text{(Number in high-scoring group)}}$

The high scoring group refers to those who made marks in the top 50%; the low scoring group refers to those in the bottom 50%.

Difficulty = $\frac{\text{(Number of students passing an item)}}{\text{(Total number of students attempting the test)}}$

The discrimination index should be higher than .40, while the difficulty index should be between .5 and .7, for maximum effectiveness.

TABLE 3

RELIABILITY COEFFICIENT FOR RECALL QUESTIONNAIRE

ITEM	p_i	q_i	p_iq_i	ITEM	p_i	q_i	p_iq_i
1.	.68	.32	.22	16.	.41	.59	.24
2.	.18	.82	.15	17.*	.41	.59	.24
3.	.64	.36	.23	18.	.50	.50	.25
4.*	.45	.55	.25	19.	.73	.37	.20
5.	.27	.73	.20	20.	.55	.45	.25
6.	.45	.55	.25	21.	.86	.14	.12
7.*	.91	.09	.08	22.	.64	.36	.23
8.*	.91	.09	.08	23.	.73	.27	.20
9.	.82	.18	.15	24.	.41	.59	.24
10.*	.73	.27	.20	25.	.82	.18	.15
11.*	.27	.73	.20	26.	.77	.23	.17
12.	.55	.45	.25	27.*	.86	.14	.12
13.*	.55	.45	.25	28.	.82	.18	.15
14.	.55	.45	.25	29.	.73	.27	.20
15.	.64	.36	.23	30.	.50	.50	.25

K-R_{21}: $r_{xx} = \left(\frac{n}{n-1}\right)\left(\frac{\sigma^2 - \sum p_i q_i}{\sigma^2}\right)$ where: number of items = n

p_i = proportion of subjects whc pass item test variance = σ^2

q_i = proportion of subjects who fail item

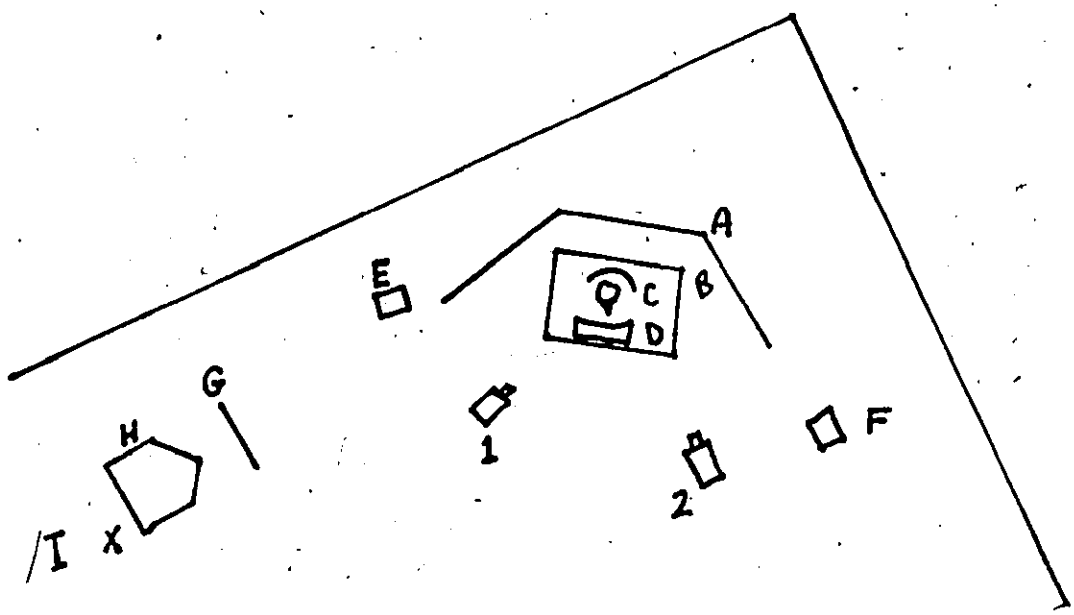
1. Original test: $r_{xx} = \left(\frac{30}{30-1}\right)\left(\frac{33.6 - 6}{33.6}\right) = \left(\frac{30}{29}\right)\left(.82\right) = .85$

2. Test items used for analysis: (Those without asterisk)

$r_{xx} = \left(\frac{22}{21}\right)\left(\frac{1.529 - 4.58}{15.29}\right) = \left(\frac{22}{21}\right)\left(.70\right) = .73$

APPENDIX I

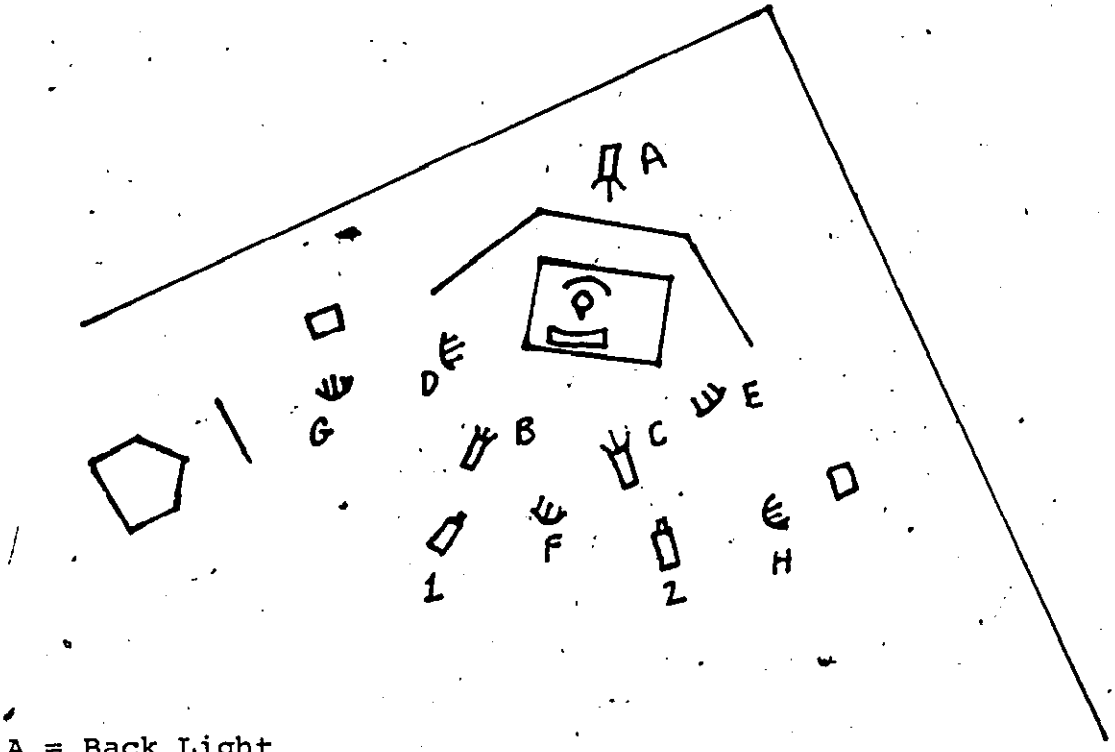
SET ARRANGEMENT FOR TV PROGRAMME PRODUCTION



A = Coloured Set
B = Platform
C = Chair
D = Table
E = Graphic Stand
F = Graphic Stand
G = Slide Projection Screen
H = Slide Projectors/Mixer
I = Position of camera 1 when tracing slides

APPENDIX J

SET LIGHTING FOR PROGRAMME PRODUCTION



A = Back Light
B = Key Light (Presenter)
C = Key Light (Presenter)
D = Fill Light (Set)
E = Fill Light (Set)
F = Fill Light (Set)
G = Key/Fill Light (Graphics Board 1)
H = Key/Fill Light (Graphics Board 2)

APPENDIX K

List of Production Crew

DIRECTOR	ARTHUR SHEARS
VISUAL MIXER	GUNTER KARKUTT
AUDIO/GRAPHICS 2	GINA SILIAUSKAS
VTR	PAT ROSE
CAMERA 1	NIKOLA CURCIN
CAMERA 2	SABINE DERNUET/EILEEN MARRETT
GRAPHICS 1/ FLOOR MANAGER	ELIZABETH SHEARS
NARRATOR	HAROLD HOFFMAN